

ENVIRONMENTAL HISTORY

Critical Issues in
Comparative Perspective

Edited by

Kendall E. Bailes



UNIVERSITY
PRESS OF
AMERICA



LANHAM • NEW YORK • LONDON

American Society
for Environmental
History



Copyright © 1985 by

University Press of America,™ Inc.

4720 Boston Way
Lanham, MD 20706

3 Henrietta Street
London WC2E 8LU England

All rights reserved

Printed in the United States of America

Library of Congress Cataloging in Publication Data

Main entry under title:

Environmental history.

Includes index.

1. Human ecology—History—Addresses, essays, lectures.
2. Environmental protection—History—Addresses, essays,
lectures. 3. Environmental policy—History—Addresses,
essays, lectures. I. Bailes, Kendall E.

GF13.E58 1985 333.7'209 84-23447

ISBN 0-8191-4376-6 (alk. paper)

ISBN 0-8191-4377-4 (pbk. : alk. paper)

Co-published by arrangement with the
American Society for Environmental History

All University Press of America books are produced on acid-free
paper which exceeds the minimum standards set by the National
Historical Publications and Records Commission.

**Bayerische
Staatsbibliothek
München**



85 156568

TABLE OF CONTENTS

ACKNOWLEDGMENTS

INTRODUCTORY ESSAYS

Critical Issues in Environmental History

Kendall E. Bailes1

Environmental History: Pitfalls and Opportunities

John Opie22

ENVIRONMENTAL VALUES AND HISTORY

The Problem of Method in Environmental History

Joseph M. Petulla36

Culture and Environment in Western Civilization

During the Nineteenth Century

Clarence J. Glacken46

Comment

Roderick S. French58

ENVIRONMENTAL ATTITUDES IN PREINDUSTRIAL AND INDUSTRIAL
CIVILIZATIONS

Gaia: Environmental Problems in Chthonic Perspective

J. Donald Hughes64

Environmental Ambivalence: An Analysis of

Implicit Dangers

Bruce Piasecki83

Comment

Richard Frank99

CLIMATE AND HISTORY

The State of the Field

Robert H. Claxton104

South American and World Climatic History

Cesar N. Caviedes135

CONSERVATION AND ENVIRONMENTALIST MOVEMENTS IN THE U.S.

The Women of the Progressive Conservation Crusade

Carolyn Merchant153

Conservation, Environmentalism, and the Engineers: The Progressive Era and the Recent Past	
Carroll Pursell	176
Comment: Merchant and Pursell	
Ronald C. Tobey	193
From Conservation to Environment: Environmental Politics in the U.S. Since World War II	
Samuel P. Hays	198
Rounding Out the American Revolution: Ethical Extension and the New Environmentalism	
Roderick Nash	242
Comment: Hays and Nash	
Donald Worster	258
ENVIRONMENTAL HISTORY AND NATIVE AMERICANS	
Navajo Ecology and Government Policy	
Donald A. Grinde	264
Science and Ethnoscience: Native American World Views as a Factor in the Development of Native Technologies	
Clara Sue Kidwell	277
Comment	
Peter Iverson	288
NON-WESTERN PERSPECTIVES ON ENVIRONMENTAL PROBLEMS	
Planned Economy and Environmental Problems: Eastern Europe from a Comparative Perspective	
Ingmar Oldberg	293
The Japanese Experience with Scarcity: Management of Traditional Common Lands	
Margaret A. McKean	334
Comment: The Japanese Experience with Scarcity	
Thomas R. Cox	374
The Historical Origins of Soviet Environmentalism	
Douglas R. Weiner	379

Nature's Revenge: The Soviet Debate over Nature and Society, 1960-1979	
Kristian Gerner and Lars J. Lundgren	412
THE U.S. GOVERNMENT AND ENVIRONMENTAL POLICY	
Environmental Policy and American Liberalism:	
The Department of the Interior, 1933-1953	
Clayton R. Koppes	437
Comments	
Gerald R. Nash	476
Harold L. Burstyn	485
Reply	
Clayton R. Koppes	488
URBAN ENVIRONMENTAL HISTORY	
Environmental Reform in the Industrial Cities: The Civic Response to Pollution in the Progressive Era	
Martin V. Melosi	494
The Search for the Ultimate Sink: Urban Air, Land and Water Pollution in Historical Perspective	
Joel A. Tarr	516
THE IMPACT OF WESTERN EXPANSION ON WORLD ECOSYSTEMS	
The British Empire as a Product of Continental Drift	
Alfred W. Crosby	553
The Global Economy and Forest Clearance in the Nineteenth Century	
Richard B. Tucker and John F. Richards	577
The Biological Conquest of the North American Indian:	
Abstract	
Calvin Martin	586
Comment	
Thomas R. Cox	587
SCIENTISTS AND ENVIRONMENTALISM	
'The Coyote Itself'--Ecologists and the Value of Predators, 1900-1972	
Thomas R. Dunlap	594

Insects, Food, and Hunger: The Paradox of Plenty
for U.S. Entomology, 1920-1970

John H. Perkins619

Comment

Karl Hufbauer658

CONCLUSION

World Without Borders: The Internationalizing of
Environmental History

Donald Worster661

LIST OF CONTRIBUTORS670

INDEX676

ACKNOWLEDGMENTS

The editor wishes to thank all those whose assistance made this volume possible. In particular, he would like to acknowledge the help of Prof. Wilbur Jacobs in the History Department at the University of California, Santa Barbara, and Prof. Donald Worster in the Department of American Studies at the University of Hawaii, who -- together with the editor -- formed the Program Committee of the American Society for Environmental History which planned the conference on which this book is based. Their many sound ideas about speakers and topics help to account for the high quality and the range represented by these articles. The Assistant Editor of this volume, Mr. William Tohee, currently a graduate student in the Native American Studies Program at U.C.L.A., spent more than a year carefully copyediting the text and preparing it on a word processor. Marilyn Moriarty, a graduate student in English at the University of California, Irvine, spent a summer at the laborious task of compiling a detailed index. I also wish to thank those graduate students in history at UC Irvine, who assisted at the conference in a number of ways and who took notes of discussions at the various sessions, on which part of the editor's introduction is based. In particular, I wish to thank the following students: John Hatch, Deborah Hirshfield, Craig Longuevan, Paul Roach, and Lee Ann Whites. The financial assistance which made the conference and the resultant publication of its proceedings possible was provided by the National Endowment for the Humanities, through a conference grant, and by the School of Humanities and the Graduate Division of the University of California, Irvine.

The editor would also like to thank the following publications for permission to reprint several of the essays included in this volume, which were first published elsewhere:

The Historian, where portions of the essay by Robert H. Claxton ("Climate and History: the State of the Field") were published in its February, 1983, issue.

The University of Virginia Press for permission to reprint the article by Joel A. Tarr, "The Search for the Ultimate Sink," published in the Proceedings

of the Columbian Historical Society (1984).

Avant Books, for permission to reprint the essay by Roderick Nash, "Rounding Out the American Revolution: Ethical Extension and the New Environmentalism," which first appeared in Michael Tobias, ed., Deep Ecology, (San Diego, 1984).

Environmental Review, journal of the American Society for Environmental History, where the essays by Opie, Koppes, Dunlap, Perkins, Worster, Hays, Weiner, McKean, Hughes, and Merchant were published in several special issues devoted to selected papers from the Irvine conference, under the guest editorship of Kendall E. Bailes.

CRITICAL ISSUES IN ENVIRONMENTAL HISTORY

Kendall E. Bailes

University of California, Irvine

Two hundred years ago, a German writer composed a short essay which began, "Nature! We are surrounded and embraced by her, powerless to separate ourselves from her, and powerless to penetrate beyond her. Without asking, or warning, she snatches us up into her circling dance, and whirls us on until we are tired, and drop from her arms. . . We live in her midst and know her not. We constantly act upon her and yet have no power over her." [1] Since these words were written in the 1780s the spread of industrialization and the development of modern science seemed to belie the view they express. However, after two centuries of increasing human self confidence, many people in industrialized nations may once again sympathize with the thought of this eighteenth century writer. Judging by the growth of environmentalist movements, increasing numbers have begun to question the degree of mastery human beings have achieved over nature. Concern with environmental problems in the 1960s and 1970s has focused the attention of scholars on historical aspects of the relationship between human beings and the rest of nature. This concern has spawned a number of important studies and led in 1976 to the formation of a new scholarly group: the American Society for Environmental History.

On January 1-3, 1982, an international conference on environmental history was held at the University of California's Irvine campus. Co-sponsored by the American Society for Environmental History and the History Department at Irvine, the Conference brought together more than one hundred scholars active in the field. In organizing this event, we felt that the time had come for an assessment of the field of environmental history as a whole, what it has accomplished and may accomplish in the future. In particular we wanted to bring together a number of people who are already doing work in this field but may not have met before, in order to widen and enhance a research network of individuals with similar interests. The meeting, at which nearly thirty papers and comments were presented, proved to be the most extensive national

conference ever held in a field the future significance of which can only be expected to grow as public concern with environmental problems increases in the decades ahead.

The debate over such problems has been heightened in recent years by the publication of a number of studies, one of which is The Global 2000 Report, a document released in 1979.[2] It makes some highly disturbing projections for the future, if present world trends continue. The conclusions of this report "indicate the potential for global problems of alarming proportions by the year 2000. Environmental, resource, and population stresses are intensifying," it concludes, "and will increasingly determine the quality of human life on our planet. These stresses are already severe enough to deny many any hope for betterment. At the same time, the earth's carrying capacity--the ability of biological systems to provide resources for human needs--is eroding. The trends reflected in the Global 2000 study suggest strongly a progressive degradation and impoverishment of the earth's natural resource base." [3]

This report was released during the Carter Administration, and its successor in Washington has clearly been working from different assumptions, having decided that such reports are unduly alarmist. The attack on the so-called 'doomsayers,' including such biologists as Barry Commoner and Paul Ehrlich, has been given an intellectual and scientific basis by other eminent scientists, perhaps most notably the late Rene Dubos in several recent books which were critiqued at this conference in a paper by Bruce Piasecki. The so-called 'cautious optimists' like Dubos stress at least two major points in their approach to environmental problems: nature's resiliency, and mankind's ingenuity and adaptability in overcoming such problems. That is, they stress that nature is more resilient in recovering from environmental damage than the 'alarmists' have given it credit for being, and mankind is more adaptable and capable of self correcting changes in its relationship with nature than the pessimists would have us think.

As Dubos himself expressed it in his recent book Celebrations of Life: "Grim warnings have been repeated ad nauseam since the doomsday forecast of the Club of Rome's Limits to Growth. Like many others, I also believe that our present form of technological civilization will eventually collapse if present trends continue--but what a big if this is." [4]

Thus the debate continues, both in political institutions and the forum of public opinion, with recent evidence from public opinion polls in the United States indicating that the general public is taking no chances; it remains much more concerned to maintain and strengthen environmental safeguards than the current administration, and this caution has been evidenced in the reluctance of the U.S. Congress to cooperate in a wholesale dismantling of environmental protection measures. Only the future can tell who is right in this debate, but it seems obvious that we cannot ignore the issues involved, nor can we afford to act on such important questions out of ignorance.

My own criticism of such forecasts as The Limits to Growth and The Global 2000 Report is rather different from that of scientists like Rene Dubos. The criticism I have of these otherwise useful studies is one which they share with other global studies published by various groups in recent years; that is, their almost total lack of historical consciousness or background. Their focus has been on recent trends and possible future dangers, together with the need radically to change governmental policies and general cultural patterns in areas that affect mankind's interplay with nature.

It is one thing to point out currently alarming trends and call for change--certainly a useful and necessary service--but quite another to understand the historical reasons for the persistent patterns of human thought and behavior that have led to the present situation. Historical experience can give us many clues to possible future outcomes. More historical knowledge and interpretation in this area may suggest some of the causes of such deeply rooted patterns, patterns that are often very difficult to change. Papers presented at conferences such as this

one provide numerous case studies where both successful and unsuccessful adaptation and change have occurred in the interaction between society and nature. Only with a deeper knowledge of the range of such cases can more informed decisions be made about future needs and problems. One of the useful outcomes of such conferences, we hope, will be to lift the debate about the environment out of the immediate political arena--where it has too often become mired in partisan polemics--in order to discuss some of the basic underlying value systems, thought patterns, human institutions and structures of social action that can be found in mankind's past environmental experience.

For the purposes of this conference, we defined environmental history quite broadly to include all studies of the relationship between human societies and the natural environment through time. The conference sessions focused on four interrelated sub-areas: 1) changing values and attitudes toward nature and their significance; 2) the effects of human economic activity on the natural environment and vice versa; 3) the history of conservation and environmentalist movements, and 4) the role of professional groups, such as scientists and engineers in transforming nature and in their relationship to environmental thought and movements.

Given that broad framework, a number of issues considered critical to the field emerged from the papers, formal comments, and discussions in the various sessions. They deserve further consideration by scholars. The first concerns whether environmental history requires a special methodology. Although no clear consensus emerged from the papers and comments, a number of participants made the point explicit, or it became evident from the approach taken in their own work, that an understanding of the methodology of the general historian needs to be combined with a knowledge of modern scientific ecology. In other words, they suggested a methodology similar to that needed by the historian of science who must know both historical methodology and a good deal about the content of the natural sciences.

As John Opie expressed it in his opening address, environmental history deals not with mankind

alone--that is, not simply with social, political and economic relations and the ideas and beliefs of human beings--but with mankind in its ties with a natural setting. Or to put it in a less passive way, environmental history deals with the dialectic between nature and culture, the interaction of humans with the rest of nature through time. Ecology provides many generalizations and concepts about ecosystems and how they function that may be useful to the environmental historian. To quote John Opie, "two major aspects of ecology influence how the environmental historian proceeds: the focus of ecological science upon large-scale systems, and the unique attention ecology gives to a holistic approach to human phenomena." But as Opie points out, a methodology which borrows concepts from a natural science also contains certain implicit dangers: in particular the danger of imposing a form of biological determinism upon human history that denies any uniqueness to humans, or sees no difference between the human species and other species. Opie considers this as one of the problems environmental historians must wrestle with--how to give a biological or ecological perspective to history without denying any independent role to the human actor, or any freedom or uniqueness to human beings in helping to shape their own history. The dangers of too narrowly a biological approach were also alluded to by Professor Cox in commenting on the papers of Profs. Martin and Crosby, whom he criticized for giving too little attention to cultural and social variables and overemphasizing biological factors as primary causal agents.

The influence of scientific ecology and other natural sciences can be found in a number of the papers presented here: one might mention in particular those of Perkins, Dunlap, Weiner, Martin, Crosby and others. However, many others require no knowledge of ecology or other natural sciences and depend largely for their methodology on the traditional approaches of the historian. What perhaps remains most crucial, a point emphasized by Joseph Petulla in his paper, is the ability to sort out the primary variables from a mass of evidence and construct a persuasive argument that explains change concerning a particular human interaction with the natural environment, or the lack of such change over time. Petulla sees five crucial types of variables

that must be considered by the environmental historian. As he expressed it, environmental history is the study of what impact economics, politics, social structure, technologies, and value systems have had on the natural environment and the use of natural resources. One might add that the reverse is also true: environmental history includes the study of what impact particular natural environments, and the availability or lack of particular resources, have had on human societies. For example, the paper of Robert Claxton, on climate history, deals with that question, as does the paper of Ingmar Oldberg on the environmental problems of the smaller Eastern European countries, such as Poland, East Germany, and Czechoslovakia, with their limited natural resources and particular geographical and climatic conditions.

In one sense, therefore, the problem environmental historians face is similar to that faced by any historian--to sort out the variables in a concrete historical situation and to argue persuasively from the evidence about which of these variables are most important in interacting toward a particular result. This leads to one of the oldest problems in historical writing, the relative importance of ideas and beliefs versus other important variables. Certain of the papers deal primarily with ideas about nature and human interaction with the environment.

For example, Clarence Glacken and Donald Hughes create typologies concerning important sets of ideas or beliefs, Glacken for the nineteenth century and Hughes for the classical civilizations of the Greco-Roman world and its immediate predecessors. Professor Kidwell does something similar for American Indian cultures, finding in the great maze of beliefs among the North American Indian tribes certain shared values and beliefs about nature. Donald Grinde in his case study of the Navajo finds in their differing beliefs about nature the basis for conflict with the dominant western civilization of this continent, which holds radically different ideas about nature and mankind's place in it. Professor Dunlap has provided a case study about modern scientific ideas which argues that scientific research has changed our notions about the role of predators in an ecosystem, ultimately affecting our practices toward them.

Specifically, new scientific ideas have helped put an end to attempts to eliminate certain predators from ecosystems, animals once considered harmful to human society. If Professor Dunlap sees a positive force in the development of such scientific ideas, Bruce Piasecki points up the danger of certain other scientific ideas, particularly the views of the eminent microbiologist Rene Dubos about the resiliency of nature and the adaptability of human beings in dealing with their environments. What both Dunlap and Piasecki have in common, however, is a belief in the ability of ideas to affect environmental practices. Such articles perform an interesting and useful service in helping to provide an orderly way of thinking about belief systems and concepts about nature.

As Richard Frank noted in his comment on Professor Hughes' paper, "History offers a reminder that things were once different, that there was another ethos which humanity followed for millenia.... There is, then, deeper significance in understanding the history of man's view of the environment. To recapture the past, to know that humanity once pursued a different ethos, is to know that the world was once different, and might be so again." Either implicitly or explicitly, the papers mentioned above give a major weight to ideas and beliefs as determinants in environmental history. In this they follow a tradition of historical writing well represented by Lynn White, Jr. in his much debated article of the 1960s, "The Historical Roots of Our Ecologic Crisis." [5] White found in the religious beliefs of the Judeo-Christian tradition a primary cause of recent environmental problems, and the solution he believed would come from a change in belief systems.

Other papers and comments presented at the conference took sharp issue with such views, and sought for causality in a complex mixture of beliefs, social institutional practices and economic interests. For example, Joseph Petulla, while obviously seeing ideas, beliefs, and value systems as important factors helping to shape environmental practices, questions whether such factors alone are primary. He suggests that to understand how ideas, beliefs, and value systems persist and change requires a close study of social institutions, how

they interact with the natural environment, how and why they perpetuate certain intellectual and moral traditions and not others. For particular concepts, values, and beliefs about nature to survive, writes Petulla, they need institutional and community support. They do not arise in a vacuum but proceed from social institutions which in some way find it in their interest to propagate and support such values. Thus Petulla changes the focus of analysis for the environmental historian from ideas, values and beliefs per se, to their institutional matrix. Douglas Weiner's article, "The Origins of Soviet Environmentalism" is a case study which illustrates such an analysis of ideas in their institutional and political setting. He surveys the various strains of environmental thinking which existed in Russia before the 1917 revolution and then shows which strains found institutional support in the Soviet period and which floundered either because they clashed with official Soviet goals and assumptions or did not find sufficient resonance to arouse enthusiasm in the centers of institutional power.

Donald Worster in his concluding essay for this volume develops a similar critique of the Lynn White approach: environmental history as a field, he argues, will "stultify if it is relegated to a mere subdivision of intellectual history, purveying an unconvincing idealist notion of social change: that is, if it takes ideas, religions, and philosophies to have been the sovereign shaping forces in history." Worster clearly is not against the study of ideas and beliefs but, among other things, he wants environmental historians to shift from a heavy focus on the ideas of great individual thinkers to a study of mass consciousness and collective mentalities as revealed, for example, in rituals, in bodies of professional knowhow, in mass public opinion. But most of all he is concerned about how such beliefs arise out of the material interests and needs of people at particular points in time. Richard Frank, in his commentary, suggests how a link might be forged between ideas and belief systems, on the one hand, and the other critical variables historians must consider when arguing about causality. Frank suggests that ideas about nature, such as those of Rene Dubos, should be treated as ideologies, that is, as rationalizations for existing institutions and practices: "What Dubos has done is produce a classic

example of ideology--a system of premises and arguments designed to justify existing institutions and relations." This is not to deny the force and efficacy of such sets of ideas, only to argue that they are not an independent force existing in limbo but are rooted in social relationships and the promotion or protection of institutional arrangements and material interests. Thus the analysis of values, ideas, beliefs by themselves is a useful but not sufficient approach for the environmental historian who must dig deeper to uncover their social and institutional roots.

In a sense, this is what Professor Samuel Hays has attempted in his complex analysis of changes in popular beliefs and environmental practices in the United States since World War II. By contrasting the conservation movements prior to World War II with the rise of environmental movements since 1945 he has found a number of critical differences which he seeks to explain by underlying changes in the economy and social structure of the U.S. during the postwar period. Ideas and beliefs are given their due but are situated in and explained by broader changes in the social structure and economy. In particular, he finds the greater affluence and rising educational levels of the American public to have been primary causes of these changes in belief systems and practices. Whatever one may think about his particular thesis, his approach is one worthy of close consideration by other scholars engaged in environmental history. X

Another point on which a number of participants differed was the question of whether the historian should adopt the role of moral critic. Some participants felt strongly that moral judgments are not the task of the historian; it is sufficient to understand and explain why ideas and practices developed in the way that they did. John Opie, in his introductory address, suggested that environmental historians are sometimes "torn between the determination of causes and the assignment of responsibility. Can one go beyond explanation and assess judgment?" To ignore judgment and fail to apply explicit moral criteria is regarded by some environmental historians as an abdication of responsibility on the part of the historian to use knowledge not only to explain but to point out ills,

how and why they arose, and to suggest alternatives based on historical experience. At the risk of accusations of faddism, Opie believes historians have the right to be not only explainers but moral critics if they so choose.

In the discussion of Opie's paper, Joel Tarr felt that academic historians in particular should not be moral critics or advocates per se, since this role tends to undercut their credibility as objective scholars seeking to understand human experience and makes them suspect as promoters of a particular point of view or a particular set of policy options. In other words, they are suspected of selecting only those facts agreeable to their viewpoint and slanting their interpretations to support particular preferences which depend on the historian's own prior convictions. Environmental historians should rather analyze problems as objectively as possible and present their conclusions dispassionately, leaving to others the task of judgment and advocacy.

Donald Worster, on the other hand, defended the right of historians to be advocates and moral critics, and wondered why historians have trouble with this role when economists (Friedman, Galbraith, Samuelson, Thurow, to mention a few) do not. Bailes agreed with Worster and wondered if the relative decline of history as a popular field since the 19th century when compared with economics is not in part the result of historians abdicating the role of moral critic and advocate. One reason for the popularity of history in the 19th century was that historians caught the imagination of the public by their willingness to criticize and advocate positions of a general nature. As historians have become more and more specialized they have shied away from broader moral commitments, at least as reflected in their scholarly work. Bailes argued that historians can be both objective in considering the available evidence and explicit in defining their own values and preferences so far as environmental beliefs and practices are concerned.

Others at the conference suggested that many contemporary historians, unlike economists and political scientists, tend not to develop broad theoretical models of their subject matter which can then provide a set of criteria for judgments and

criticism. However, this is where environmental historians with a knowledge of scientific ecology may have an advantage. Ecological models can provide a set of criteria by which to measure and critique past societies and environmental practices. That is, scientific ecology can tell us something about what constitutes a viable ecosystem, one that is self-sustaining and supportive of life forms over time, and one that is not. Ecology and history together can suggest the degree to which past societies have maintained a dynamic balance between society and nature, sustaining both, and the degree to which certain practices have tended over time to upset that balance in a way destructive of human life, the natural environment, or both. Along these lines, Douglas Weiner suggested that there is a need to identify clearly the 'biological baseline' needs of human beings in order to better measure how different societies have gone about meeting them, or have failed to meet them. Ecological models offer many useful ideas in defining such needs and indicating whether or not they have been met.

Lynn White, however, objected to the general tenor of this discussion, feeling that there is a great temptation for young branches of history to argue over generalizations before a sufficient basis has been laid by detailed case studies. His advice was to get back to cases and not worry too much at this point about broad 'ecological models' and sweeping generalizations.

Whether or not the environmental historian becomes a moral critic or advocate, some of the conference participants argued that at the very least environmental history serves a moral purpose by dissecting and calling into question certain myths constructed in the past to serve particular interests, in other words by de-mythologizing the past. For example, John Perkins in a sense has done that by challenging an argument he sees as a rationalization for the adoption and widespread use of chemical pesticides. This is the argument that such pesticides have been necessary to prevent starvation. His paper argues that the threat of famine or starvation has never been a factor in the development and increasing use of chemical pesticides in American agriculture since the 1920s. Rather, such use has arisen from the needs of farmers to

continually lower production costs per unit and to economize on labor by increasing the capital intensity of agriculture. The 'agricultural treadmill' that rewards the early bird, the farmers who first apply new techniques to increase production, lower production costs per unit, and thereby increase their profit margins he sees as the major stimulus to the introduction and spread of chemical pesticides in American agriculture, not any particular danger of widespread hunger or starvation. Richard Frank has suggested that this type of de-mythologizing, that is, the critical examination of the reasons given for a particular environmental practice or policy, is an important function of environmental history. Bruce Piasecki's paper forms another instance by pointing out the dangers of 'environmental ambivalence,' an attitude he finds widespread in history, epitomized in his paper by the works of Walt Whitman and Rene Dubos. Environmental ambivalence is the belief that there is an innate human impulse, unavoidable though at times regrettable, to change the natural environment. The attitude of 'environmental ambivalence' encourages us to see this as an inevitable part of human nature which we must learn to live with, like death and taxes. Piasecki believes that this is, in fact, a myth which encourages us to think that there is nothing we can do about environmental deterioration. His article forms an articulate argument against such views.

If one of the uses of the past, in the view of some environmental historians, is to provide a basis for moral criticism and advocacy of particular environmental viewpoints, another use of the past is to provide evidence about specific environmental practices that may be useful for the future. In her article, Margaret McKean seeks such a useable past in the experience of 19th and 20th century rural Japan. The purpose of her case study is to suggest ways of dealing with a problem area which environmental economists have dubbed 'free rider problems,' or the 'tragedy of the commons.' She seeks in the past social mechanisms that can be effective in preventing the destruction of any natural resource held in common, whether land, air, water, minerals, etc. As a political scientist, she finds it helpful to comb the historical record for examples of success in preventing tragedies of the commons. Various

solutions to free rider problems have been tried, such as 1) privatizing the commons on the theory that individual owners will take better care of something if it is their private property, (something not always possible; though, how does one divide up or privatize such resources as clean air or many bodies of water?); 2) enforcing a community ethic by persuading its members that their private good coincides with what is in the public interest; 3) managing a common resource through smaller communities of co-owners on the theory that by reducing the size of groups responsible for a resource the personal benefit to each co-owner of maintaining that resource increases.

In the management of village common lands in rural Japan she has found a successful example of maintaining a common resource which provides certain ideas she feels are transferable to other societies. Specifically, she argues that the success of Japanese farmers in maintaining village common lands at maximum sustainable yields was a result of several factors: the rules governing access to these lands were made by the co-owners themselves, not imposed from the outside; the rules were applied equally and fairly to all villagers; enforcement was delegated by the villagers to certain members of their own community by general agreement; punishment for violation of the rules was based on a graduated scheme to match the offense; the rules were clear and aimed specifically at preventing depletion and deterioration of a resource needed by everyone.

Professor Cox, in commenting on this paper, questions the transferability of the Japanese experience to the management of large tracts of public lands or other commons, particularly those outside of Japan. He feels that Professor McKean's case study concerns a very specific situation, involving only small areas of land, in a society quite different from Western societies. In particular, he argues that Japanese success here was bought at a great price in social conformity and the suppression of individualism. One wonders, however, if the degree of 'social oppression' in Professor McKean's case study is any greater than that involved in being the owner of a condominium in the United States, subject to rules about common areas, rules made and enforced by a community association. The

condominium form of ownership in the West, which has spread widely in the past decade, while scarcely applicable to all commons, forms a somewhat comparable system (however, in an urban setting) to the one explored by Prof. McKean in the sense that it is aimed at maintaining a commonly owned environment. Cox's criticism raises a more general problem for environmental historians, however: does the maintenance of environmental quality in general, and the prevention of 'tragedies of the commons' not require some suppression of individualism and more social control? Of course, any system of laws or rules and their enforcement requires social control but the real question here concerns the level of social control necessary to maintain environmental quality and the differing tolerance for such controls on the part of various cultures.

This is one area in which comparative studies by environmental historians might be especially helpful. One might expect, for example, that the state socialist societies of Eastern Europe and the Soviet Union, with their public ownership of the means of production and central planning would be more successful in maintaining a high level of social control to prevent environmental deterioration. Indeed, such an argument has been made, not only by Soviet and Eastern European writers but recently by two respected Western economists.[6] However, three Swedish scholars invited to this conference argue that despite the differences between the organization of Soviet-style societies and Western societies, the environmental efficiency of the former does not seem appreciably higher than the latter. In fact, in some of the smaller Eastern European countries environmental problems may be more severe than in the West. In contrast to Western writers such as Barry Commoner, who have seen capitalism as the major culprit, their analysis suggests that what capitalism and Soviet-style socialism share in common is the major cause: modern industrialism with its ethos of economic growth and the mass support this ethos gains from its promise of greater security and ever-rising standards of living. In other words, such explanations return us full circle to the question of consciousness (ideas, beliefs, values) and what interests in society such beliefs and values serve.

Although the articles by Oldenburg, Gerner and

Lundgren on Eastern Europe and the Soviet Union indicate that state socialism has found no ideal solutions to environmental problems, both papers by these authors indicate the degree to which such problems are taken seriously in Soviet bloc nations. Perhaps even more interesting, both papers show a rapid evolution of views concerning environmental problems in these countries and a high degree of experimentalism in attempting to deal with them. What seems especially promising and worthy of close attention is a change from an emphasis on administrative and punitive methods in these countries, for example compensation for damages to the environment, to a greater emphasis on economic incentives aimed at the prevention of such problems in the first place. How successful such attempts will be remains an open question, but these efforts bear close watching by environmental historians. What Eastern European states have not been willing to tolerate for any length of time are grassroots environmentalist movements, such as the Polish Ecology Clubs which flourished while Solidarity was at its height, or similar groups which experienced a short-lived existence in Czechoslovakia before the Soviet intervention in 1968. This suppression of grassroots movements forms an interesting contrast to environmental movements in Western Europe, the U.S., and Japan which have provided much of the impetus for changes in those countries.

The significance of the difference between the more bureaucratic approach to such problems in Eastern Europe and the mixed bureaucratic-grassroots approaches of the West and Japan requires further exploration by scholars. These are only several of the problem areas that would benefit from comparative study. A third problem, barely touched on during the conference, is perhaps even more cogent and important: the effect which war and warfare states have had upon the use of natural resources and the level of environmental quality. It would be worth contrasting the environmental records of such military superpowers as the United States and the Soviet Union with smaller industrial countries which have relatively lighter military burdens and democratic systems, such as Norway and Holland. As yet, we lack detailed studies in English concerning the environmental practices of such countries that could provide a basis for comparative study, but the

problem is an important one for future research agendas. In a period of international confrontation and insecurity, if not outright warfare, what happens to natural resources and environmental safeguards? Are preparations for warfare mutually incompatible with environmental quality or is this an oversimplification of a complex question? Only a series of detailed comparative studies can suggest an answer. In his commentary, Professor Richard Frank was one of the few conference participants to raise the problem of the relationship between societies based on warfare and environmental problems. He suggested a strong link between environmental deterioration, the waste of natural resources, and the rise of warfare states. However, his suggestion needs detailed empirical investigation.

A number of papers at the conference analyzed how environmental policies are made at the national level. The papers on the Soviet Union and Eastern Europe took this approach, as did a number concerned with the United States. For example, Prof. Clayton Koppes examined in detail the policy making process during the Democratic administrations of FDR and Truman and argued that, contrary to accepted opinion, there was a major discontinuity in such policies between these two administrations, despite continuity in many other areas and the general liberal orientation of both administrations.

His analysis focused on the policy-making process in the two administrations and the views of top environmental policy-makers. His approach was criticized on several counts by Prof. Gerald Nash in an extensive commentary. Nash felt that Koppes focused too narrowly on the views of a few people at the top of the Washington hierarchy, at times taking sides with several of these figures, and largely ignoring regional sectional conflicts that had a major influence on the shaping of policy. The critic also argued that Koppes "places too great a faith in the rhetoric of those involved in the formulation of environmental policies, without probing deeper into the self-interest which that rhetoric was often designed to cover." Prof. Nash recommended more emphasis on how policies are affected by bureaucratic struggles: "Much public policy emerges not out of lofty ideas. . . . but out of the morass of bureaucratic in-fighting."

Finally, Nash believed that many policies emerged not so much from the wills of a few policy-makers but "had their roots in changing economic and social conditions in the United States" and that individual policy-makers shifted their views to reflect these changes in order to survive politically. Finally, Nash emphasized that grassroots support for various environmental policies needs more careful examination: "Should we not consider the many interest groups who impinged on the formulation of environmental policies in the United States rather than focus exclusively on a bureaucratic elite composed of self-styled liberals?"

This clash of opinion indicates the complexity of interpreting any national policy-making process and the difficulty in analyzing the various influences that contribute to policy formulation. The emphasis on identifying the role of various interest groups that have contributed to environmental policies and practices and relating those interests to broader social and economic changes is a theme taken up by a number of papers, including those of Samuel Hays, Martin Melosi analyzing some of the environmental effects of the municipal reform movements during the Progressive era, Carolyn Merchant who emphasizes the important role of women's groups in environmental reforms during the same period, Carroll Pursell who looks at engineers as environmental reformers, and Roderick Nash who discusses the grassroots ethical and emotional appeal of recent environmentalism.

The work of such writers suggests that a detailed prosopography of the various interest groups contributing to changes in environmental policy, their views and activity, can greatly aid our understanding of environmental movements. What one finds missing in these papers, however, is a similar detailed discussion of the opponents of environmental policies, how they organized to promote their interests and the close interaction between opponents and proponents in determining outcomes. At times, one has the feeling of watching a football game in which one of the two teams is invisible, or fades in and out as a faint blur. Despite such caveats, however, these papers have added greatly to our

knowledge of U.S. conservation and environmental movements in the twentieth century.

The interpretations of Samuel Hays and Roderick Nash, in particular, reveal an interesting contrast in approaches. Both authors see a qualitative difference between the conservation movements of the early twentieth century and post-World War II environmentalism in the United States. Both would agree that production concerns and engineering ideology aimed at more efficient use of resources was a crucial ingredient of the pre-World War II movements, while scientific ecology played a more prominent role in postwar environmentalism.

Both writers see these movements in harmony with earlier American traditions, but here the similarity ends. Hays looks for the roots of modern environmentalism in postwar economic and social changes, and sees them as part of the history of changing consumer needs and desires, while Nash stresses the ethical and emotional underpinnings of such movements as a major part of their appeal. Specifically, Nash views recent environmental movements not as hostile toward traditional American values but as an extension and new application of a revolutionary democratic tradition which goes back to the origins of the American republic: in particular he sees environmentalism containing a strong defense of minority rights and aiming at the liberation of oppressed groups, extending our understanding of such rights and groups from humans per se to other species and even inanimate nature.

Hays also links environmentalism to an American tradition, but in his case it is the American tradition of searching for a higher standard of living and a better quality of life (the 'pursuit of happiness'). He believes American consumers have extended their desires from the satisfaction of necessities and conveniences, such as consumer durables, to amenities, such as improved natural environments, recreational and leisure-time activities and increased physical well being. He also sees part of environmentalism's appeal, in an era of increased economic and political centralization (the growth of large corporations and the federal government), to be the emphasis of such movements on more grassroots control, the desire by

individuals and families for more control over their lives. However, he does not view environmentalism as simply reacting to environmental deterioration or a loss of control over one's life. He sees it as formative, a reflection of increased standards of living and better education which influence people to improve their own sense of well being. In other words, he interprets environmental movements as part of a new, creative stage in the development of industrial societies.

Donald Worster criticized both these papers for their implicit assumption of some kind of linear progress in history, whether ethical progress or socio-economic, and questioned how much lasting change environmental movements have actually accomplished: "An age of scarcity has succeeded one of affluence, and we are no longer certain we can afford frills like snail darters." In particular he criticized Nash's notion of ethical extension, doubting the degree of cultural and ethical change in recent American history and arguing that "moral revolutions cannot occur only on the abstract plane of ideas and philosophy, they must be based on underlying structural changes."

In his concluding essay, Worster argues that a focus on national developments is an insufficient approach for environmental history. He believes that environmental historians need to focus on two interrelated transnational processes that have taken place in recent centuries: 1) the transition from vernacular to professionalized authority in dealing with the natural environment, and 2) the shift from local subsistence economies to a world market order and the effects of that shift on human interaction with nature.

Under the first rubric, Worster would have us focus more on the contrast between folk cultures and folkways in their interaction with nature and the rise of professional expertise with its claims to universality and the effects which professionals like engineers, scientists, public health experts, economists and other have had on the natural environment. Various papers at the conference dealt with separate aspects of this question--for example the papers of Grinde and Kidwell on the folk beliefs and folkways of Native Americans, and the papers of

Pursell on engineers, Perkins, Dunlap and Weiner on natural scientists--but we lack any broad synthesis yet on the process of transition itself.

Worster would also like to see a more global synthesis in the second problem area: the effects of the international market economy on the natural environment. Again, we have a growing number of interesting case studies which touch on this problem area, for example the paper by Richards and Tucker at this conference on the world's forests and the volume of articles growing out of a conference they organized recently at Oakland University on this subject. They argue that expanding world trade and the spread of plantation agriculture and imperial power was largely responsible for what happened to the world's forests in the 19th century, leading among other possible consequences to increased soil erosion and the rise in carbon dioxide levels in the atmosphere since the 1870s. Their view of the causes of the depletion of the world's forests was challenged by Professor Cox in his commentary, but Richards, Tucker and their associates have marshalled a good deal of evidence on this subject in recent years. Worster would clearly like to see more studies of this type, aimed eventually at producing a synthesis, a global environmental history for the modern period.

Here one can agree that a national focus for environmental history is inadequate by itself. As industrialization and economic modernization have spread to more countries, the environmental problems accompanying them have shown little respect for local and national boundaries. As Prof. Tarr's analysis of waste disposal problems indicates, one type of technological solution for wastes has often led to other problems, helping to transform such problems from local to international ones. To cite several examples, taller smokestacks aimed at preventing local smoke pollution have contributed to the international problem of acid rain, while disputes over fishing rights, or the disposal of radioactive and other wastes in oceans have led to considerable international conflict. While work on environmental history at the local and national levels is obviously necessary, more work on the international dimensions of environmental history also needs to be undertaken. Case studies on the significance of international

conflicts over resources, for example, or on attempts to negotiate and enforce international agreements aimed at correcting environmental problems, promise to make the field of environmental history an even more exciting and important endeavor in the future. The more studies we have of environmental history at all levels, local, national and international, the closer we will be to producing the kind of global historical perspective environmental problems require.

Acknowledgments: The Conference on which this volume is based, "Critical Issues in Environmental Issues," was made possible by grants from the National Endowment for the Humanities and the University of California, Irvine.

ENDNOTES

[1] Usually attributed to Goethe, this quotation may actually have been written by George Christoph Tobler, a Swiss theologian and friend of Goethe. It was first published anonymously in the Tiefurter Journal (1782). See T. H. Huxley, "Nature: Aphorisms by Goethe," Nature. Nov. 4, 1869, p. 9.

[2] The Global 2000 Report to the President: Entering the Twenty-First Century, Washington, D.C., 1979.

[3] *Ibid.*, p. iii.

[4] Rene Dubos, Celebrations of Life, New York, 1981, p. 144.

[5] Lynn White, Jr., "The Historical Roots of Our Ecologic Crisis," Science, 155 (10 March, 1967), pp. 1203-1207.

[6] R. J. McIntyre, J. R. Thornton, "On the Environmental Efficiency of Economic Systems," Soviet Studies (1978).

ENVIRONMENTAL HISTORY: PITFALLS AND OPPORTUNITIES

John Opie, Duquesne University

In 1729, Jonathan Swift wrote the essay, A Modest Proposal, in which he suggested that the population and poverty problem in London be solved by selling the babies of the poor as food for the tables of the rich. This was an early solution to a problem of environmental management. It is equally rash and probably just as darkly amusing to attempt an assessment of environmental history. Which are our babies and which are our rich?

A fundamental law laid down by environmental science states that nature works best when all its elements are in a dynamic equilibrium with each other. And when man invades a habitat, the relationship should be based on harmony, not mastery. There should be as little interference and as much cooperation as possible. When a society becomes unsynchronized with its natural setting there is potential for collapse first in the natural system and inevitably in the dependent civilization. The historic record is becoming clearer on this relationship.

When historians of the man-nature relationship examine the relative success or failure of a given period or society, they often use this environmental rule of equilibrium. Carl Sauer, for example, analyzed the agricultural opportunities in the American midwest, as they appeared under different types of land use. Even when he included different food needs of the several societies that had worked the land, it appeared that the most appropriate man-land balance was achieved by white immigrant Europeans in the mid-nineteenth century. What they took out of the land as independent farmers they replaced in other ways. Harmful exploitation came later, and is reaching a climax in today's agribusiness. Most studies of the Dust Bowl, such as those by Paul Sears and Donald Worster, document how far American society can move away from environmental balance and do harm to itself as well as to nature. Joseph Petulla has acknowledged that his American Environmental History has a pessimistic tone about the ability of American society to achieve a sustainable long-term environmental setting to

support a successful and appealing civilization. Lynn White, Jr., Clarence Glacken and Rod Nash have each in their own ways examined a variety of ecologically successful and failed civilizations, depending on how each society treated its geography, and its relative skill in devising values and techniques in dealing with the natural world. Alfred Crosby chronicles the harmful impact of European endemic diseases--smallpox and measles--upon vulnerable native Americans and finds in this a clue to the white man's relatively quiet and easy dominance in the New World. Looking at the ancient world, Donald Hughes, as did George Perkins Marsh a century ago, describes the likely connections between agricultural overdevelopment, climate change, and the collapse of civilizations. More immediately, Joel Tarr and Martin V. Melosi, examine the societal harm done by water and air pollution, respectively, while Sam Hays and Douglas Strong trace the tortured course of the environmental movement of the last century in the United States. And John Perkins and Tom Dunlap consider the uphill fight over harmful chemical insecticides. The list is very long. I have looked, along with James C. Malin and William Albrecht, at what may have been the greatest civilizational failure in American history: the mistaken frontier settlement of the arid great plains in the 1870s and the 1880s, which led to extensive human suffering, societal collapse, and repeated migrations and depopulations.

In these historical samplings, a common assumption arises based on the environmental law already mentioned: there is a universal harmony between man and nature which should be striven for. Is this akin to the quest for a golden age or an ideal utopian environment? Sometimes utopias existed in the past, as in the textbook version of Periclean Greece, or Middle America at the turn of the century, as seen, for example, in Edward Albee's poem, Knoxville, 1915. Sometimes utopias are posited for the future. Is there a search for a holy grail of ecological equilibrium which characterizes, shapes, and even controls the pursuit of environmental history? Do environmental historians pursue their craft while having in mind certain specific models? Must we have an environmental utopia which is as demanding as the worker's paradise of Marxist historians, or the millennialism of Christianity?

Yi-Fu Tuan suggests that "yearning for an ideal and human habitat is perhaps universal."

The appeal of this environmental millennialism is not difficult to fathom. Over the last two decades the environmental movement has worked hard to redirect American society, by legislation, from its long history of exploitation, and move the country grudgingly toward a mutually-sustaining relationship with nature. Standing behind the clean air and clean water acts, strip mining controls, protection of wilderness and endangered species, and the creation of the Environmental Protection Agency, is a vision of what an environmentally desirable United States should be. Similarly, in 1972, when the Club of Rome published its computerized picture of a dismal future by 2000 AD, based on increased pollution, population, and consumption, it had also in mind a corrected and improved world, based again on ecological balance.

To use this ideal world as a reference is tempting indeed. It is virtuous, as Rene Dubos, Paul Sears, and others have noted, to seek to eliminate pollution, monotony, and ugliness from the world. In a contrary way, the power of the ideal is demonstrated by the bleak picture given us by actual historical studies. Most environmental history writing seems to revel in dismal conditions. When the environmental historian is preoccupied not with the utopian ideal, but its opposite, can we call it a "dystopian" interest? The problem arises when this form of historical analysis tends toward prejudice. To analyze a society in environmental terms can mean anticipation of the standards by which it will be measured. To understand this direction (or misdirection) in environmental history, we need to consider three external influences (aside from history itself) which give environmental history its unique coloration as an independent and original field.

Virtually alone among historical fields, environmental history has a legacy from and obligation toward natural science. This more so in subject matter than in methodology. Ecology is a recognized biological science centered on such traditional unhistorical subjects as the metabolism of organisms, the hydrological cycle, and energy exchanges. In particular, two major aspects of

ecology influence how the environmental historian proceeds: the focus of ecological science upon large-scale systems, and the unique attention ecology gives to a holistic approach to natural phenomena.

By using the discovery process of quantification, and of reductionism, ecologists state that they give attention to a real world beyond the world of appearances. Scientific method brings to light a level of understanding not ordinarily available to the layman. It is a material, dynamic, and inevitable zone. Soil, water and plants, urban blight, pollution and disease are all features of interacting processes and habitats. Agriculture is not merely farming, but a subsidized, solar-powered, ecosystem. The historical geographer, Donald Meinig, writes, "Such a mind sees trees not in terms of species, dimension, color, nor even as major organic features, but as chemical factories powered by sunlight, lifting stations in the hydrological cycle, biological transformers in the energy exchange between lithosphere and atmosphere." Nature is a vast input-output matrix, with networks and flows. A human being becomes a hierarchical system of organs, cells, enzymes and genes, and in turn a human being belongs to larger systems of populations, societies, and ecosystems.

We have only a partial picture of the human condition unless we learn to see the issues of civilization on the scale which makes humans a component of ecology, as Eugene P. Odum says, of "a new integrative discipline." Odum defines ecology as holistic, and thus set apart from much of natural science, which is reductionist. He also sets ecology apart from ordinary life experience, which is chaotic, irregular, and fragmentary. Only when long-range problems can be uncovered in a supracivilizational basis can large-scale solutions be proposed. Odum argues that new properties and dimensions of nature and civilization emerge which were evident at lower levels. The proper study of man is not man alone, but man in environment. But the environmental historian, by attaching himself to the world of ecology, has a tiger by the tail.

Second, the environmental historian is constantly dogged by the spectre of advocacy. Would it be appropriate for the American Society for

Environmental History to oppose the activities of James Watt? We are accused of faddism; environmental awareness is said to be a novelty. The field is suspect within the historical community for promoting a point of view. Are environmental historians torn between the determination of causes and the assignment of responsibility? Can one go beyond explanation and assess judgment? As far as environmental historians associate themselves with today's environmental movement, the accusation is powerful and often just. On the other hand, we must also ask whether or not advocacy has some certain virtues. Let us not sweep the matter of advocacy under the carpet.

The environmental historian very often selects his subject matter on the basis that it is a condition needing correction. A forest is clearcut, the soil erodes, and the decline in water storage capacity brings on a decline in local food production. Analysis by an environmental historian often takes on the nature of a warning. What historic policies meant that the floor of Yosemite would today be overrun by concessionaires? What if settlers had been more cautious moving into the land west of the 98th meridian? Will the greenhouse effect, brought on by carbon dioxide pollution of 250 years of coal burning for industry, be harmful to the goals of American society? In all these cases it is implied that society was or will be impoverished in body and in spirit. Meinig writes, "To regard the scene before us as no more than a laboratory for so-called objective research is to be indifferent to human needs; every landscape evokes wrath and alarm, it is a mirror of the ills of our society and cries out for drastic change." Has Athens overwhelmed Jerusalem, ignoring questions of who is responsible and who has the duty to bring change? The question of advocacy cannot be sweetly sidestepped by donning the cloak of objectivity. Because of the wrongs he uncovers and the insights he gains, must the environmental historian inevitably turn to social action? I wonder to what extent Rachel Carson's reputation as a scientist was diminished by her outspoken statement in Silent Spring?

It is commonplace for environmental historians to look at a specific historical phenomenon--the barren lands of the Near East, the eroded central

highlands of Spain, the drylands of Kansas and Nebraska, West Virginia gutted by strip-mining--and consider alternative technologies, government policies and life-styles better suited to their natural settings. The frontier historian of ninety years ago, Frederick Jackson Turner, concluded that it was his duty--a moral imperative--and the duty of all responsible historians, to warn Americans that the frontier, which had so powerfully molded American society, had closed in 1890, and that the fundamental democratic values which came out of the frontier were in danger of losing their foundation. A similar prophetic spirit flavors much of the teaching and writing in environment history today. There is a strong sense of moral responsibility to call to the attention of other historians and the general public the ethics of land use, of appropriate technology, and responsible conservation of resources. Otherwise inequity and injustice rule the land.

Third, the environmental historian, by the very nature of his discipline and academic standing, seeks to bring the interests of the humanities in the liberal arts to bear upon environmental science. An environment cannot be evaluated by itself as a wasteland or garden, as ugly or beautiful, as habitable or a desert; these are cultural references with many regional and ideational variations. One man's meat is another man's poison. The road is a two-way road: ecological science informs the historian's interpretive stance, but he is still controlled by his own method. The humanities is his starting point.

But typical historians' definitions of man and civilization are changed by the ecological redefinition of the natural world. An enlarged restatement of nature inevitably means reconsiderations of human nature. Some serious problems are immediately evident. The technique of ecology as a biological science pays scant attention to individuals in a community or species, or to individual differences or variations. Its attention is centered on groups, populations and species. This approach is filled with peril for the interests of the individual and the self. Marwyn S. Samuels goes so far as to emphasize the importance of the "free, individuated, and even willful subject." The question raised is whether choice and responsibility

(even advocacy) are diminished. In such a case, does a basic feature of humanity become vestigial and disappear? There can be a kind of environmentalist juggernaut which threatens the essential frailty of human autonomy and selfhood. Is the presence of environmental science in the household of the humanities like a fox in a chicken coop? Isaiah Berlin writes that modern science and modern collectivism tend "to emphasize the immense predominance of impersonal factors in history, of the physical media in which life is lived, the power of geographical, psychological, social factors which are not, at any rate consciously, man-made, and are often beyond human control." Concrete individuals become "the means, the instrument, the manifestation . . . of some vast all-embracing schema of eternal human progress, or of the German Spirit, or the Proletariat, or of post-Christian civilization, or of Faustian man, or of Manifest Destiny, or of the American Century, or of some other myth, or mystery, or abstraction." The novelist, Kurt Vonnegut, carries this to an intriguing absurdity in his novel, The Sirens of Titan, by making all of human history merely the source of a signal transmitted through space to start-up an intergalactic vehicle. Yet this same notion of freedom and autonomy, so vigorously defended, also did much to create the exploitive Faustian principle of Western industrialism.

It is worth noting that historians create certain large groupings for more than convenience sake; they represent ideals. The standard human "type" in the usual Western civilization textbook can be described as the representative human acting out the historical narrative of Western Civilization. The text does not usually address itself to "elderly widows" or "slightly deaf literary critics." But someone has suggested that the largest such grouping, and thus most representative, would not be "white males of working age," but "young Chinese females." The mandate of the environmental historian is to avoid levels of generalization which would deny humanity its selfhood, freedom, and sense of responsibility. Even where the participants are faceless, nameless, and number in the millions, and where they have molded their environments over long periods of time, we can still recover the human context, and understand, by reading the landscape, their vision of how they interacted with the

environment. In Illinois, generations of Native Americans burned off the encroaching forest to make room for the plains animals which gave them their living. At the least, a collective or populations approach can remind the environmental historian that humanity is our ultimate renewable resource.

In a sense, we are talking about environmental determinism. The problem of environmental determinism is a stigma that has often delayed the capacity of environmental historians to follow through on their own definitions of man and nature which does not conflict with ecological methods or historical viewpoints. Another stigma which restricts resolution of scientific-humanistic differences is tied to the current disavowal of the tenets of Frederick Jackson Turner and his popular and notorious single-theory "Frontier thesis" of American history. Turner's position is in eclipse, and rightfully so, but the issues raised have not gone away.

Definitions of civilization are equally ambiguous. In traditional humanistic terms, a "high" civilization is especially characterized by the arts, literature, philosophy, and other learned liberal arts which focus attention on the life of the mind. Alternatively, the goals of civilization are said to involve the "good life" of a high standard of living and a superior quality of life. In the West this is attached to the Industrial Revolution. Still another viewpoint emphasizes the goals of equity and justice among competing elements of society, and their successful resolution is said to be the true mark of true humanity. These are, as it were, standard "textbook" definitions of civilization, but not very often openly articulated. The flaw in these definitions, as Harlan Hague has noted in his critique of textbooks in American history, is the degree to which an environmental perspective is purposely excluded. The exclusionary statement, "man has no biology any longer, just history," is typical. The civilizational process is seen in the humanities as inevitably a separation or distancing from nature. It is still difficult to shake off the "mind-body" dualism which permeates the humanities in the West.

Within these limitations, the environmental historian as humanist can still bring matters of values and ideology to bear. The geographical

setting of America becomes a powerful cultural manifestation. The governing clusters of ideas in our society--liberty, equality, opportunity--power, success, growth--individualism, competition, exploitation--are vividly embodied in America's physical heritage. Could some future archeologist, a millenium hence, somehow without access to written records, fathom the truth of American society from its management of its environment? The work of Peirce Lewis, Donald Meinig, and Yi-Fu Tuan point to man's imprint on the environment as the leading means to comprehend the true values and real priorities of a civilization. Grady Clay's phrase rings true for environmental history: "There are no secrets in the landscape." Peirce Lewis describes the land as "our unwitting autobiography."

Does environmental history, then, have any autonomy as a field, or is it a melange of science, advocacy, and humanism? Can environmental history be distinguished from historical or cultural geography, from frontier history, cultural anthropology, and a myriad of other disciplines? Is it a victim of the "two-cultures" syndrome, belonging to neither world, its subject matter overlapping a natural science but seen instead through the screen of history as a humanistic discipline? Or is it a quasi-religious invasion by the ecological faithful--unwashed by rigorous scientific method--of a territory, the interpretation of the natural world, where they have no business being?

History in an environmental vein requires a "dual literacy." The historians' invasion of the natural world is more extreme than trespassing into political science or literature, or even using historical spectacles to inquire into psychology or econometrics. The environmental historian practicing his craft must acquire a basic familiarity with ecology in order to include the subject matter and datum that characterizes this science and the field it covers. Most of us have discovered, often with some pain and embarrassment, how foolhardy it is to assume otherwise. This familiarity does not demand professional competence as a practicing environmentalist, but it does insist on a sympathy toward the biases and procedures of natural science. In other words, it is likely that the environmental historian, coming as he does from the humanities, will have a perpetual vulnerability to the natural

science dimension of his field.

Gradually, however, environmental historians have earned their spurs by learning to look from the environment to the culture it supports, rather than vice versa. The environmental historian is likely to start with the geography involved, particularly the ability of a region to support the human demands made upon it, and its relative vulnerability due to human interference. Looking at the phenomena of history from an ecological viewpoint opens up new dimensions of the human condition and its historic development. But Carl Sauer also reminds us that a geographical region does not exist in abstraction from human expectations, participation or interference. The seeing eye is still a human eye. The difference now is that the environment is taken for what it is not universally, but at a particular point in history with concrete potential and limits, and not merely as a limitless stage on which a history is played out. This is a shift in historical perspective, however, which has not yet reached the textbook writers.

This indifference is understandable, for it long seemed, perhaps until 1800 at the earliest, that the imprint of man on the landscape was feeble. But the tables have been turned through the workings of science, technology, and industry, and now it is the habitat that is vulnerable, and not the inhabitant. The results of dual literacy can be likened to a positive feedback loop, constantly crossing the two cultures. The movement and logic of environmentalism is to travel from a proper concept of the land to a more adequate perception of human activity, in the process avoiding a man-centered parochialism. An environment without a human context would be like a body without a brain. In turn, someone said human intelligence is "matter thinking about itself."

It is at this point that the environmental historian can be drawn (kicking and screaming) into the mainstream of American life. Back in the dark days of 1940, when the nation was caught between depression and war, the historian Ralph H. Gabriel looked into what he called the "American Democratic Faith." Today, a new traditionalism looks into restatements of fundamental American values. Admittedly, a good deal of this is lip service, but Americans are searching for permanent values which

will shore up our society under adversity and stress. This includes the quest for underpinnings or roots, including associations with specific environments or personal geographies. This is a more extraordinary interest than we may first realize, since American society has long been characterized by its geographical mobility and placelessness. A search for underpinnings in the American land is a novelty, as if Americans had suddenly discovered the value of place in personal and national identities. Yet we must also remember the original Puritan quest for a "new heaven and a new earth" on American soil.

The modern essayist Richard Rhodes writes movingly of the profound identification made with the rural world of Middle America. The land, when it is secure and supportive, is described as a person's "living tether." A "lived geography" is valued and deeply implanted in personal consciousness. Returning to one's home place is returning to a primordial place. The black Alabama writer, Albert Murray, notes that "a return to that very old, sometimes forgotten, but ever so easily alerted trouble spot deep inside your innermost being, whoever you are and wherever you are back from," is tied to a physical homecoming. Americans may be at the point of belatedly including their landscapes in their communities of identity.

It is surprising that environmental historians have neglected the one dimension of the National Environmental Protection Act of 1969 which directly involves their craft. Legislated into every environmental impact statement for land use is the mandate to search out, identify, and evaluate sites of historic importance. It is extraordinary that the obvious links between environmental history and historic preservation have not, to my knowledge, been systematically developed. Yet the emerging importance of public or applied history could become an outlet for environmental advocacy in an appropriate historical perspective. There are environmental history links to the related fields of material culture, artifact history, and the so-called "living history" programs which have yet to be examined. Material culture and historic preservation have too many environmental applications to be left to the archeologist, as they currently are.

There is no one archetypal environmental

historian who covers the field. The most implicit and self-conscious historian of the environment is still Fernand Braudel of the French Annales school. His studies of the Mediterranean in the sixteenth century and of capitalism since 1500 attempt to take the power of the environment upon human affairs as more effective than all other factors put together. Human folkways are controlled by whether one lives along a shoreline or in mountain massifs. Braudel also notes the impact of harmful human interference, such as sheepherding in the once lush but now barren Spanish central plateau.

The observations of this informal paper, on many counts, have been a commentary on Braudel's work. He has long been convinced of the intimate, and permanent, relationship between man and his physical surroundings. Braudel's search is for long-term definitive forces in history; his time scale is more geographical, or even geological, than according to the usual historical tenets: "A history in slow motion from which permanent values can be detected." He works to uncover elemental natural "structures," so-called, which have decisive, far-reaching influences over human life.

Perhaps, as I have been told, American history is still too brief to include such monumental notions, but it can also be argued that our history now has a degree of duration, and that the American experience may also include an unusual "compression" of history. According to Braudel, what stand out in New World settlement are the vast spaces. Human influences seem insignificant, like islands set up in the middle of incomprehensibly large oceans, buffeted by superhuman forces. Braudel plays down the ordinary sequence of political, military, and societal events almost into insignificance compared to his extended geographical cycles of imperceptible, slow, repetitious, ever-recurrent movement. What comes to mind in early American history is the attempt of the British to establish and enforce the Proclamation Line of 1763, a meaningless event compared to other forces at work.

The power of structures is nowhere more evident than in agricultural life, the most representative form of Braudel's "material life": elemental, repetitious, traditional, crossing uncounted generations. It must be remembered that early

American history was entirely dominated by an agricultural world view, and rural themes persist into the present. In a largely agricultural society, the dimension of time is tied to the cycles of seasons. The environmental dimensions of fertile land, climate, water, and terrain persist as controlling factors, even into the world of ultramodern agribusiness. Braudel calls the agricultural process a "conjuncture," as is modern industrialization, both attempts to come to terms with one's environment in the long-run. But everywhere structures set boundaries for human possibility: food supplies, populations, productive labor, the taming of nature are all involved in this "ground floor of history." Nowhere, however, does Braudel affirm a specifically environmental stance based on the guidelines of ecology. But the scope and range of Braudel would be useful in looking into matters of pollution, of the exploitation of natural resources, and the irreversibility of waste.

Environmental history tends to be centrifugal; it keeps on flying apart. We have seen how the environmental historian participates in the gulf between the ecological ideal and historical reality, between the two cultures of science and the humanities, and between disinterested objectivity and the ethical obligation of advocacy.

No doubt the ideal environmental archetype mentioned at the beginning of this essay--a sustainable harmony between man and nature--will persist as the measure of historical judgment. The task is to make this enduring utopianism also self-correcting. Dual literacy can dispel the mutual isolationism of both ecological science and cultural anthropocentrism. The route to the ideal of environmental harmony is not one-way, but should be modified and adjusted as more concrete historical data is available. Any picture of an ideal runs the danger of becoming fixed, static, and frozen. Only by establishing an internal critique can the archetype be made useful. The model is constantly changing. The slogan of the 1933 World's Fair in Chicago, with its optimistic vision of a liberated future, appears to us today contradictory and unacceptable: "Science finds--Industry Applies--Man Conforms." The 1982 World's Fair in Knoxville, Tennessee, focused on the realities and the future of energy, a subject taken for granted in the past but

no longer today. This suggests real change in our models. As an historian, I have always enjoyed the encounter in the nineteenth century between the American transcendentalist Margaret Fuller and the English historian, Carlyle, in which Fuller said, "I accept the universe," and Carlyle retorted, "Gad! She'd better!" And remember Spinoza: non ridere, non lugere, neque destastari, sed intelligere. "Not to laugh, not to lament, not to curse, but to understand."

ENVIRONMENTAL VALUES: THE PROBLEM OF METHOD IN ENVIRONMENTAL HISTORY

Joseph M. Petulla
University of San Francisco

In this paper I will explore the relationship between social reality and historical method, that is, the relationship between the structure of the historian's model and the structure of social events, with special emphasis on the problem of values. The way we "practice" history, as Barbara Tuchman put it, depends on the way we look at social reality. The way we look at social reality is colored by personal and social value systems. To complicate the problem further, social reality itself is a bundle of conflicting value systems expressing themselves within and outside of societal institutions.

Values

Under scrutiny, the problems of values in general, and those of environmental values in particular, are deceptively complex. Sources of cultural values spring from family behavior, religious beliefs, economic, social and political institutions, and these represent only the surface of the wellsprings of values. Personality and character, maybe even genes and the stars, play a role in the formation of value systems.

In order to be able to function in the world, people need to interpret the millions of bits of information which bombard us as we grow into mature adults. We know from our own experience and from observing students that we need and want values to live by. We develop assumptive values and images about the world and ourselves, assumptions which help us to predict the behavior of others and the outcomes of our own actions. It is not surprising that young people should join fraternities or even religious cults with their ready-made models and heroes. It is easier to live in a community representing strange values than in no community at all.

Personal values tend to be shaped by cultural values derived from family, economic, social and political institutions, which provide the moral support for a society. But although people are given values from their cultural environments, societal

institutions do not necessarily form all of their personal values. The values which have inspired revolutions in Poland, Iran and in scattered Latin American nations have received their dominant images more from religious, political and human aspirations than from economic institutions.

When we start to unravel the complicated web of conflicting values in ourselves, our institutions and our societies, our first clue comes from a cluster of identifiable subcultures of cultural environments, each of which possesses an identifiable set of common values, attitudes, opinions, symbols and commitments in special constellations of meaning. People in these cultural environments speak their own common language in families, churches, political affiliations, work environments, social activist or environmental groups.

Most of us move in and out of several of these subcultures, cultivating personal interests, attitudes, viewpoints, understandings. Although the larger society exercises a special power over smaller cultural groups since it dictates the economic and political rules of the game, the groups enjoy much latitude in fostering their own private value structures. Consider, for example, "Solidarity" in Poland or Islamic religions in the Middle East, or the variety of political activity in our own country. Even under the roar of an all-enveloping media, "culture has many voices," as George Park put it in his Idea of Social Structure (1975).

It is possible for a Reagan regime to put the screws to environmentalist concerns, or for the Polish communist party to threaten Solidarity, or for military juntas to assassinate bishops, priests and nuns, but it is not possible to wipe out the values of the cultural environments which inspire social movements.

Environmental Values

The traditions of environmentalist thought and values which somehow have inspired the work and activities of environmentalist subcultures today are intertwined with the larger cultural systems where they have been born. Some of these traditions have appeared and have been tied into hundreds of historical circumstances since ancient times.

Professor Glacken's monumental work, Traces on the Rhodian Shore, was not written to prove this point but the book surely illustrates it. Ideas and values can take on a life of their own and lie dormant until historical circumstances trigger their reappearance into a new historical shape. Ideas and values can live in the collective mind of a culture, outside of actual social reality, or can be attached to and give meaning to an active social institution.

I have distinguished between biocentric, ecologic and economic environmentalist traditions of thought, but these have resided within and beside other ideas which have motivated cultural behavior. One student has been harassing me for several years to include a fourth tradition--the greedocentric, representing modern capitalism. I have resisted, mainly because I would not characterize it as an authentic environmentalist tradition, nor has it been confined to western capitalist development. There are some perceptive descriptions of social greed in the Old Testament which, if we accept oral tradition, go back several millennia.

The prototypical environmentalist tradition which I call biocentric, one that places value in nature for itself, can be found in most cultures in the ancient world. The primitive feelings which led ancients to fear and respect nature have been refined on every continent over thousands of years. In this country during modern times most of us think of Emerson, Thoreau and John Muir as exemplars of a biocentric tradition, but since the Romantic Movement there have been hundreds of famous spokesmen in western thought.

The ecologic tradition is less religious and more scientific, formulated as a conceptual model of how nature orders itself into a functional ecosystem. The biocentric and ecologic traditions are not mutually exclusive, but there have been many ecologists of this century who have not been impressed by biocentrically-motivated environmentalist arguments, and vice versa. Conservationists of ecologic persuasion are concerned about the need for stable ecosystems rather than a specific desire to place value on each element of nature in the ecosystem. Chemical pesticides destroy ecosystems, not only individual species; destruction of forests and the plowing of prairies ruin the

stability of large systems. These are the reasons brought forth by people in the ecologic tradition. George Perkins Marsh is a modern pioneer of this tradition, which goes back at least to natural law theories of the stoics and scholastics in a line of intellectual thought that comes through the beginnings of modern science.

Finally, those in the economic tradition of environmentalism espouse the "wisest," most efficient use of natural resources over time. It is sometimes referred to as utilitarian conservationism. Latter day economic environmentalists like to assign quantitative costs to those who take away public environmental amenities. The tradition of economizing is common to all cultures which know scarcity, but in the west it has been rationalized in a special way as capitalism has developed. In the context of an alliance between early capitalism and Calvinism, thrift, industry and honesty were morally rewarded; goodness eventually became identified with self discipline and economic efficiency in a period of capital formation. In this country, Gifford Pinchot was an early preacher of economic environmentalism, and almost a century of resource planners have followed his lead. Again, the three perspectives should not be considered as completely independent of each other. They overlap in content and practice. In the activity of the modern environmental movement, they tend to be found together in expressed programs and struggles of activist groups.

Values, Institutions, and Environmental Change

Broader value systems and religious beliefs can regulate or subsume environmental values. Some scholars have attempted to demonstrate that these larger systems of belief control how the people of a particular culture will view and act toward nature. They would therefore prescribe a new ethic for the society or culture as a prerequisite for changing old behavior. Professor Lynn White, for example, focuses on the Judeo-Christian belief that nature is both separate from people and also that it has been created by God primarily for human use and service. He presents the thesis that western religion is at the root of the contemporary ecological crisis:

The artifacts of a society, including its

political, social and economic patterns, are shaped primarily by what the mass of individuals in that society believe, at the sub-verbal level, about who they are, about their destiny. Every culture, whether it is religious or not, is shaped primarily by religion.... The religious problem (now) is to find a viable equivalent to animism.

-- ("Continuing the Conversation," in Western Man and Environmental Ethics, ed. I. Barbour, 1973, pp. 57-62.)

Lewis Mumford makes a similar statement: "For its effective salvation mankind will need to undergo something like a spontaneous religious conversion: one that will replace the mechanical world picture with an organic world picture" (The Pentagon of Power, 1970). Charles Reich dreams about "Consciousness III...an attempt to gain transcendence" (The Greening of America, 1970). Rene Dubos hopes for a new "common faith" (So Human an Animal, 1968). Theodore Roszak looks to a "visionary commonwealth" (Where the Wasteland Ends, 1972). These writers see, in the human capacity for visionary experiences, the hope for a common set of values, a new ethic that will transform not only religion but also other cultural institutions. The transformation, coming from the inculcation of new values, ideas and good intentions, will lead at last to a society that is responsive to environmental needs.

The educational system in America has been traditionally set up to pass along the values of our elders, and in recent years teachers have not been shy about slipping in a few more progressive values, assuming that we all love tradition so much that there's nothing wrong in starting some new ones. This means that we have an unstated faith that the free and persuasive transmission of new ideas and values will convert listeners to new ways of behavior.

The Importance of Societal Institutions

It seems to me, however, that rarely do new systems of belief follow from personal conversions. In order to survive, the new ideas need institutional

and community support. The power of established institutions incorporate and maintain traditional value systems. It takes time for new value systems to take root in a society, and more often than not the new value proceeds from societal institutions and not the other way around.

Which came first, the contemporary desire for personal mobility, or the automobile? Consumerism or advertising agencies? Universal democratic social values or democratic political constitutions? The church or Christian morality? Even Darwinist theory allows for both primeval instincts (values) as well as social organization in animal communities; so that the circularity and mutual reinforcement of values (i.e., animal instincts) and institutions could have started before human institutions got their start. Some writers refer to these interrelationships as "dialectical," a term derived from the works of Kant and Hegel, and of course Marx and Engels.

Societal systems are established and change through a complex interaction of institutional social, political, economic and technological pressures and many layers of thought, often conflicting, which represent religions and cultural ideologies of past ages. The combination of values and institutions reinforce each other to characterize and shape a particular culture. The institutions themselves may be regarded as entities which embody social values.

For example, the development of a mass-produced technology of transport along with the availability of cheap energy encourage a new social value, that of personal mobility. Next, a public policy is established, mirroring public sentiment that energy use is desirable, and eventually an interstate highway fund is set up and tax depletion allowance subsidies are offered to encourage even more energy development. Very early in this cycle, economic power becomes concentrated in the oil and auto industries, and they began to exert their influence over government to insure continued economic privileges and to blanket the media with their version of the good life. Their message confirms the widening desire for more personal freedom, symbolized by bigger and faster cars. At the same time, traditional environmentalist values from many sources may challenge the assumptions of a social environment

which undermines nature, human health, wilderness areas and clean urban air.

In this example, social, political, economic, technological and value factors have been identified. The values are found in a variety of subcultures, as when teenagers lowride their '58 Buicks down Main Street, or their parents take a Sunday afternoon drive in the country after church. As we have seen, values are found in larger systems like the church or establishment social and political institutions. They sometimes are inseparably connected to technology and economic structures like consumer or marketplace values, or the privileges of social class.

Socialist states believe in the primacy of public institutions for the inculcation of values, and therefore attempt to program their material institutions in a way that will produce the "new socialist person" geared to the common good of all rather than the selfish desires of the individual. It might be too early to render judgment on this historical experiment, but even socialist leaders have admitted that their goals have not been so easy to accomplish as many first thought. Perennial cultural values have persisted in the most hostile political climates; the Polish example keeps returning.

Historical Research

A study of the way economics, politics, social structures, technologies and value systems all interact constitutes historical research; the impact they have had on the natural environment and natural resource use constitutes the study of environmental history. Here environmental history would necessarily include human activity.

It is interesting to read historians and popular writers to observe how much weight each places on specific historical factors. Marxists emphasize the primacy of economic factors and the struggle of social classes; anti-technologists highlight the evils of technology; others illustrate the importance of belief systems and ideas; many traditional historians treat central government activity almost exclusively, and so on. These schools of thought either explicitly or implicitly espouse one of five

or more factors as the predictable, controlling variable of a societal system. It seems to me, however, that each geographic location of a societal/cultural system at a particular time is characterized by a unique mix of the above-mentioned historical factors, perhaps controlled by one or more of them for a short time, but no one of them operating independently from the rest. The unique relationship among the variables, particularly the dynamic between values and institutions, is one of the attractions of the study of environmental history. Historical periods always seem out of joint and so dynamically structured that it is close to impossible to predict in what direction they are tending, even with Ronald Reagan as President. Predictive computer models haven't yet even been able to master the art of billing consumers accurately, much less accurately to depict future events and resource needs. In the vacuum of methodology, many historians fall back on personal ideologies or dream up hunches.

Societies change and historians like to talk about the reasons for these changes. Professor Lynn White addressed the question of environmental/social change in his famous essay on the roots of the ecologic crisis. He stressed the primacy of beliefs [Science, March 10, 1967, pp. 1203-1207]. I believe that it would be possible to test his suggestion against the same periods of medieval history and come up with a more problematic picture. It seems to me that at least five causal factors were operating during the periods of change in medieval society which Professor White studied.

Although I placed a major emphasis on economic forces in my text on American Environmental History, I also tried to show concomitant developments in politics, technology and social classes. The values embedded in those economic forces in the growth of the American nation were so dominant that they tended to overwhelm the values associated with American environmentalism. Even these environmental values have become established without a strong economic base and have been responsible for changes which could not have been predicted a generation ago.

The Method of Environmental History

Environmental historians usually start with

environmentally inspired values and assumptions about social reality. In their historical method they have to look not only at standard historical documents but also at religious patterns, anthropological data, economic, political and sociological data, ecological studies, history of science and technology, history of philosophy and of ideas and more. It is not difficult to show that material from almost every discipline is useful in illuminating environmental history. It is, however, very difficult to utilize these resources intelligently.

After one realizes that, given an environmentalist perspective, every discipline offers grist for the mill and that one must continually shift from looking at one area, such as technology or religious beliefs, to looking at the entire historical system and back again. After one realizes these fundamentals about values and institutions, I'm not sure what else there is to say. Each situation is different. One can give historical examples and hope that by piling up a lot of good examples of environmental history, the cumulative effect will lead to a better understanding of what an interdisciplinary, environmental history might look like.

Much good work has been done in environmental history, many studies by people in this group. People working in historical geography have also attempted regional, specialized studies, with some good results. Other people in landscape architecture, even biology, are turning out solid, thought-provoking studies. The one requirement to do environmental history seems to be a freedom from hangups about traditional historical methodologies. Maybe this is the reason that so much interesting work is coming from disciplines outside history. This new class of maverick historians, including some people even in the field of history, is not self-conscious about its work. The group is only trying to get some answers to some basic questions, answers which might help us cope with present problems and realities.

There is a salutary side-effect of a historical methodology which looks at all sides of a societal system--social, political, economic, technological, beliefs and ideologies and so on. The method proposes that changes in any of the historical

variables tend to put others in a state of imbalance for good or evil. This model of historical study gives young people a conceptual lever to understand the complexities of contemporary society. If we can learn anything at all from history it is that most things change, and that people can help change events by engaging in any of the hundreds of spheres of influence that determine our collective fate. Activities or careers in any number of private or public occupations all can be marvelously significant in transforming society.

One of the occupational hazards of academics is a pervasive cynicism, if not total despair, about the events that engulf us all. Our cynicism tends to be transmitted to students, our moral tirades immobilize our listeners, our glum predictions depress everyone. Theory can generate practice only when both are inspired by hope. The reading of recent environmental history gives more reasons for hope than despair. The merits of the case indicate that historians should be generators of optimism, not cynical pessimism. Without justified hope, in fact, the "practice of history" becomes simply hopeless.

CULTURE AND ENVIRONMENT IN WESTERN CIVILIZATION DURING THE NINETEENTH CENTURY

Clarence J. Glacken
University of California, Berkeley

In Traces on the Rhodian Shore, I considered three ideas I thought the most important and influential in the history of thought concerned with the relationship between human cultures and the natural environment. These were the design argument or the teleological view of nature; the idea of environmental influences, like climate, on culture; and the idea of human beings as modifiers or transformers of nature.

I carried this history to the end of the 18th century not because the stories ended there, but because I despaired of finishing in a normal lifetime. The 19th century materials expanded like the area of an inverted pyramid. I have now regained my courage; perhaps rashness is a better word and have continued the themes with necessary changes into the 19th century.

There are now four conceptions: 1) the interrelationships in nature; 2) geographical determinism or the influence of geographic environment; 3) human beings as geologic or geographic agents; and 4) esthetic subjective and emotional attitudes to nature.

Interrelationships in Nature

I see three phases in the study of the interrelationships in nature in the 19th century: ecological ideas in natural theology, in evolutionary theories, and in post-Darwinian studies. Let us consider each in turn.

By natural theology I mean the argument, based on the physico-theological proof of the existence of God, that we see everywhere in nature evidence and proof of His existence. Despite cogent criticisms of the design argument already made, especially by Spinoza, Kant, and Hume, natural theologies are still going strong up to the publication of The Origin of Species in 1859 and beyond.

In the vast majority of modern natural

theologies, we find three ancient observations persisting: the great reproductive power of life, the adaptation of all life to its environment and vice versa; and the superior adaptability of human beings because, unlike the plants and animals, they can freely move into and survive in a wide variety of environments. Natural theology was based on the principle of a balance and harmony of nature, seen not as a product of a long evolution, but as a direct result of the Creator's design.

These natural theologies were almost invariably anthropocentric, but there were gradations from a purely utilitarian concept of the natural world to one which recognized that all life had a purpose independent of humanity, that humanity, though at the apex of the creation, did not by that exalted state have the right to subjugate the rest of the creation. Darwin, Wallace and Huxley took natural theology seriously not because of its substance, but because of its influence and popularity, not only among clergymen but among scientists as well.

If one formulates a concept of interrelationships in the natural world without the help of the design argument and creationism, then what were previously secondary or efficient causes become primary ones. One consequence was the emphasis put on environment by Lamarck and on the natural selection of random variations by Darwin and Wallace. Factors like climate, the physical conformation of the land, checks, whether by environment or other life forms like predation or parasitism, became of greater importance when no longer subservient to final causes. The balances and harmonies of nature were now seen as a product of evolution.

When Lamarck first taught his students in zoology at the Jardin des Plantes in Paris in 1800, he impressed upon them the need for a philosophy of the subject, warning against the dangers of knowing a great deal about a single genus or species but little about its relationship to nature as a whole. Consistent with this philosophy, Lamarck stressed the importance of studying the invertebrates; it had been neglected; it was considered more fashionable to study the higher forms of life. This neglect made impossible any study of nature as a whole; thus we will be ignorant of these complex interrelationships.

Darwin's contributions to this concept are so widely known that I hesitate to do more than mention him. His work on the effects of earthworms on vegetable mold is the most ecological of his writings, but there is no time here for it. The oft-quoted passage on the cats-to-clover chain is still the most concise exposition of his ecological point of view. We start with the clovers; bumble bees are almost indispensable to their fertilization; the field mice control the numbers of bees by destroying their combs and nests, while the cats keep down the numbers of the mice. This chain is an example of what Darwin in the third chapter of The Origin of Species called "a web of complex relations."

Wallace's first inspiration came from the tropical world. Like young Darwin, he had come under the spell of Humboldt's narrative of his explorations of the tropical regions of the new world. Henry Bates's The Naturalist on the Amazon was another strong influence and, like Darwin, so was Malthus. He went so far as to call Malthus a "philosopher of biology." The impressions the tropical rainforests made on him were profound, vast areas then, unfortunately not now, relatively free of massive human intrusions. There he found harmony and stability. The ideas of both Wallace and Darwin were as important from an ecological as from an evolutionary point of view, a fact concealed by the bitter controversies of the period over phylogeny.

These observations lead me to three examples of post-Darwinian ecological studies: Kerner von Marilaun's work of the plant life in the Danubian lands (1863), Karl Mobius's study of the oyster beds off the coast of Schleswig-Holstein (1877) and Stephen Forbes's on the lake as a microcosm (1887).

Kerner von Marilaun was a professor of botany at the University of Vienna and director of its botanical gardens and museum. In his plant life in the Danubian lands (Das Pflanzenleben in den Donauländern) he did not study the distribution of a single genus or species but plant associations. He did field work in the Alfold, the great Hungarian plain, when much of it was still in its natural state, and described its plant associations like the

tall grasses, with hundreds of smaller plants, invisible to casual observation, growing under and protected by them, likening the association to human society. The overall picture of the flora of the Danubian lands is that of a great mosaic, whose patterns change from swamp to forests, from plains to the high Alps, from mountain summits to deep ravines.

Karl Mobius, a professor of zoology at the University of Kiel, set about studying oyster beds, a scientific work inspired by an economic problem. The Germans loved the Holstein oyster. It was disappearing. Why? There had been an alarming disappearance of oysters in the seas of Northwestern Europe. The French had failed to replenish their beds; dumping oysters randomly in the sea did no good. Mobius studied an area along the coast of Schleswig-Holstein; the most and the best oysters were found on the east side of the island of Sylt, and in the vicinity of Amrum and Fohr, smaller islands just south of the Danish order. He studied the oyster bed itself, coarse sands, small and large stones and shells between the mud on the shore and the quartz and sand on the bottom. He found there an amazing variety of life and called the bed a "biocoenose," a community of living things.

It was now becoming clear what was happening. When the oysters were removed from the beds in large quantities, they were replaced by other life forms that could live there too, and there was no more room for the oysters. I wonder if Mobius was amused or annoyed, or both or neither, when he said that the oystermen were astonished that the productivity of the beds had diminished after millions upon millions of oysters had been taken from them.

Stephen Forbes's The Lake as a Microcosm was read to the Peoria Scientific Association in 1887. He thought the lake a microcosm because its flora and fauna were isolated and remote from those on land. He classified Illinois lakes into two groups, the fluvial and the watershed lakes, the former formed by periodic overflowing of rivers, the latter of glacial origin, isolated and stable. He saw an intense Darwinian struggle for existence occurring in the fluvial lakes. The flooding of a large area permitted a huge growth of populations, but when the waters receded, a savage struggle for existence

followed in the now drastically limited environment. Forbes contrasted these wild fluctuations of life in the fluviatile lakes with the stability of the watershed lakes with their life zones.

Influences of the Geographic Environment

In my view, environmental determinism or less stringent ideas of the influences of geographic environment have to do with their relationship to the origin and nature of human culture, not to environmental influences on plants, animals, and human beings as individuals. In their modern history, they belong predominantly not to biological, but to geographic, social and political thought. They have been forceful and influential ideas in explaining cultural differences, national character, so-called early stages in the history of civilizations, the philosophy of history, the origin of religions, in universal history and national histories. This body of thought tended to view peoples, cultures, and civilizations as somewhat passive, to some degree or at some period molded by environment, as opposed to the idea of human beings as active modifiers of the natural world. The single, most arresting fact about determinism and geographic influences is that they were vital and strong through the greater part of the 19th century, in a period of unprecedented environmental change by human agency.

What are the reasons for their power and persistence? It is hard to say precisely, but I think the antiquity of such thinking had much to do with it. The influence of environment, especially climate, has been and still is deeply imbedded in popular belief. Byron used it humorously. Don Juan's mother, Inez, worried about his philandering in the hot southern climates, but was not worried when unknown to her he had an affair, of all things, with Catherine the Great (Inez thought she was merely being maternal) because Russia had a cold climate.

Throughout the 18th century the chief emphasis was on the influence of climate. A fresh start was made by the German geographer, Carl Ritter, a fervid believer in the design argument, who applied it to human history and geography, arguing that the Creator had so designed the earth's surface including the northern and southern hemispheres, that each

continent stimulated and brought out something different in people. The Creator planned that the human race, through these different experiences in different continents, would develop to the fullest extent.

The outstanding work in this field in the 19th century, however, is the Anthropogeographie of Friedrich Ratzel who in the opinion of his admirers and critics was the archetypal environmental determinist. The first volume (1882) is quite environmentalistic, the second (1891) more open, revealing wide reading in the literature of travel and environmental change. One idea, however, stands out: as a civilization progresses it becomes more, not less dependent, on its environment. He was convinced that the character of a people depended much on its rootedness in its soil. The word, "Boden," has been a powerful one in modern German history.

Determinisms inevitably falter, basically because they cannot stand up to close and unrelenting scrutiny, especially by unfriendly critics. Environmental determinism began to falter in the late 19th century. It was, however, still strong in the United States in the twenties of this century largely owing to Ellen Churchill Semple's Influences of Geographic Environment (1911) and the writings of Ellsworth Huntington. Semple's book was an adaptation not a translation of Ratzel's more deterministic chapters while Huntington sought out the influences of climate in historical and contemporary civilizations.

These ideas were undermined by three developments: the easy correlations between environment and people collapsed with detailed historical research. The burgeoning of the ethnographic literature which led to the formulation of the culture concept had a similar effect. The third was the overwhelming power of human beings to modify, transform, destroy nature, rather than being controlled by it. The criticism culminated in the work of French geographers, the possibilists, who strongly emphasized history, pointed to possibilities offered not dictated by environment, and the role of human beings as geographic agents.

The Human being as Geographic Agent

During my studies of the 19th century history of ecological ideas, one observation forced itself upon me. It started as an annoyance. I could not study the history of these concepts without constantly running into the human race and its activities in modifying and destroying the natural world.

The idea that human beings are geographic or geological agents was probably first formulated in a self-conscious way by Buffon. He divided the history of the earth into seven epochs, in the last of which nature is aided by man. It was later formulated by Lyell in the first edition of his Principles of Geology (1830-33) in discussing the various agents at work in fashioning the earth's surface, including the human race. Although he changed his mind later, he then considered it a comparatively weak geological agent.

With Buffon and Lyell, the human race appears as an intruder, a latecomer in the early history. I have the feeling that the idea of the human race as an intruder became much stronger with the abandonment of traditional earth history based on the Old Testament, the sequence of the antediluvian, the flood, and the post-diluvian periods. It was replaced by a rudimentary historical geology and paleontology, lengthening the age of the earth, and reinforcing the realization that human beings were real latecomers on the scene.

It was not only the idea of the human being as an intruder that was important in the attempt to give a conceptual framework for observations that had accumulated so profusely by the beginning of the 19th century. We must also consider the significance of the history of ideas concerning the gulf between human and other forms of life. It would be quite a volume. Xenophon's Memorabilia of Socrates would be a good beginning, and it could conclude with Teilhard de Chardin's The Phenomenon of Man. The human race is not only an intruder, but a unique intruder, whether this uniqueness is considered the result of God's creative acts or the product of distinctive human endowments like the ability to accumulate and pass on knowledge and skills, a highly specialized use of the senses, the power of speech and writing, and so on. Though part of nature, human beings are also apart from it. Their modifications,

replacements, destructions are of a different order than those of other living things, and the difference is qualitative. Beavers and human beings both build dams. The beaver builds instinctively, the humans in response to a need or supposed need, helped by an accumulated knowledge of water control.

The best example of the meeting of ecological concepts with ideas of the human being as a unique geographic agent in the history of nature is George P. Marsh's Man and Nature, first published in 1864. I do not want to give the impression, however, that it was Marsh alone who saw what had been and what was happening. Marsh assumed a balance and harmony in nature if uninterfered with, and the human being as unique among many other agents modifying it. The building blocks which rescued his work from being a compilation were (1) a rejection of the environmentalism of geographers like Ritter who thought the earth made man. Marsh said man made the earth. (2) a rejection also of traditional theology. To account for God through evidences in the material world is imprudent and impious. Lowenthal in his biography quotes Marsh as saying, "It is a poor divinity which rests its claim to Godhead on the instincts of the beaver or the sagacity of the ant." (3) he agreed about the unique position of humanity in the natural order. "Man, is in both kind and degree, a power of a higher order than any of the other forms of animated life." (4) he rejected the view that human beings are weak geographic agents.

Let me now give examples from the post-Darwinian studies I have discussed. Kerner von Marilaun was witnessing the passing away of the old, haunting, charming landscapes of the great Hungarian plain. Railroads were crossing the Alfold in all directions; marshes were being steadily confined; fertile fields replaced the grassy steppe. Many steppe plants were disappearing before one's eyes, great flocks of birds bid the region farewell, and "the beautiful romance of wildness will be overwhelmed by the prose of a utilitarian culture."

In concluding his monograph on the oyster beds, Mobius introduced the broader subject of extinctions, mentioning the actual or threatened extinction of the dodo, turtles, the beaver, and the Greenland whale. The overexploitation of the oyster beds was directly related to the coming of the railroads. Previously

the people who consumed oysters lived near the beds, but with the new railroad networks, they could be shipped all over Europe, increasing tremendously the numbers of oyster-lovers. Forbes remarked in passing that the fluviatile lakes were exceptional breeding grounds for living things, especially when they are protected from the filth and poison of towns and factories. Finally it is worth recording that before Darwin, Wallace, Marsh and the others, Dickens published in the fifth chapter of Hard Times (1854) his unforgettable description of Coketown, a devastating combination of social conformity, utilitarian and commercial values, and air and water pollution.

Subjective, Esthetic, and Emotional Attitudes to Nature

I believe the period, roughly from the middle of the 18th to the latter part of the 19th centuries was one of a real efflorescence of writings on the subjective, emotional and esthetic attitudes toward nature. Most of the ideas were old. It was the depth and extent to which they were explained that mattered. In preparing this material, I found myself rereading works I have not read since my late teens, and early twenties, authors like Wordsworth, Scott, Byron, Keats, Goethe, Emerson, and Cooper.

Cooper's novels, especially The Deerslayer and The Last of the Mohicans, were standard Christmas gifts for boys of my generation, and I read his novels, ignorant of the Higher Criticism of Mark Twain. It was with a far different eye that I read his prose decades later. I found in Cooper's Prairie striking landscape descriptions, I read the old trapper's scornful vituperation about cutting down the forests, and Cooper's essay comparing European and American scenery.

When I was into this material, I made a discovery. I was in the middle of things, the period I had chosen was part of a continuity, and I was forced to go back in time. This is most disconcerting when one has set one's mind on going forward. I was driven back to Locke, and the reason was that Locke in An Essay Concerning Human Understanding rejected the existence of innate ideas. These two were powerful tools in expressing feelings and attitudes toward nature. Locke's

arguments became an open door for appreciating the beauties of nature, first through sight, and then through the other senses; and the association of ideas could be vivid and strong in places like lonely crags and promontories, in the awesome Alps, in the Roman Campagna, at Niagara Falls. The reaction against Locke was equally important. In English literature, the rejection of Locke is associated primarily with Coleridge. He and others with similar views, were unwilling to credit the senses with such powers of perception and understanding; they saw a higher intuitive power at work, which Coleridge called Reason, superior to the lower powers coming from the senses which he called the Understanding. Similar ideas were in Schelling Naturphilosophie and their arguments and beliefs are at the heart of the American Transcendentalist's interpretation of nature, quintessentially in Emerson's Nature.

I found an embarrassing number of major and minor themes, but I will not clutter up this modest effort by listing them. It is worthwhile, however, to give a few examples of the major ones:

1) The poetry and prose of the period is full of natural theology and other religious interpretations of nature. The association of ideas is a favorite way of bridging the gap between nature and the mind.

2) The mysteriousness and evocative power of nature was also a powerful theme, topics that fed on moonlight, ruins, and old abbeys.

3) The sublime, the beautiful, and picturesque had many examples in scenery.

4) Reverie, fantasy, melancholy, meditation, especially in places which would induce an association of ideas. Night thoughts prospered too, especially the Night Thoughts of Young, and in Germany Novalis's Hymns to the Night.

5) Contrasts between pristine nature and nature with historical associations, the most popular being that between the scenery of the New World and the Old. A typical contrast might be between the Roman Forum and its environs and a beautiful moonlit lake in a remote untouched American wilderness.

6) Contrasts between art and nature, art in the

sense of that which is made by human beings. The belief in the superiority of nature over art goes back to the ancient world. A variant, endlessly mentioned in this period, is the contrast between the city (art) and the country where nature is more dominant, including the frequent idealization of rural life, though there are powerful descriptions of its agonies in Cowper, Crabbe, and Clare.

7) The personification of nature and ascribing human emotions to inanimate objects, what Ruskin called the Pathetic Fallacy. It could be used humorously and with striking and touching effect as when Heine saw the mountains looking at him earnestly, nodding and wishing him bon voyage as he was crossing the Alps into Italy.

8) Ruins and the evocative power of ancient buildings, whether the classical ruins of Palmyra, Greece and Rome, or the dilapidated abbeys, towers, and castles of Northwestern Europe.

9) The human relationships to other forms of life. Although not a dominant theme, cruelty to animals like the sports of cockfighting and fox hunting were repugnant to many of these writers who had love and respect for life. The masterpiece of this genre in my opinion is John Clare's The Badger.

10) The ancient theme of the instability and evanescence of all things human in contrast with eternal nature is tirelessly repeated. I call it the Sic transit gloria mundi theme.

When I was in elementary school, it was still approved pedagogy for pupils to memorize poems. One that Miss O'Neill had us memorize was from Scott's Lay of the Last Minstrel, the lines beginning, "Breathes there the man, with soul so dead, / Who never to himself hath said, This is my own my native land?" I read this from a far different perspective in preparing this work. The writers of this period did not invent patriotism or nationalism, but they stressed something that made them more powerful. It was not only the glorious deeds of the past, the sagas of earlier kings, the drama of defeat and victory that induced love of country. It was rooted in the soil, in the nature they loved and where they were born. It needs no emphasis that this has been

one of the most powerful ideas in modern history.

Conclusion

I set about on this rash venture knowing full well the dangers ahead. It would be impossible to finish; I could only stop. In doing it, I have been reinforced in my original hope and suspicion, that these four subjects with their subsidiary ideas can greatly enrich our understanding of what has been involved in the human relationship to the earth, not only in the 19th century, but in the present as well, when humanity and the earth are in far greater peril than the gloomiest hypochondriac of the 19th century ever suspected.

COMMENT: ENVIRONMENTAL VALUES AND HISTORY

Roderick S. French
George Washington University

Our panelists long ago established their excellence at their craft as historians which frees us to concentrate on the subject matter of the panel, namely, "environmental values and history." Technical questions of scholarship can be left to one side. What is at issue--"the critical issue"--is whether their investigations have discovered value traditions in our history which might lead to more ecologically responsible behavior today. As John Opie emphasized, environmental history has been distinguished by this most basic of existential concerns: Can the human species learn so to modify its behavior that earth history will have a future?

On that fundamental score, I do not find these papers encouraging. They survey a variety of creative, sometimes scientific and often literarily gifted figures who stand on the margins of the history of the last two hundred years. Fascinating and noble as these figures may be, I see very little in these papers to persuade me that, philosophically speaking, they should be moved from the margins to the center of our culture. Indeed, for purposes of discussion, I would assert that the more we study the well-known works of the Transcendentalists and other alternative culture types, the more we see why their world views could never serve as the normative philosophy for an ecologically responsible civilization.

Prof. Petulla may be correct in saying: "Theory can generate practice only when both are inspired by hope." His paper closes with the more qualified assertion: "Without justified hope . . . the practice of history becomes simply hopeless." I would like in a few words to indicate why I do not find the grounds for that justified hope enumerated in these papers.

When I first read Traces on the Rhodian Shore, I found almost everything persuasive except the final periodization. (That reservation relates to the historiographical dispute between the camps of

Carl Becker and Peter Gay regarding the "modernity" of the 18th century which is not immediately relevant.) Like all of his other readers I was delighted to learn in the announcement of this conference that he had turned his encyclopedic curiosity forward to the 19th century. However, I am not similarly delighted by what he has found there. Granted this is only a preliminary scouting report, but the impression is already well-established that the century features a hopelessly inchoate miscellany of partially developed philosophies of the mankind-nature relationship.

The first section of Prof. Petulla's essay on methodology offers again his threefold typology of environmental traditions as a means of bringing some order into this conceptual jungle. He identifies the biocentric, ecologic and utilitarian traditions--as he had developed them in his most recent book. Perhaps we can use his typology as a framework for the discussion of these papers, as well as the general subject.

To take just one moment on methodology, however, we should notice that Prof. Glacken presents his findings in four discrete categories, each represented by different individuals. It is as if he had plowed four fields and raised four separate crops. What is more serious is that the fourth category which he introduces for the first time in this work in order to do justice to the nineteenth century, namely, the esthetic, is not integrated with the others. It simply floats by itself and is treated as merely subjective. This reminds us that what was lost in the nineteenth century was the unified set of sensibilities of the eighteenth century, as represented in the integrated world view of Jefferson. That eighteenth-century world view could not assimilate either the data or the dynamism generated in the nineteenth century. Moreover, as Prof. Petulla acknowledges, we are not yet equipped, methodologically, to recover the lost coherence. His best advice is that we proceed by "piling up a lot of good examples" of studies from different disciplines and hope thereby to protect ourselves from the narrowness of monodisciplinary analyses. I suspect this will be a point for further consideration in the discussion period.

I will proceed now to comment on the several

value traditions as presented in these papers. First, the biocentric tradition, defined as a world view which "places value in nature for itself." Under this rubric, two of the papers serve up the Transcendentalists--again, but wrongly so in my opinion. The notion that Transcendentalism is available to us as a philosophical foundation for modern environmentalism is one of the great unexamined assumptions of our movement. This delusion is easily explained: We need an alternative philosophy. They wrote, and wrote well, about nature themes. Their countercultural antipathy for the commercialism of bourgeois culture is morally appealing, etc., etc. But our conventional assessment of this school of thought will not stand the test of analysis. Moreover, the uncritical acceptance of this idea is blocking the development of a truly serviceable philosophy for contemporary environmentalism.

My counter interpretation can be sketched as follows: The ultimately damaging fact about Transcendentalism is that the Transcendentalists ultimately were not interested in Nature. Transcendentalists were interested in nature only as a manifestation of the divine or as a material reflection of a higher spiritual reality or as a teacher of moral lessons. Philosophical Idealism, which underlies American Transcendentalism, is always seeking to apprehend some antecedent rational structure of the universe behind or above Nature. For all the talk about fresh experiences of nature in the Concord crowd, their mode of knowledge is always recollection. Remember Thoreau's beautiful passage in Walden wherein he says he is "hinting" at the "cherished enterprises" of his life. "I long ago lost a hound, a bay horse, and a turtle dove, and am still on their trail. . . . I have met one or two who had heard the hound, and the tramp of the horse, and even seen the dove disappear behind a cloud, and they seemed as anxious to recover them as if they had lost them themselves." A second and final illustration, also from Walden, would be this: "If we read of one man robbed . . . or one mad dog killed . . . we never need read of another To a philosopher all news . . . is gossip."

Hence Thoreau's surprising ambivalence regarding travel. He was always caught short by the question: Why travel to see other landscapes when what one

wants to "see" can be learned by careful observation in the precincts of Concord? Whatever moral truth there may be in this insight, it has devastating consequences for the value of experience and for the study of nature. We can look to these New Englanders for the original philosophical basis of the well-known California maxim: When you have seen through one redwood tree you have seen through them all. That may be unfair. But have you noticed that students of Thoreau and Emerson are embarrassed by what they take to be lapses. Those awkward instances are not lapses.

To support that charge, I would cite Thoreau's essay, "On Walking." The piece breathes the spirit of Manifest Destiny. In it he baldly supports the right of the industrious Anglo-Saxon farmer with his progressive agricultural methods to dispossess the lackadaisical Indian husbandman. If the writings of the Transcendentalists were not sufficiently persuasive with their contemporaries to inhibit imperialism in the Age of Jackson, of what use can they be to us in the Age of Watt?

Transcendentalism was not a celebration of Nature. We should have been warned by the hierarchical structure of Emerson's first essay entitled, "Nature." The concern of ecology would rank no higher than the second of his levels of the uses of nature. Moreover, the conclusion of his analysis was, in his words, that nature was "degraded" with regret. And that first essay was the high point in Emerson's view of humans-in-nature! The alienation of human and non-human nature grew to a melodramatic crescendo in the essay, "Fate." What went wrong, philosophically speaking?

In a word, Emerson began life with the philosophical Idealist's assumption of a teleologically unified universe of nature and history. His actual life experience destroyed that confidence. He came to see non-human nature as indifferent to human purposes. He saw that those moral and symbolical meanings attached to natural facts were not properties of nature itself but attributions of human interpretation. The only relationship open to him was a fatalistic identification with uncaring nature.

As Kenneth Burke has written, Emerson was

whistling in the dark and he knew that he was whistling in the dark. Nietzsche had not yet announced the "Death of God" but the odor of putrefaction was already in the air. The divine soul of Emerson's Nature had expired.

This last point connects with Professor White's exhortation to find "a viable equivalent to animism" for contemporary men and women. I agree with Prof. Petulla that the request is strikingly put but misleading as formulated. The modern equivalent to animism cannot be some self-induced re-inspiring of natural objects or places. The equivalent attitude of respect toward nature must be grounded on an imaginative grasp of the principles of scientific ecology.

That brings us to Prof. Petulla's second tradition, the ecologic, which has had two great American representatives, one in the nineteenth century and one in the twentieth century, George Perkins Marsh and Aldo Leopold. Having taken so much time on the Transcendentalists, I will confine myself to an unsupported observation on the limitations of Marsh.

What can we learn from G. P. Marsh? We can learn, in magnificent detail, how human action has modified the face of the earth. That constitutes an inspired insight, one that is invaluable to the necessary re-education of our species. But, if we ask the critical question of philosophical anthropology, what ought to be the human role in earth history?, Marsh goes silent. He cannot answer the question because he has not made up his mind as to whether the story of humanity is entirely a part of earth history or a story which begins and ends in some realm of being which transcends the earth. As he put it rhetorically in the conclusion of his great study, he could not say whether man was of nature or above nature because he didn't have enough evidence. Presumably, by now, he has found the missing data.

What is "natural" for humans is not fixed by "nature." Jean-Paul Sartre was fundamentally right in his slogan: We are the one creature whose existence precedes the definition of its essence. There is no primordial equilibrium to be restored which would resolve our alienation in passivity. We

are the active, self-defining animal, condemned to the freedom of perpetually redefining our nature. Ecological innovation or "intervention" in this sense stops only with our death. The point can be made in Aldo Leopold's language. Thinking like a mountain is a great achievement of imaginative intelligence. The irony is that whereas men can learn to think like mountains, the latter cannot reciprocate the favor. Paradoxically, what appears initially to be an exercise in ecological humility turns into a confirmation of our natural uniqueness.

So, in the end, our colleagues for all their foraging have not salvaged much to nourish a robust, ecologically constructive, conception of earth history. But have they exhausted our cultural reserves? Not in my opinion. As I have said elsewhere, we have a far more serviceable alternative available to us in American Pragmatism, the first major post-Darwinian school of philosophy. Dewey's assertion, for example, that "human intervention for the sake of affecting ends is no interference" in nature is not a warrant for imperial behavior on our part. It heightens our responsibility for the fate of the earth--a fate now seen as truly shared by all earth life.

We should all hope that Prof. Glacken will continue his investigations to the close of the nineteenth century which will bring the Pragmatists into his purview. If he concludes that they, too, are inadequate philosophers of mankind-in-nature, then we are in trouble in the 1980s--even more deeply so than he suggested in his somber closing lines.

J. Donald Hughes
University of Denver

We are told that when the king of the Persians traveled through any of his numerous and wide-flung provinces, he pointedly observed the condition of the land. Where a landscape was well-cultivated and thickly planted with trees, he rewarded the local governor with honors, gifts, and expanded territory; but where he found neglected fields, deforestation, and deserted lands, he removed the governor from office and replaced the miscreant with a better administrator. So the king judged the worth of his appointees by the care they gave to the land, and thus to its inhabitants, believing this just as important as maintaining a garrison for defense or a good flow of taxes. The principles seem clear: a governor who cares for the earth and can cope with environmental problems can be trusted to govern well, and the quality of an administration can be judged by the state of the environment in its territory.

This story comes to us from the Economics of Xenophon,[1] a Greek who knew the Persian Empire at first hand, since he had marched through about half of it at the head of a mercenary army. He was also a farmer who knew the land and how it responds to treatment of every kind. He summed up his experience of human relationship to the earth in a memorable sentence: "Earth is a goddess and teaches justice to those who can learn, for the better she is served, the more good things she gives in return." [2]

A key to Classical Greek and Roman land ethics and views of environmental problems in a period of decisive importance to the later history of the world can be found in this sentence. Specifically, it is to be found in an examination of the concept of Earth: the Greek Gaia or Ge, the Latin Tellus or Terra, and the related idea of cosmos, as it developed through ancient history. No other idea is so central to the understanding of environmental history in this age, or probably any age in the history of mankind. Indeed one possible meaning of the word "earth" in classical literature is "environment." But the ancients seldom used the word

in the passive, inanimate sense that often emasculates the word "environment" in modern use. The Greeks and Romans spent most of their lives outdoors, developing their ideas of earth in active interplay with the living world of nature. They often speak from a point of view that is chthonic, which means, to translate the word literally, earthy. And the chthonic view does not draw a sharp distinction between human life and the life of nature, but sees human beings as children of Earth, sharing in her life and her nature. Instead of mere "environment," then, they saw Earth as a primal goddess or a vast living physical being. If she demands worship it is not just in the conventional sense but in the form of good husbandry as well, and she can both reward good service and punish carelessness.

This paper will examine three major classical conceptions of the earth: first, the traditional view of Earth as a goddess; second, the view developed in the sixth century B.C. and afterwards by some philosophers that Earth is a living organism; and third, the view, consistent with each of the two previous, that earth exists in reciprocal balance with her human inhabitants and responds to their treatment in positive and negative ways that are appropriate and just. This third view is basic to the land ethic enunciated by the agricultural writers.

Earth as a Goddess

When Xenophon says, "earth is a goddess," he is articulating the dominant traditional image of the earth. Earth to the classical Greeks and Romans is the oldest goddess, the all-mother, Ge meter panton, Terra Mater, Mother Earth. Plutarch puts it this way: "The name of Earth is dear . . . and precious to every Greek, and it is a custom to revere her like any other deity." [3] The antiquity of earth-worship is hinted in the Suppliants of Aeschylus, where the repeated cry, "Ma Ga, Ma Ga," [4] the simplest form of the name "Mother Earth," probably echoes ancient ritual. The perception of earth as a goddess can be traced even farther back, into the prehistory of the Mediterranean lands. Cultures that had no writing carved figures of a broad-bosomed mother goddess in wood, bone, and stone, often symbolically incorporating masculine elements, apparently so that

she could give birth of herself. Her image on walls and seals is surrounded by figures of animals, birds, and trees. In the earliest of these representations no masculine gods are portrayed, and when they finally appear they are smaller, subsidiary figures, the sons and lovers of the Great Goddess. So it was among the Minoans of Crete, whose statues of the bare-breasted goddess holding snakes, the oldest of earth-symbols, are so deservedly famous.

With the Mycenaean Greeks, we reach an historical period where we can begin to read records scratched on clay tablets in the script called Linear B. Here the goddess is called Wanaka, Our Lady, to whom tracts of agricultural land were dedicated. She is pictured receiving offerings from men and women including animals and the produce of the soil.

Our first detailed evidence of how the early Greeks viewed the earth goddess comes from poetry of the Archaic Period, particularly Hesiod and the Homeric Hymns. In the beginning, they tell us, was wide-bosomed Earth, mother of gods and men, animals and plants. She nourishes and cares for all creatures as her own children. From her all things spring; to her return all things that die. Her creative womb bore all that is, including first of all the sky and all that it contains; the stars and all the worlds are her children, not this world alone. Many of her offspring are monsters, like the one-eyed Cyclops and hundred-handed Briareos; her fecundity has a dark side. Indeed, Earth herself contains the underworld, which can be seen in one way as a vast uterus but in another way as the common tomb of all the dead. We are born from her, we are nourished by her, and we return to her when we die.

Earth is portrayed by the poets in two aspects, cultivated and wild. Two Homeric Hymns celebrate her: one, "To Earth the Mother of All," speaks of rich tilled land responding to human labor:

Mistress, from you come our fine children
and bountiful harvests;
Yours is the power to give mortals life and
to take it away.
Happy is he upon whom your glance falls
with favor,
Finding him worthy; to him come all things
in abundance.

His life-giving acres of cornland at harvest are heavily laden, Cattle abound in his pastures, his house is filled with good things.[5]

The other, "To the Mother of the Gods," is a wild poem that sings of her delight in "the howling of wolves and bright-eyed lions among echoing hills and forested canyongs." [6] In these lines we hear the deep past resounding. Earth is not just the medium of the farmer's toil, but provides food and fertility for the flocks of the herders, and also the wild animals and plants whose abundance supports people who live by hunting, gathering, and fishing. [7]

The Greeks of the classical period maintained traditions of closeness to the earth. They called themselves "earthborn" or "autochthonous," particularly those who, like the Athenians, traced their ancestry back to the Mycenaeans on their own soil. Deucalion and Pyrrha repopulated the earth after the mythological Great Flood by casting stones, "the bones of their mother," [8] over their shoulders, and Earth gave instant birth to human beings. Athens remembered her earliest kings as sons of Mother Earth, so intimately connected with their chthonic origin that they were said to be serpent-formed in their lower parts. The more old-fashioned among Athenians gathered their long hair with golden clasps shaped like cicadas, those insects that can be seen emerging from the earth in springtime, to symbolize that they were "children of Earth, who sustained them." [9] The Romans had similar feelings; Lucretius says, "the Earth deserves the name of Mother; by herself she made the race of men." [10]

Earth's relationship to the other ancient gods was not always peaceful. The Greeks and Romans were descendants of invaders who worshipped a pantheon of warrior sky gods, predominantly male, and brought them with them into the Mediterranean lands. The sky gods became the Olympians; Hesiod worked them into his Theogony as grandchildren of Mother Earth whom she aided to overthrow the older gods. Everywhere shrines of Earth were rededicated to the worship of the upstarts, Zeus or Apollo most often. But the old religion was not supplanted totally by the new. Chthonic religion continued beside the Olympian as an alternative way of relating to the gods. Theologians who tried to reconcile the two joined them with the

image of sexual union. Zeus as weather-god took the role of the cloudy figure Ouranos, Gaia's son and consort who had suffered a cosmic emasculation. Now Zeus could send the fertilizing rain and cause Earth to conceive; he could be father, she mother. "The rain falling from the beautiful sky impregnates the earth, so that she gives birth to plants and grain for beasts and men." [11] A statue of Ge on the Acropolis showed her imploring Zeus for rain. [12] But in spite of or because of such attempts at harmonizing, the chthonic perspective on the world remained and even infiltrated Olympian religion.

At this point we can look at the environmental dimension of ancient worship. Among the earliest places of worship of Mother Earth were caves where offerings could be placed inside her body in ritual enactment of sexual fertilization, or springs where her life-giving waters emerged like milk from maternal breasts or menstrual flow. Other places holy to Earth were groves, since trees were regarded as daughters of Earth, growing from and remaining rooted in her. Any natural area set aside for worship was a temenos or bounded sanctuary. Within it nothing natural could be disturbed; no trees cut, no wood removed, no animals hunted nor fish caught. Obviously this had some effect in preserving areas of the ancient landscape from environmental damage. Vincent Scully wrote a perceptive book called The Earth, the Temple, and the Gods in which he demonstrated that the choice of location for temples, theatres, athletic stadia, and healing sanctuaries was determined by careful observation of the conformation of the earth's surface and the shapes and directions of topographical features visible from the sites. That is, Mother Earth herself was allowed to make the choice of the siting and orientation of any important structure dedicated not only to herself, but to any of the gods. Anyone visiting these places should be conscious of their great natural beauty, but Scully noted that particular shapes of hills and notches on the horizon, especially when these suggest feminine and masculine images, almost determine the spot selected. [13]

Gaia's shrines were oracular: a worshipper could sleep in one of them and expect to receive the dreams she sent. Also chthonic were initiation mysteries where men and women came to be integrated into the great cycles of nature: seedtime and

harvest, reproduction and birth, through identification with the goddess, as at Eleusis. Here the life and death of mortals was identified with the sowing and growth of the crops that can be seen every year. People die and are buried in the earth, as seeds are planted in the soil. But as seeds send forth shoots in response to healing moisture, they believed, so those who were initiated into the mysteries would flourish again and live a happy life among the dead under the hollow earth, confident because they "knew the end of life and its god-sent beginning." [14]

Almost every goddess incorporates the archetype of Gaia in some way, [15] as Demeter, goddess of grain, and her daughter Persephone, the deities of the mysteries of Eleusis, clearly do. Artemis is "Mistress of Beasts" and "the wild wood." Rhea or Cybele is "Mother of the Gods." Hera is a mother who seasonally renews her virginity and gives birth parthenogenetically to monsters, as Earth herself had done. Athena is nurturer of children and called "Mother," although a perpetual virgin, and her attributes include the earth-symbols of olive tree, owl, and serpent.

But the goddess most closely and importantly associated with Gaia is Themis, her daughter. In fact, one can call Themis the alter ego of Gaia: Aeschylus makes Prometheus, her son, say that she is the same goddess. [16] Worship was given to Ge-themis at Delphi and Athens. [17] Now this is very interesting because Themis is goddess of law, of justice. Why should this be an attribute of Earth? [18]

It is because Earth has her own law, a natural law in the original sense of those words, deeper than human enactments and beyond repeal. It is not the justice of human morality; it is written in the nature of things. "Earth is a goddess and teaches justice to those who can learn, for the better she is served, the more good things she gives in return." [19] Who treat her well receive blessings; who treat her ill suffer privation, for she gives with evenhanded measure. Earth forgives, but only to a certain point, only until the balance tips and then it is too late: famine, disease, disaster, and death come to those who upset her balance arm and to their children. This is Gaia's view of environmental

problems.

Ancient history and mythology are full of stories in which Earth has her revenge on those who harm her or the creatures she protects. Ecological sins meet with ecological punishments. Erysichthon, whose name means "tearer of earth," cut down a tree inhabited by a dryad in spite of the tree-spirit's protests; she complained to Mother Earth, who afflicted him with insatiable hunger. Orion boasted that he would kill all the animals in the world. This too was reported to Mother Earth, who sent a monstrous scorpion to sting him to death. Today they are constellations opposite one another in the sky. Oedipus' rule of Thebes was sinful (although some would say, unconsciously so) but we must not forget that he killed the Sphinx, one of Earth's monstrous offspring and probably an endangered species. A result of this was that blight hit the crops growing on the land he ruled. There is even a reference to overpopulation: Themis planned the Trojan War with Zeus in order to thin out the teeming tribes that were oppressing the surface of Mother Earth.[20] Hesiod and others warn against pollution as a religious violation. The fact that Columella had to put forth an argument that plowing is not the wounding of Mother Earth by her children shows that there were those who thought it was, and probably feared her revenge.[21]

And the fear of Gaia's revenge was no light matter in ancient times. For though she cares for all creatures as her children, they believed, and provides food for every living thing, she also knows that the droppings of cattle manure her trees and the bodies of men are humus for the grass of the plains. At times she is arbitrary and violent; the volcano too is her voice. But in Gaia's revenge is no vindictiveness at all, only the deepest and most natural working. Those who learn and obey her laws have the best chance, in the words of the Homeric Hymn, to see "their sons exult with ever-fresh delight, and their daughters in flower-laden bands play and skip merrily over the soft flowers of the field. Thus it is with those whom you honor, O holy goddess, bountiful spirit." [22]

Earth as a Living Organism

The second important ancient conception of the

earth is that she is a vast living organism. For the Greeks this was a natural step from seeing her as a goddess. Farnell says, "the worship of the earth, conceived in some way as animate or personal, was a universal fact in human religion in certain stages of human life." [23] If the idea of Earth as goddess stressed the personal image, the concept of Earth as organism stressed the animate image.

Several years ago, artificial satellites were placed in synchronous orbits around our planet and made time-lapse motion pictures of one side of the Earth. I remember my sense of wonder at seeing this beautiful changing atmosphere for the first time as a whole. As the terminator between day and night swept repeatedly across the globe, the clouds moved in variegated patterns. Weather fronts marched in procession across the northern continents and a great cyclonic storm revolved in the Atlantic. It struck me immediately that what I was seeing was a gigantic system of circulation, like the streaming cytoplasm of a cell. It looked unmistakably organic and alive. This view of the whole atmosphere as a moving, literally breathing system did even more than the photographs of a spherical jewel hanging motionless in space, or the time-lapse films shown every day in television, which zoom in too closely on our own segment of the planet and superimpose a grid of state boundaries that mar Earth's natural cycles, to convince me that we are not just living motes on a vast mineral ball, but that the Earth itself is alive.

This is the hypothesis of James E. Lovelock, the British atmospheric chemist, who described its development and naming in these words:

It appeared to us that the Earth's biosphere is able to control at least the temperature of the Earth's surface and the composition of the atmosphere. Prima facie, the atmosphere looked like a contrivance put together co-operatively by the totality of living systems to carry out certain necessary control functions. This led to the formulation of the proposition that living matter, the air, the oceans, the land surface were parts of a giant system which was able to control temperature, the composition of the air and

sea, the pH of the soil and so on as to be optimum for survival of the biosphere. The system seemed to exhibit the behavior of a single organism, even a living creature. One having such formidable powers deserved a name to match it; William Golding, the novelist, suggested Gaia--the name given by the ancient Greeks to their Earth goddess.[29]

Golding's choice of the name Gaia for the living entity of Earth is particularly appropriate, because some of the ancient philosophers enunciated a theory of the cosmos which is not far from the modern "Gaia hypothesis." Plato affirmed that the world is "that Living Creature of which all other living creatures, severally and generically, are portions." [25]

The idea of a living, sentient cosmos is not an isolated view among philosophers, but a dominant theme. It emerged first among the Pythagoreans, who held that the world is spherical, animate, ensouled and intelligent. They emphasized the cyclical interplay and balance of the elements and creatures within the organic unity of the world. Empedocles may have been enunciating a grosser vision of the Earth as a living creature when he said, "the sea is the Earth's sweat." [26] But Anaxagoras, in holding that the cosmos breathes, perhaps came closest to Lovelock's atmospheric hypothesis.

Plato gives us the first extant systematic account of the ancient theory. He maintains that the cosmos is "a living creature, one and visible, containing within itself all living creatures which are by nature akin to itself." [27] And this living creature is "endowed with soul and reason." As Cicero echoed him centuries later, "The world is an intelligent being, and indeed also a wise being." [28] The Stoics also followed Plato's view of the cosmos as an organism which is sentient, rational, pervaded by harmony, and of which all living things are parts. It is self-sufficient because it nourishes and is nourished from itself.

An important difference does exist between the ancient philosophers' view and the modern Gaia hypothesis. In the former case, the living creature (zoon) is the kosmos or universe, while in the latter it is Gaia, the Earth, or more strictly the

biosphere, that is considered to be the living entity. But the difference seems less important when the ancient conception of the universe is taken into account. In the usual picture, the Earth is at the center and occupies a uniquely important position within the cosmos. Any philosopher who held that the cosmos is alive would also have asserted that the Earth, as its heart, was also alive. Plato clearly implies that the Earth shares the same nature as the cosmos of which it is part, which includes being alive.[29] The Earth is the locus of virtually all known living things, including rational man. In the general Greco-roman view of the environment, therefore, saying "the Earth is alive" and "the cosmos is alive" would not be functionally different statements. Both, in popular speech, would amount to saying, "the world is alive."

Then what is the place of human beings within this living organism that is the world? Mankind is one functioning part of the totality, and we are what we are because we have a share of the whole. Our bodies are composed of the same elements as the world, since we were generated out of the Earth. Indeed, Empedocles says that it is exactly because of this that we can know or perceive the world: "For it is by earth that we see earth." [30] We are alive because the world is alive; our souls are extensions or parts in one way or another of the world-soul. As Plato says, "Whence can a human body have received its soul, if the body of the world does not possess soul?" [31] This view gives humanity an integral place within the living universe; we share the qualities of the whole organism by physical existence, living, sensing, and being conscious. Most philosophers gave mankind a special role within the cosmos, as possessor of reason par excellence, although they did allow a certain degree of intelligence to animals and even to plants. By her habit of growth, for example, the vine herself instructs the viticulturalist in her needs for support and shade.[32] Still, reason is our most distinguishing quality; man is the rational animal.

The modern exponents of the Gaia hypothesis tend to speak of collective humanity as the "nervous system" of the biosphere, the organ through which it becomes conscious, not that we lack other functions but that our brains give us that special role. Lovelock speculates that we may not be unique in this

respect, since the cetaceans also have large brains whose functions we do not fully understand.[33] Perhaps they are the nervous system of the sea, and the fact that we are hunting them to extinction may be a catastrophe of a more serious nature than we have suspected.

Not all ancient philosophers postulated a living cosmos. On what one proposition would they have agreed? The atomists and Epicurus would have denied it. Epicurus stated that there were many universes like our own, and that in some of them animals and plants were not present. How could a universe be alive if it lacked living creatures? Our particular universe does, of course, have life within it, although life for Epicurus was only an arrangement and motion of atoms within the void.

Granted such dissenters, the view of the world as living organism was so widely held among philosophers throughout classical antiquity that it must have been familiar to every educated person in the Greco-Roman world. And it was congenial with the general intellectual world-view of the times.

Now if the world is a living organism within which the parts function in harmony, environmental problems represent a disharmony or an illness of the organism. The world is in a state of natural dynamic balance; anything that puts stress on one part is adjusted for by a shift somewhere else in the system. But if it is nonetheless upset it is sickness, and a restoration of health must be sought through healing (therapeia) or purification (katharsis). Thus the problem can be seen as miasma, a pollution that needs to be removed. This concept has very ancient sources, springing from the deepest strata of chthonic religion.

The modern scientists who have advanced the Gaia hypothesis undoubtedly were not aware of how far back in intellectual history the antecedents of their theory can be traced, and how fitting was Golding's suggestion of a classical Greek name for the entity they postulate.

The Ancient Land Ethic

We need to look at a third and last attitude of the ancient peoples toward the Earth. It is a

teaching of primitive reciprocity: Earth rewards good husbandry and punishes a wastrel. It is the basis of the land ethic taught by the best agricultural writers and epitomized by Xenophon in the quotation that has emerged as this essay's theme, and which I will now translate in slightly different words: "Earth willingly teaches righteousness to those who can learn, for the better she is treated, the more good things she gives in return." [34]

The ancient economy was dependent on farming; as Aristotle affirms, "The greatest number [of those who labor to get wealth] obtain a living from the cultivated fruits of the earth." [35] So the question of assuring that Earth would continue to be generous from year to year was of the highest importance. Cicero used a financial metaphor: "The farmer keeps an open account with the Earth," [36] and receives low or high interest as he invests his labor and materials.

But most ancient writers put the principle in more personal terms. Since "Earth as being your mother delivered you, now as if your land were your mother and nurse you ought to take thought for her" [37] and tend her "with care passing that of son for mother, the more that the Earth is the divine teacher of her mortal children." [38] As children of Earth, human beings are totally dependent on her for sustenance and strength. The myth of Antaeus has a more universal meaning: as long as he was in contact with Earth, his mother, he was invincible, but as soon as Heracles held him up so he could not touch her he began to weaken. "To give earth" [39] was the symbol of surrender and slavery to a foreign conqueror.

To the principles of economic return and filial gratitude the Stoics added the arguments that the Earth is beautiful and should be preserved for that reason, and that Earth is useful, providing the sphere for the exercise of human art, skill and labor.

The idea of agriculture as the care of the earth has a long and honorable history. The acts of tilling and sowing in earliest times were cast in the metaphors of sexual fertilization, and the nourishing response of Earth was compared to the maternal suckling of children at her flowing breasts. Not all

the ancients had such a positive view of tillage, to be sure. Cultivation could also be seen as a "wearying" of Mother Earth, who grows older as the generations go by and less able to produce what once she bore.[40] The well-known "Hymn to Man" in Sophocles' Antigone says that the farmer tires earth by plowing her: "Earth, the supreme divinity, the immortal and unwearied one, he wears away." [41] but others like Columella countered this view, maintaining that cultivation properly done and compensated for by manuring need not exhaust the soil. Earth is not growing old, he said: the blame for her infertility lies in poor husbandry; declining crops are our fault, not hers.[42] The damage that humans can do to the earth was seen most clearly in industries that make their profit by taking things from the earth, as in the cutting of timber and mining.[43] But always the principle was the same: Earth responds to human treatment in kind. She rewards responsible, wise labor and punishes the lazy and harmful. This is the inexorable operation of the law of Themis.

From the chthonic viewpoint, the worst sin of all is failure to take care of the land itself. The Earth will never let the idle farmer prosper. If a man gets no grain from his field, it is reasonable to assume that it is because he "takes no trouble to see that it is [properly] sown and manured." [44] When a sheep is ailing, Xenophon observes, we generally blame the shepherd, so if a farm in otherwise good country fails to prosper, we can blame the farmer either for laziness or bad practices.[45] One who lets goats graze in a young olive orchard or vineyard, warns Varro, must expect to lose his trees and vines.[46] The results of mistreatment of the Earth were clear to the ancient writers: hunger, ill health, erosion, poverty, and general ruin were all forms her revenge could take. For "although she supplies things in abundance," she is not an easy taskmistress. "She does not allow her benefits to be won without toil," at least not in the Mediterranean climatic zone, "but accustoms folk to endure winter's cold and summer's heat." [47] And even the best farmer may have a bad year now and then.

If the agricultural writers warn of her poetic justice, they also reveal its positive side. Even the work she requires is beneficial, since "Earth

gives increased strength through exercise to those who labor with their own hands." [48] And instances of Earth rewarding good husbandry are numerous. Homer praises Odysseus' father, King Laertes, for his horticultural ability. His orchard and vineyard were unusually fruitful because they were trimmed and cultivated with skill and care. The results "were the glorious gifts of the gods." [49] It was the same with the gardens of King Alcinous of the Phaeacians. Indeed, throughout classical history, a flourishing agricultural environment was regarded as the sign of a good ruler. When Alexander the Great had to choose a new king for Sidon, he selected Abdalonymus, who was found watering a garden. Robin Lane Fox suggests that Alexander picked the man because he was such an excellent gardener. [50] The principle seems to be that one whose plot of ground flourishes will also be able to see that his land and people flourish.

Those who rule have responsibility toward the Earth. Lawgivers had to place the division of the land and the care of the Earth among their first concerns. Solon limited the amount of ge one man could own, not only to prevent the dispossession of impoverished small landowners, but also to make sure the earth received proper attention. And political philosophers urged that legislators make enactments to protect the land and control its use. Plato advised that the state make certain that arable soil not be preempted for other purposes. As he put it, "where Earth, a true mother to us . . . is minded to yield sustenance for us, our living should not be cheated of the benefit by any man, living or dead." [51] The laws made by the state affect mutual transactions between human beings and the Earth, so they should reflect those deeper laws taught by Earth herself.

And these laws are not hidden; the Earth is a teacher whose books are always open for us to read; she does not willfully lead us astray, so if human beings fail to discern the law of Earth and act on it, they have only themselves to blame. Xenophon states this clearly: "I think that just because she conceals nothing from our knowledge and understanding, the Earth is the surest tester of good and bad individuals." [52] To flourish in their land, a people must first understand the nature of the Earth. And this is not difficult, since the Earth is such a gentle, humane teacher that all we need to do

is see her and listen to her, and she at once will make us comprehend her. She herself gives many lessons in the best way of treating her. When deciding what to plant in a given place, "you are not likely to get a better yield from the earth by sowing and planting what you want instead of the crops and trees that the earth prefers," and you can find out what she prefers by observation of what grows there naturally. "For the earth never plays tricks, but reveals frankly and truthfully what she can and what she cannot do." [54]

Though the relationship with Earth was seen as a mutual interchange, Earth was always regarded as the senior partner, the stronger one, the encompassing one within whose embrace the human species was only one of many creatures. "All things come from the Earth," announces the pre-Socratic philosopher Xenophanes, "and they reach their end by returning to Earth at last." [55]

Conclusion

These, then, are the components of the chthonic viewpoint insofar as we can trace it among the ancient Greeks and Romans. First, the Earth is the oldest goddess, supporter and nurterer of her children, human and nonhuman, and therefore entitled to respect and worship. Her principles of justice, personified as her daughter and alter ego Themis, are deeper and more compelling than human enactments because they are written in the soil and rocks, are heard in the rain and winds, and have their inexorable effects without need for courts and juries beyond the land and crops themselves. Environmental problems are seen as a result of the failure of human beings properly to worship the Earth and follow her unwritten laws.

Second, the Earth is a living being of whom humans are only part. Right relationship with the Earth means that the total organism is in good health; so environmental problems are seen as illness, as a failure of one part of the organism to interact supportively with others.

Third, Earth is seen as responsive to human care or the lack of it, giving rich returns to those who treat her well and punishing those who are lazy or who weary her by trying to wrest from her what she is

not ready to give. Environmental problems are seen as the passionless revenge of Earth on those who fail, either through ignorance or avarice, to practice well the art of the attentive tender of the land. "For Earth is a goddess and teaches justice to those who can learn, for the better she is served, the more good things she gives in return." [56]

A final observation seems in order. To paraphrase James Lovelock, the chthonic view of the environment does not envision "a subjugated biosphere with man in charge." Mankind is not the "possessor of this planet," but "a part of, or partner in, a very democratic entity." [57] These words, which he applies to the Gaia hypothesis, express equally well the chthonic tradition in classical thought. Other tendencies in Western intellectual history have made man the lord of the Earth, conqueror of nature, uncaring consumer of the Earth's "natural resources." This is the attitude that continues to lead us in the present time, the Age of the Great Recessional, when each year Earth is losing more forms of life than in centuries before. In a decade when we are being told that we have to sacrifice environmental values for industrial growth and national strength, we could find healing in another voice, that of the ancient Hymn to Earth, Mother of All:

Gaia, mother of all, I sing, oldest of gods,
Firm of foundation, who feeds all creatures living on earth,
As many as move on the radiant land and swim in the sea
And fly through the air--all these does she feed with her bounty.
Mistress, from you come our fine children and bountiful harvests;
Yours is the power to give mortals life and to take it away. [58]

ENDNOTES

- [1] Xenophon, Oeconomicus 4.8-9.
- [2] Ibid. 5. 12.
- [3] Plutarch, Moralia 935B.

- [4] Aeschylus, Supplices 890.
- [5] Homeric Hymn 30. 5-10, trans. by Thelma Sargent, The Homeric Hymns: A Verse Translation (New York: W. W. Norton, 1973), p. 79.
- [6] Hymn. Hom. 14.4-5.
- [7] W. K. C. Guthrie, The Greeks and their Gods (Boston: Beacon Press, 1954) pp. 58-59.
- [8] Ovid, Metamorphoses 1.415.
- [9] Plato, Menexenus 237B.
- [10] Lucretius, De Rerum Natura 5.820.
- [11] Aeschylus, Danaids fr. 25.
- [12] Pausanias, Description of Greece 1.24.3.
- [13] Vincent Scully, The Earth, the Temple, and the Gods (New York: Frederick A. Praeger, 1969).
- [14] Pindar, fr. 102.
- [15] Most instructive on this question is the chapter, "Beginning with Gaia," in Christine Downing, The Goddess: Mythological Images of the Feminine (New York: Crossroad, 1981), pp. 131-156.
- [16] Aeschylus, Prometheus Bound 209.
- [17] Farnell, vol. 3, pp. 13-14.
- [18] Most scholars have said that it is because when oaths were sworn, Earth was called to be witness. Demosthenes was said to have been able to reduce people to tears by intoning the well-known metrical oath, "By Earth, by all her fountains, streams, and floods" (Plutarch, Life of Demosthenes, 9). But why Earth? Because she was everywhere, received shed blood and the bodies of the slain, and could exact vengeance from oath-breakers. She was mother of the Furies; Electra prayed to Earth for revenge on Clytemnaestra, who had broken the marriage-vow in a way more serious than usual, by murdering her husband.
- [19] Xen. Oec. 5.12.

- [20] Robert Graves, The Greek Myths (Harmondsworth, England: Penguin, 1960), 159e.
- [21] Columella, De Re Rustica 10.57-58.
- [22] Hymn. Hom. 30. 13-16.
- [23] Farnell, vol. 3, p. 2.
- [24] James E. Lovelock and Sidney Epton, "The Quest for Gaia," New Scientist 65 (1975): 304.
- [25] Plato, Timaeus 30D.
- [26] Philip Wheelwright, ed., The Presocratics (Indianapolis: Bobbs-Merrill, 1966), p. 153. The testimony is from Simplicius, quoting Theophrastus.
- [27] Pl. Ti. 30D.
- [28] Cicero, De Natura Deorum 2.13 (35).
- [29] Pl. Phd. 109B.
- [30] Empedocles, fr. 378, from Aristotle, De Anima 404b13.
- [31] Plato, Philebus 29A-30A.
- [32] Xen. Oec. 19. 18-19.
- [33] James E. Lovelock, Gaia: A New Look at Life on Earth (Oxford: Oxford University Press, 1979), p. 149.
- [34] Xen. Oec. 5.12.
- [35] Aristotle, Politics 1256a39.
- [36] Cicero, De Senectute 15.
- [37] Plato, Republic 3.414 D-E.
- [38] Plato, Leges 5.740A.
- [39] Aristotle, Rhetoric 1399b11. "Earth and water" was the customary demand by the Persians of Greek states during the Persian Wars.

- [40] Lucr. 5.827.
- [41] Sophocles, Antigone 333.
- [42] Columella, Rust. 1. Praef. 1-3.
- [43] Arist. Pol. 1258b29.
- [44] Xen. Oec. 20.4.
- [45] Ibid. 3.11.
- [46] Varro, De Re Rustica 1.2.17.
- [47] Xen. Oec. 5.4.
- [48] Ibid.
- [49] Homer, Odyssey 7.132.
- [50] Robin Lane Fox, The Search for Alexander (Boston: Little, Brown, 1980), p. 184.
- [51] Pl. Leg. 12.958E.
- [52] Xen. Oec. 20.13.
- [53] Ibid. 16.3.
- [54] Ibid. 20.13.
- [55] Xenophanes, fr. 27; Wheelwright, p. 33.
- [56] Xen. Oec. 5.12.
- [57] Lovelock, p. 145.
- [58] Hymn. Hom. 30. 1-7; Sargent, p. 79.

ENVIRONMENTAL AMBIVALENCE: AN ANALYSIS OF IMPLICIT DANGERS

Bruce Piasecki
Clarkson College

Social philosophies condoning ambivalent responses to the environment are receiving considerable attention; after a decade of environmental advocacy, these philosophies of ambivalence are being recognized for their rigorous assessment of the many problems implicit in the human use of nature. By ambivalence, I mean the existence of contradictory thoughts or emotions--such as love and hate--toward the same object at the same time. By environmental ambivalence, I mean the persistently human attitude towards nature which wants both to preserve the pristine quality of a given locale and to humanize the same terrain. The ambivalence is persistent; policies toward nature thereby fluctuate--back and forth, at different times, from the passionate search for environmental quality to the wavering acceptance of severe degradation. An impressive volume of applied social science has quantified this recurrent tendency in American policy and society; landscape architects, city planners, and wilderness managers confront the problem on a project basis each day. Industrialists, environmentalists, and lobbyists divide the world around the margins of disagreement this innate attribute permits. Yet a significant question remains: what can be gained by recognizing the effects of ambivalence, and what are the dangers of endorsing this factor in the human use of nature?

Ambivalence influences the emotional response to stimuli with such relentless frequency that we seldom perceive it as functional in the search for environmental policy. Its omnipresence accounts for the neglect of its effects. A brief example may clarify the problem at hand. In passing the Coastal Zone Management Act of 1972, Congress acknowledged the growing pressures on America's coastline for the establishment of critical fish and wildlife habitats. This was no small triumph for environmentalists, if one considers the growing pressures for increased industrial and residential development on America's coasts. Many Americans want to live on the coast (over half of the nation resides in, or near, coastal

areas). Others are willing to travel great distances to visit the beach. Industry prefers the ease of access to coastal areas, and the great plus which plenty of water supplies. So it was no small victory for environmentalists when Congress passed the CZM Act in 1972 to preserve a few fish and estuaries.

But in an effort to balance the effects of increased offshore oil and gas development expected from plans to increase domestic energy production, Congress then added significant amendments to the CZM program in 1976. After the 1973 oil embargo, Americans wanted both to preserve valuable coastal areas--and to develop them. We wanted untouched wetlands and increased energy activity on the coast simultaneously. Thus, the government, in four short years, codified American ambivalence into law. As a result of these bicentennial amendments, the Federal government now gives states grants and loans to accommodate the new population attracted by energy industries, and at the same time, pays the costs for repairing "unavoidable" environmental damage traceable to energy activity. That is, we encourage industrial growth on the coast and demand the restoration of the coast during and after such growth. We even subsidize through these federal grants the building of hospitals and schools to service the increased residential pressures in these areas. If ambivalence is best defined as the existence of contradictory thoughts and emotions toward the same object at the same time, then legislation which condones both the build-up and the clean-up of American coasts is rooted in environmental ambivalence.[1]

Since histories of public policy and social change often neglect, in their emphasis on administrative change, the enduring qualities of the American response to nature, historical evidence of ambivalence in the private sector is harder to verify, but no less visible.[2] I am not talking about a factor in American decisionmaking that can be erased by a new government, or by a more enlightened administration. I am describing, instead, a stable and everpresent aspect of the human response to nature which has proven durable, despite aggressive regulatory attempts to resist its destructive potential. Environmental ambivalence may be thought of as a continual part of the human condition; it is a permanent dye in the fabric of human life which

colors the history of humanity's impact upon the earth without promise of fading.

Ambivalent responses to nature constitute a critical problem in environmental history not only because they help explicate confused legislation.[3] Philosophies of environmental ambivalence deserve scrutiny because they are dangerous. Danger is an inexact word, especially when it is used to caution human interactions with nature. Yet when I speak of the danger of skidding on an icy road, or the perils of polar exploration, most of you can understand what I mean. Although meteorologists refer to icy road conditions as "hazardous," they really mean that it is "dangerous" to drive on icy roads. The danger is directly proportional to our speed, size, visibility, and nerve.

The danger of condoning ambivalent responses to nature, however, is not direct, but insidious. It represents another, more perilous, kind of danger. It progresses into our policies and habits almost imperceptibly, and always indirectly. It breeds inefficient confusion, rather than intelligent compromise. To accept our ambivalent response to the environment is necessary, but then to infer that our policies and actions toward nature should manifest the wobbling imprecision of ambivalence is dangerous. It represents an incomplete inference, a skipped step in the logic of environmental ethics, which is gaining acceptance at an alarming rate.

A few brief examples may help clarify my point. There is a tendency in America to misname man-made dangers in the environment. Today we refer to toxic chemical wastes, stored in thin metal containers, as "hazardous wastes"--as if it was the element of chance, rather than their corrosive nature, which let them leach into the ground. Spent fuel rods also are "hazardous." I suspect that the unwritten history of the American response to environmental dangers would confirm this tendency: most Americans are not comfortable with a notion of a nature that can repel, precisely and predictably, our industrial intentions. That is too direct. It does not fit the pattern of ambivalence by which we instinctively view nature.

One problem, then, with environmental ambivalence is that its dangers can only be noted indirectly. A policy saturated with ambivalence is

often viewed as the triumphant product of power politics--the difficult and hard-earned success of compromised differences between developers and environmentalists. Apologists praise the confused legislation for its just service to conflicting special interests; yet in the end, the assured function of a sound policy has not been written. In the modern arena of public interest advocacy, the discerning arbiter, noting the indirect dangers of a policy that eventually hurts all parties, is seldom heard. Instead, a number of articulate advocates are busy selling the concept of ambivalence to conclude the twentieth century.

The recognition of ambivalence is difficult, and always indirect; but the acquiescence to it, and the popularization of it as a general philosophy, opens the world's lands to the possibilities of uninhibited devastation. American environmental history testifies to this danger. Two outspoken proponents of ambivalence will be assessed, in this concluding section, to verify its implicit dangers. Although a hundred years separate these writers, they both are recognized for their passionate embrace of ambivalence, and for their endorsement of humankind's urge to humanize utterly the earth. The peculiar appeal of these writers rests in their ability to ennoble contradictory responses to nature, and to endorse the complete humanization of the globe.

Walt Whitman, America's great bard of westward expansionism, advocated extreme environmental reform throughout the second half of the 19th century. His works present "a new race dominating previous ones," which should, in time, inhabit the globe and transform nature into "a new earth." Whitman celebrated his century's great changes--the proliferation of railroads, steamships, and telegraph lines in "Passage to India"--and encouraged his generation's social mandate to change--utterly--the face of the earth. Yet Whitman also has been called America's great poet of nature, our patron saint of ecology. How can we understand this apparent contradiction?

Whitman's poem, "Song of the Redwood Tree," poses an answer. Published in 1874, the poem tells of the western advance through the redwood forests of California. Written in three parts, and divided into a series of speeches spoken by a dying redwood tree,

the poem is a prime example of environmental ambivalence. In addition to increasing Whitman's recognition, the poem, which appeared in Harper's, codifies two centuries of American ambivalence toward the environment.[4]

The poem begins with the "Voice of a mighty dying tree" acknowledging the fact that it will be cut down: "Farewell my brethren,/ Farewell O earth and sky, farewell ye neighboring waters,/ My time has ended, my time has come." The poet hears this "death-chant" from an area "along the northern coast . . . (which is) Riven deep by the sharp tongues of the axes." Yet the poet is not distressed by the loss of this noble tree, a tree which may have stood from before the birth of Christianity. He hears, instead, the "still prouder" . . . "loftier strain" of "the new culminating man," who will sing of the complete conquest of nature by man. Although Whitman has the tree, in its second speech, assert "I too have consciousness, identity,/ And all the rocks and mountains have, and all the earth," his veneration of the tree is ambivalent. For at the same time, he accepts the uninhibited advance of the frontier American, who "giving not taking law," forces the redwood to "abdicate" its power and its glory. The poem ends:

In man of you, more than your mountain
peaks or stalwart trees imperial,
In woman more, far more, than all your gold
or vines or even vital air . . .

I see the genius of the modern, child of the
real and the ideal,
Clearing the ground for broad humanity, the
true America, heir of the past so grand,
To build a grander future.[5]

Historians have generated numerous terms to describe this representative set of assumptions--"manifest destiny," "white man's burden," "westward expansionism," "resource imperialism" are but a few. Yet the neglected factor relating each of these diverse terms may be ambivalence, a feature inherent in the human use of nature yet granted peculiar endorsement by Americans.

Whitman's willingness not only to acknowledge his ambivalent response to the redwood, but also to

acquiesce completely to it, to "celebrate" it, permits a dangerous misperception. The redwood tree, so resistant to pests and surface fires that it would have lived until it tumbled from its own height, becomes a mere externality to man. It must "abdicate" its glory. This point may seem obvious to some of us by now--the rhetoric of conquest has lost its speciousness--yet the notion of endorsing environmental ambivalence is not lost to our times. It is becoming an integral part of American pragmatism. Although we have shifted from romantic metaphors of the conquest of nature to deliberate sciences of environmental management and control, the American use of nature remains dramatically two-faced. The 19th-century concept of nature (which presented nature to be a superabundant and resilient goddess that must be "adorned and embellished"[6] by the activities of man) has been modified by a quiet suspicion that nature is, in fact, fragile and limited. Yet this shift has, in many instances, only intensified the temptation toward accepting ambivalence as the rationale for our action. A final case study should confirm this suspicion.

René Dubos has been a leading spokesperson for ambivalent responses to the environment since the early forties. He claims that this ambivalence is inevitable, and quite helpful in the creative interplay implicit in the human use of nature. He has popularized the notion that humanity must humanize the earth; yet in assessing the results of this global humanization, he prefers to call himself a "Despairing Optimist." His longstanding column in The American Scholar runs under this deliberately ambivalent title, and his recent book-- The Wooing of Earth --summarizes with alarming tact, our time's most articulate endorsement of environmental ambivalence. In an effort to synthesize the previous claims of this paper, I will conclude by recreating the lasting appeal and implicit dangers of Dubos' popular position. My intent is to analyze the implicit dangers of social philosophies which condone ambivalent responses to nature, rather than to provide a comprehensive reading of Dubos' impressive and informed philosophy.

René Dubos has grasped the limitations of the preservationist attitude toward nature. Dubos, because of his uninhibited commitment to an utterly humanized earth, feels the inadequacy of

environmental idealism with exceptional weight. He reminds us, in the first pages of The Wooing of Earth, that:

some of the landscapes that we most admire are the products of environmental degradation. The denuded islands of the Aegean Sea, the rocky shores of the Mediterranean basin, the semi-desertic areas of the American Southwest are regions that appeal to countless people from all social and ethnic groups, as well as professional ecologists. Yet these landscapes derive much of their color and sculptural beauty from deforestation and erosion, the two cardinal sins of ecology. The immense majority of people, furthermore, elect to live in places from which the wilderness has been eradicated and which have been profoundly transformed by human habitation. Orthodox ecological criteria are therefore not adequate to evaluate the quality of a particular environment for human life.[7]

However distasteful one might find Dubos' recurrent praise of landscapes modified by human action, no one can denounce the artful insistence of his book: humans have, since the beginning of our ascent, added beauty to nature through desolation and change. Dubos has written his book, as he notes in his preface, to create this more balanced view. He felt "the world's environmental crisis has been discussed to death and hardly needs further elaboration," and wanted to correct the one-sided warnings of the recent past with a colorful account of "the creative and appealing aspects of human interventions into nature." [8] The primary purpose of Dubos' book seems, at first, this stated and powerful reminder. Yet the danger of Dubos' book resides in its unexamined endorsement of ambivalence as the more balanced perspective.

If bringing the popular one-sided accounts of the environmental crisis into question is Dubos' exclusive purpose, the book is an astounding success, for he raises serious doubts about advocates of environmental idealism without once referring to these popular titles. The 1970s produced a number of these books, from Everyman's Guide to Ecological

Living to The Ecology Action Guide, each gaining impetus by the increasing problems of advanced industrialism, yet none addressing the inherent ambiguities in the human use of nature. Their excitability, evident in a ceaseless parading of emotion and ominous detail, seems, after Dubos, a mark of their incompleteness, a sign of their inability to achieve a sensible perspective on the problems of man's ambivalence toward nature. They appeared prophets of doom, betraying, at times, a firm aversion to the future; their fear of the present signaled a need to mask some of the unchangeable characteristics of the human species. Dubos' book refuses this temptation. The Wooing of Earth --like its many best-selling precursors--is a catalogue of man's violence to nature. Yet it brings the latter into question by asking why the writers of the 70s depended so heavily on a description of brutality without answering the important question: what is it, after all, about man that moves us to such brutality? The eight chapters of Dubos' book are built in the attempt to answer this question in the most reassuring fashion possible.

In assessing the manner in which Dubos' answer to this question achieves its credibility, one first has to admit that his response is thrilling. By the time one reaches his explicit endorsement of environmental ambivalence, one is quite won over by the timeliness of his tempered optimism. After a decade of alarmist titles on impending doom, many readers will be hard pressed to dislike Dubos' position. He speaks openly and affirmatively about proposed projects to dam the Congo River and to build a barrier across the Bering Strait, reminding his readers that "people have no choice but to transform the surface of the earth." After all, he notes, the Suez and Panama canals "also constituted great ecological risks when they were built." [9] Like Walt Whitman's proud acceptance of the proliferation of railroads, steamships, and cotton gins, Dubos' celebration of modern times, although tempered by occasional and informed despair, depends upon the belief that man's longing to inhabit the globe is legitimate, inevitable, and utterly human. It is no surprise, then, that Dubos' subsequent book is titled Celebrations of Life, and that in his recent published interviews he often resorts to a Whitmanesque faith in the marvelous adaptability of man in the face of apparent doom.

Despite the varying degrees of unease Dubos' faith creates in different individuals, this haunting fact remains. There is something profoundly appealing about Dubos' position--it could not have endured (as it has, in many forms, throughout human history) in the fact of many rivals, had it not been so attractive. One notes this again when Dubos explains why "to be human" means to humanize the globe:

Human settlements now exist at practically all latitudes, but human beings are biologically out of place in most of their natural settlements where they have made their homes. The reason for this lack of environmental fitness is that our species emerged in a subtropical climate where it acquired certain fundamental biological characteristics that it has retained ever since, whatever the natural conditions under which it now lives. In Arctic regions as well as in the tropics, *Homo sapiens* remain genetically best adapted to a certain type of semitropical savanna. We could not survive long even in the temperate zone if it were not for ability to use fire, build shelters, practice agriculture, and manufacture a great variety of artifacts Because of its unchangeable characteristics, human life implies the humanization of the earth.[10]

The attraction of such a pose is, of course, irresistible; one is ready to accept it as commonsensical before Dubos cites further evidence. It would be insane, or insensitive, to question such an obvious stance. The notion that all humans would manipulate their environment to recreate the same narrow range of temperatures that constitute human survival provides the lasting appeal of comforting rationalization.

Yet Dubos' explanation, for all its grandeur and tact, is, in the end, dangerously misleading. Its appeal consists in its identification of a supposedly irreversible and irresistible urge in human nature to humanize the globe. It is astonishing to see how little argument Dubos thought necessary to support

this, his central claim: his disclosure of innate human motives can be used to explain away whatever other reasons anyone might offer as factors behind our current crisis. It could be used to diminish significant differences of degree. The modern habits of synthetic substitutions, competitive advertising, conspicuous consumption, and planned obsolescence have little bearing on Dubos' account of the crisis: "people destroyed more of nature as the centuries went by, not because they had lost respect for it, but because the world population increased and because technological means of invention became more and more powerful." [11] Why not believe, then, that man's innate preference for conditions reminiscent of our genetic origins governs our current environmental crisis? Is this not the secret motive behind our ceaseless transformations of the earth? After all, "people have no choice but to transform the surface of the earth." It is the ease by which Dubos' position can be misunderstood and oversimplified that brings itself into question.

It is only in retrospect that one begins to feel something profoundly unnerving about Dubos' position. It is not that it makes hard policy decisions seem easy, nor that it steers us clear of politics and the peculiarly consumptive habits of modern cultures. Dubos' book may prove thrilling for many readers in the same way a first reading of Nietzsche or Freud proves exhilarating. To identify and describe a class interest, a sexual drive, or a will for power or domination, is to have identified the secret motive, the sole source of human misdeeds both in the past and forever in the future. This ability to annihilate distinctions of degree is part of its popular appeal, but not its chief danger. The real shortcoming of the book lies in Dubos' unwillingness to recognize the implications in endorsing a position of ambivalence toward nature. He writes in the final chapter:

Most of us are ambivalent about defining environmental quality. Our attitudes are governed more by habit than by logic In brief, we want to save both the wilderness and the environments that have been created by destroying the wilderness. Ambivalence toward nature is not peculiar to our civilization As I pointed out earlier, there are good

biological reasons for an ambivalent attitude toward the wilderness.[12]

If ambivalence towards the environment is based on "good biological reasons," and if the need to transform the earth is an "unchangeable" characteristic of human nature, then there isn't much we can do about developing a responsible environmental conscience. Philosophies based on ambivalence usually inspire indifference rather than the precise social planning required by long-term environmental problems.

This position of informed ambivalence can serve as a reassuring precondition for severe environmental desolation in the future. The danger of Dubos' book rests in the ease with which his ambivalence can be misused. Although Dubos suggests that the cultured individual would not misuse the realization of ambivalence, he provides no evidence in support of this. In fact, the intent of his position seems, at times, pacification, a deliberate cultivation of informed indifference. Rather than clarifying man's role in restoring or managing damaged ecosystems, his praise of the humanized earth avoids the troublesome side of the erosion and deforestation his book attempts to reconcile. His articulate portrayal of man-made scenery neglects the larger questions concerning the resolute need to correct man-made mistakes. In short, his belief in ambivalence, and the propriety of humanized things, testifies to the indirect nature of the problem. His approach helps us appreciate man-made achievements by accepting the man-made, whether it be rubber, plastic, chemical, or radioactive.

But these are only small parts of his larger disservice. It is, in short, his articulate endorsement of environmental ambivalence which deftly obscures the questions at hand. Throughout this book, one finds that Dubos frequently neglects the more threatening issues about the recovery of damaged ecosystems, in the name of innate ambivalence. We are "ambivalent about defining environmental quality," and there are "good biological reasons" for our ambivalence.[13] Rene Dubos' man would be a modern Hamlet, an articulate prince whose ambivalence conflicts with his best efforts to avenge the murderous injustices of his times.

None of this is meant to bring the sincerity of Rene Dubos' work into question, nor to cast doubt upon his distinguished service as a microbiologist. I have, instead, used his recent book to assess the peculiar appeal and insidious results behind a position of environmental ambivalence. By attributing to nature the qualities of a "resilient" goddess, legitimately "wooed" by humankind from a position of power, Dubos has projected the confidence of his own field of speciality onto the workings of nature at large. Dubos' work in the 30s and 40s acclaimed a certain indefatigable resilience[14] within the human body itself, a vitality of homeostasis which ceaselessly labors to keep the living human functionally ready, against terrible odds, for sensual experiences and the good life.

In The Wooing of Earth, however, Dubos inadvertently shifts the dominant image of his work from this paradigm of maintained human readiness to one of nature's dramatic rehabilitation: the image of nature is restored in its damaged and deteriorated state to a prior condition of abundance and resilience. The nature of The Wooing of Earth does not look very much like the nature presented by the media in the 1970s: it is a nature rich and ready to accept humanity's ambivalent and inefficient use of it. As Dubos' career has progressed, he has relied more firmly upon this confidence in nature's ongoing resilience. It rehabilitates his hope in humanity's future, and renders him one of our time's most articulate optimists. Although the human species has proved impressively resilient on its own terms, the natural environment may not necessarily prove to have the same homeostatic powers as her dominant species. This final act of mystifying the powers of nature, analyzed by the philosopher of science Alfred Whitehead as a "fallacy of misplaced concreteness," may prove the most misleading, if not lethal, of all.

ENDNOTES

[1] Once, after I had spent two classes attempting to explain the complex social forces which led Congress to amend the CZM Act in 1976, a student of mine said: "This build-up and then clean-up mentality doesn't make much sense to me. Why not

limit the build-up so that the clean-up is minor, if not minimal?" Inserting that this was the point from which Barry Commoner launched his political campaign, I asked her: "Yet how might we do this?" She answered in a brief but telling parable: "I grew up in a family of seven. Once or twice every week, I'd have to cook. This was fine. I enjoyed cooking, and it was great to have someone clean up after me. But the other days of the week, when my brothers cooked, they would make countless unnecessary dishes. Each item on the menu took them five or six dishes. It turned out to be a bad deal to have to clean up their mess most days of the week. Finally, I got us to agree: the cook must also clean up. You'd be surprised how rapidly they began to cook meals with half the dishes!"

[2] Leo Marx has studied this problem in great detail. See: "Pastoral Ideals and City Troubles" in the Smithsonian Institution's 1968 edition of essays, under the title The Fitness of Man's Environment (New York: Harper & Row, 1968), pp. 121-144. Professor Marx has devoted much of his career to the study of environmental ambivalence. In addition to his The Machine in the Garden: Technology and the Pastoral Ideal in America (New York: Oxford University Press, 1964), see: "American Institutions and Ecological Ideals" in Science, 27 November 1970, Vol. 171, pp. 945-952.

[3] For an impressive philosophical investigation into the varieties of environmental ambivalence, see: Yi-Fu Tuan's "Ambiguity in Attitudes Toward the Environment," in Annals of the Association of American Geographers (Vol. 63, No. 4, December 1973), pp. 411-423. Tuan describes three situations under which ambiguous responses may emerge: 1) fluctuations in mood and perception in the experience of a complex environment over an extended period of time; 2) the discrepancy between the mind's penchant for symmetry and life's bias in favor of movement; and 3) feelings and primitive concepts which contain the seeds of their converse. Tuan concludes by claiming ambiguous responses to the environment must be recognized, their general characteristics must be described, and a measurement technique must be developed: "Geographers should feel free to explore this insight (phenomenon of ambivalence) and bring it to bear on the problems of perception, attitude, value, judgment and behavior that are the

quintessentially human horizons of our field."

[4] For an elaborate analysis of Whitman's role in American environmental reform, see: Cecelia Tichi's New World, New Earth (New Haven, Conn.: Yale University Press, 1979). Although Tichi ignores the hard line of land speculators, resource businessmen, and writers who appropriated Whitman's words with devastatingly materialistic intent, her book is useful in illustrating the long foreground to Whitman's career of environmental reform. For Tichi's reading of "Song of the Redwood Tree," see pages 200-210.

[5] "Song of the Redwood Tree" can be found in Whitman's Leaves of Grass, Comprehensive Reader's Edition (New York: New York University Press, 1965), pp. 206-210, edited by Harold W. Blodgett and Sculley Bradley.

[6] I echo Albert Brisbane's The Social Destiny of Man here. Brisbane, a popular pamphlet writer during Whitman's day, popularized the estimate of nature which found American lands superabundant and peculiarly apt for human use. In this astonishing tract advocating severe environmental reform as the social destiny of man, Brisbane wrote: "The terrestrial Destiny of Man is to oversee the globe, which is a vast domain confided to his care. This important trust supposes a general and perfect cultivation of its surface, the fertilizing of its deserts, the draining of its swamps and morasses, the covering of its mountains with forests, the regulating of its streams--in short, the adorning and embellishing of it by every means in his strength and intelligence." I excerpt the above quote from Tichi's text, page 219.

[7] René Dubos, The Wooing of Earth (New York: Charles Scribner's Sons, 1980), p. 1.

[8] Ibid., pp. xiv and xiii.

[9] Ibid., pp. 150 and 151.

[10] Ibid., pp. 57 and 60.

[11] Ibid., p. 72. Although Dubos often qualifies this point (such as on p. 70 in this particular passage), his qualifiers do not rectify the

obliteration of degree inherent in his general acceptance of ambivalence.

[12] Ibid, pp. 128, 129, and 131. I assemble this collage quote to isolate the otherwise hidden characteristics of Dubos' ambivalence. I am not claiming Dubos' exclusive purpose to be the endorsement of ambivalence. I find his book to be dangerous precisely because it advocates ambivalence without examining its consequences. Dubos has allowed a stray observation to become the central premise of his philosophy, thereby opening up his work to misunderstanding and misuse.

[13] Ibid, pp. 128 and 68.

[14] My criticism of Dubos' book has been limited to his image of man, without much reference to the accuracy of his image of nature. The three scientific studies on the resilience of nature cited by Dubos prove far more tentative than Dubos' larger claims. The first reference comes from the anthology, Recovery and Restoration of Damaged Ecosystems, published in 1977; each article in it assumes a more exacting and complicated conception of "resilience" than practiced by Dubos throughout his work. According to John Cairns, the editor of the anthology, any analysis of an ecosystem's vulnerability must take into account not only its "resiliency," defined as "the number of times a system can recover after displacement," but also the following:

- (A) vulnerability to irreversible damage,
- (B) degree of elasticity or the ability to recover from damage, (C) inertia, or the ability to resist displacement of structural and functional characteristics.

Cairns proceeds to refine his definition of these factors by relating each to the far more controversial and important parameters of toxicity and carcinogenicity. Dubos' position, lacking not only the provisional tone of his references but also much of their complexity and sophistication, reads as follows:

Whether or not one agrees with the magnitude of

Dubos' faith in nature's recoverability, one should recognize the mystifying implications of his analogy. Homeostasis usually refers to the maintenance, by internal mechanisms and feedback, of a relative constancy within organisms, not ecosystems. Dubos, on the other hand, assigns the same powers of recovery known to be effective in the human body to nature at large. Throughout his career, Dubos' position has been based on the premise that the characteristic of superabundance (defined as the belief that no degree of human action can disturb the whole of nature beyond repair and equilibrium) is the dominant feature of nature. Although a belief in superabundance may be an essential ingredient behind the human preference for expansionary economies, it hardly fits a time when many consider nature fragile, limited, and recalcitrant to the increasing advances of industrial man.

COMMENT: ENVIRONMENTAL ATTITUDES IN PREINDUSTRIAL AND INDUSTRIAL CIVILIZATIONS

Richard I. Frank
University of California, Irvine

In the first article Professor Hughes has described for us the ancient tradition, still remembered by Greeks and Romans of the classical age, which he calls the chthonian tradition. According to this cluster of ideas humanity was a partner with earth, not its master and possessor, and the emphasis was on partnership and stewardship, rather than domination and exploitation.

Chthonian, incidentally, comes from χθων, χθωνος --which meant "earth," like Gaia. It is an interesting fact that Greek had two synonyms for earth, as did Latin: but we need not pause on this philological point right now.

What is important is the new significance given many familiar texts. Professor Hughes has quoted at length from Homer, Plato, and Cicero. I shall here note briefly another:

Suetonius tells us that once Julius Caesar dreamt that he had had intercourse with his mother. He was much disturbed, but was assured by wise friends that this was merely symbolic,

that it meant he would
possess the whole earth,
the common mother of us all.

This is, I think, a remarkable example of the fusion of two traditions, the chthonian and the one which displaced it and led to what Professor Hughes calls the present Age of the Great Recessional. But what shall we call this new tradition?--Since Professor Hughes does not name it, I shall suggest one: the iron tradition. When did this new tradition gain dominance? What was it? What were its results?

For answers to these questions we can do no better than to go to Val Camonica in Northern Italy, a wide, deep valley almost fifty miles wide and situated just northeast of Brescia. The prehistoric inhabitants of the valley have left a great mass of

rock carvings which constitute a priceless record of their civilization over a period of 2100 years, extending from the Neolithic Age to the Roman conquest. In 1956 Emmanuel Anati, an Israeli archeologist studying in France, began cataloging, studying, and interpreting these inscriptions--over 30,000 in number, and eight years later he published a book which offers a splendid synthesis--entitled simply Camonia Valley (London: Jonathan Cape, 1964).

For our purpose, one element of Anati's work is fundamental: the sharp, absolute break around 1,000 B.C.

It is only toward the end of the Bronze Age . . . that the first battle scenes appear. this subject had never interested the Camunian artists until then; but henceforth it becomes very important--helmeted warriors bearing shields, spears, or lances occur with increasing frequency. At about the same time we begin to see battle scenes showing two warriors in combat. (p. 183)

In the Camonica Valley the combat of gladiators appeared towards the tenth century B.C. and took root very quickly. (p. 187)

All this is connected with the arrival of iron technology, and the dominance of war and hero worship. There was a profound shift in the religious ideas and also--we must presume--the practice of Camunian people. Anati concludes:

The hero cult and the bloody rites that accompanied it threw Camunian thoughts and beliefs into turmoil at the dawn of the Iron Age. In the Bronze Age this cult was still unknown . . . ; the carvings of that period give abundant testimony of a reverence towards weapons and tools which lent strength and glory to men. The veneration that originally surrounded such implements then turned to heroes. This veritable psychological revolution occurred between the tenth and the eighth centuries.

Previously, the implement itself embodied power and strength; man was only an instrument, a means employed by the gods to maneuver it The implement [in the Iron Age] was now a means in the hands of the man-god to master the world, and it is he who will henceforth wield the supernatural powers with which the weapon was once endowed. (p. 194)

This shift--this "veritable psychological revolution"--is connected with Dumegil's Indo-European ideology. That is too large a topic to take up here--but let me note one thing--the Indic distinction between the three classes--rulers, warriors, and workers--in which workers are clearly the largest of all. Corresponding to this is the three-fold division of knowledge:

darma

karma

arta--in which arta, the knowledge of the peasant, is inferior to the knowledge of the ruler (darma) and the warrior (karma).

So the new ethos--the iron tradition--gives precedence to rulers, warriors, and heroes. The earth goddess gives way to the sky gods--Zeus, Mars, Woden, Thor.

Throughout the Iron Age, which still continues, the central concern of mankind has been warfare and domination. The earth has been subjugated and used to serve these ends, with consequent damage.

And so it is no coincidence that now, in what Professor Hughes calls the Great Recessional, one of the species most threatened is man himself. With our new-found nuclear technology we may yet succeed in killing ourselves off. It is time for the Iron Age to end.

Now let us turn to Professor Piasecki's article. He has given us a very perceptive analysis of Rene Dubos' work, placing him securely within an important--perhaps dominant--trend of modern

through. Professor Piasecki even calls it "a permanent dye." Professor Piasecki has suggested that "ambivalence" is a key to understanding contemporary reactions to environmental problems. I must say, with all respect, that the term helps us to evade, rather than further, analysis. Ambivalence is a term from literary criticism, and has been used most successfully to deal with poetry. But environmental problems are connected with politics, not poetry; let us be political, not poetic. Especially in dealing with a phenomenon such as Dubos. Dubos has argued--quite steadily and quite unflinchingly--that humanity's natural destiny is to possess the earth and exploit it to the fullest degree possible. If this destroys wilderness, that suits "the immense majority of people." If it creates "environmental degradation," such as the denuded islands of the Aegean, "countless people" will admire them and they will become tourist attractions and resorts. In other words--what exists now has always existed, and always will exist, and this is right and proper because it corresponds to the logic and preferences dictated by human nature.

What Dubos has done is produce a classic example of ideology--a system of premises and arguments designed to justify existing institutions and relations. On the Gramsci Scale of ideological purity it deserves a perfect 10.

Conclusion

And this brings me to the connection between these two papers--a connection which seems providential. The connection is in a crucial element of Dubos' ideology--the argument that things have always been as they are. We owe to Professor Hughes the knowledge and insight that things have not been as they are now. There was one something different--a chthonian tradition which viewed earth as a mother, a partner, a friend--not an object, a treasure house of goodies to be pillaged at will.

By now the Iron Age has lasted 3,000 years. Its ethos has become a menace. History offers a reminder that things were once different, that there was another ethos which humanity followed for millennia, that ruthless and imprudent exploitation need not be a permanent dye. In short--Professor Hughes has

given a crushing rebuttal of Dubos' ideology, and an insight into the causes of the ambivalence Professor Piasecki describes.

There is, then, deeper significance in understanding the history of man's view of the environment. To recapture the past, to know that humanity once pursued a different ethos, is to know that the world was once different, and might be so again. It is to gain an alternative, a new vision. That is a great achievement, for it is written

where there is no vision,
the people perish.

CLIMATE AND HISTORY:THE STATE OF THE FIELD

Robert H. Claxton
West Georgia College

I. INTRODUCTION: Importance of the Climate Factor in History

Congress passed the National Climate Program Act in 1978 to organize better the collection and distribution of weather data.[1] The findings of Congress reveal some aspects of the comprehensive nature of climate's influence upon man as either a resource or a hazard:

(1) Weather and climate change affect food production, energy use, land use, water resources and other factors vital to national security and human welfare.

(2) An ability to anticipate natural and man-induced changes in climate would contribute to the soundness of policy decisions in the public and private sectors.

(3) Significant improvements in the ability to forecast climate on an intermediate and long-term basis are possible.

(4) Information regarding climate is not being fully disseminated or used, and Federal efforts have given insufficient attention to assessing and applying this information.

(5) Climate fluctuation and change occur on a global basis, and deficiencies exist in the system for monitoring global climate changes. International cooperation for the purpose of sharing the benefits and costs of a global effort to understand climate is essential.

(6) The United States lacks a well-defined and coordinated program in climate-related research, monitoring, assessment of effects, and information

Now, as in the past, climatic factors are important to commercial and subsistence farmers, millers (for either hydroelectric or wind power), veterinarians (especially regarding dairy cows), recreation directors, transport managers (whether frozen canals or fogged-in airports), builders (both in determining when and how to erect structures), fuel suppliers (either to heat or to cool), forest technicians (who want to control fires), urban planners (who worry about water supply), public health officials (who find certain conditions conducive to the greater incidence of particular diseases), military officers (recalling Napoleon's problems with snow in Russia and rain at Waterloo), insurance companies (three-fourths of the annual costs of natural hazards are due to floods or windstorms or droughts), or politicians (warm and sunny weather brings out the voters).

Definition of Variability

There are definite standard gradations in the expression "climatic variability." A "major change" in climate refers to an event of the magnitude of the beginning or end of an ice age, while a "minor change" persists over a century such as the much-debated deterioration during the "Little Ice Age" in early modern European history. In addition, there are weather "trends" of ten to fifty years like the general warming from 1880 to 1940 in the northern hemisphere. Finally, there are a variety of short-term weather "episodes" lasting days or even hours or less but which have had disastrous impact upon economic activity. These include hurricanes, floods, lightning, tornadoes, hail, windstorms, frost and freezing, urban snow congestion, snow avalanches, fog, and drought. Historians generally have not paid enough attention to the short-term episodes and, indeed, most have been skeptical or oblivious of the trends and changes. For purposes of clarification, "history of meteorology" herein describes the growth of technical understanding of weather phenomena, moving from collection of data to commenting on it to explaining it. "Weather history" or "meteorological history" means the study of episodes while "climate history" deals with trends and changes.

Development of the idea

The idea that weather is a factor in human history is not new. Its evolution, in fact, could be the subject of a study by itself. Even in ancient times, writers commented on the influence of weather on people. Spanish chronicles in colonial Latin America described the general climatic conditions of places they discovered. In the middle of the nineteenth century, some writers added a new dimension to discussions of weather. This was the notion of statistically observable fluctuations and even periodicity in the occurrence of certain extremes. Based upon his experiences in Australia, William Stanley Jevons began to tie economic downturns to poor harvests which were in turn attributed to bad weather which, he theorized, sunspot cycles initiated. At the turn of the century, the notion of increasing dessication was popular and Ellsworth Huntington concluded that the great migrations of Asian peoples were due to unusual aridity.[3] Huntington developed the idea of large scale climatic fluctuations in historic times and devoted a lifetime to finding often simplistic examples of the existence of climatic factors in human affairs. In 1947, C.E.P. Brooks published a synthesis of earlier paleoclimatological studies with additional speculation about causation in history. Four years later, a short-lived Journal of Human Ecology ran several weather-and-history thematic articles. Meanwhile, the American Academy of Arts and Sciences held a pioneering conference on climatic change in May, 1952. Five years later, the International Journal of Biometeorology began publication.

More recently, several books have again popularized the theme of climatic variability, in both the past and the future, with various purposes in mind.[4] Among the authors are Robert Claiborne, William Gates and John Imbrie, John Gribbin, Stephen Schneider, Reid Bryson, Mikhail Budyko, A. Barrie Pittock, Crispin Tickell, and Stephen Rosen. The ideas of these writers have encouraged some historians and investigators in other fields to emphasize the importance of understanding climate much more fully.

A sense of urgency

There is a certain sense of urgency to the

investigation of any relationship between climate and people. Generally, during the first half of this century, the climate of the United States seemed stable. On the other hand, since the 1960s, those "average" climatic conditions have tended to become much more variable. This apparent reverting to a greater frequency of extremes may converge with other ominous trends. Global population exceeds four billion and it is growing. The number of refugees increases but there is only the limited possibility of migration across international borders. Meanwhile, all the world's people are becoming more economically interdependent and demanding more from the weather-dependent food, fiber, and energy-producing industries. Technologically marginal nations today would be especially vulnerable in the event of notable changes in weather patterns just as people were in agrarian medieval Europe. Significant and long-lasting climatic variability has occurred in the past and theoretically could occur again.

Gatherings of Investigators

Various interdisciplinary meetings have brought together researchers from many nations to facilitate more extensive study.[5] Monash University hosted a conference in 1975 to explore climatic variability from a southern hemisphere perspective. Early in 1979, the World Meteorological Organization sponsored "a conference of experts on climate and mankind" in Geneva. Later that year, the Journal of Interdisciplinary History conducted a climate and history workshop at Harvard. Still later, in 1979, the Climate Research Unit of the University of East Anglia organized an international conference under the auspices of several sponsors. Likewise, the American Meteorological Society held a conference on climatic impacts and societal response in Milwaukee in 1980, followed by a conference on climatic variation in San Diego in 1981.

Why Historians Should Become Involved

In the process of reconstructing past episodes and trends, as revealed in documents or other sources, historians can make important contributions to physical science as well as other social sciences. They can expand the understanding of what "normal" weather is by looking at centuries rather than at the

conventional thirty-year averages. Ultimately, the reconstructed record of the past may aid in predicting future weather patterns. At the same time, by examining the impact of variability upon human institutions in the past, historians can assist in policy formation regarding immediate emergency relief and the more elusive long-term effects. The record of response to past weather-based disasters could provide scenarios for future crisis management.

Historians may also help themselves as they study past weather.[6] Such a study for one particular region builds an extensive familiarity with local sources and it also provides one integrative, and perhaps less biased, theme for the history of the place under investigation. Weather history can also be one unifying theme in world history. Besides this, the degree to which sophisticated weather data instruments were used in other times and places can be one indicator of modernity.

Several journals already exist which publish articles on the reconstruction of past weather, instances of variability, physical explanations for climatic phenomena, possible relationships between climatic factors and human life, and research techniques for all of these themes. These serials comprise Table 1.

Table 1
Climate and History Serials

Bulletin of the American Meteorological Society
45 Beacon Street
Boston, MA 02108

Chinook
P.O. Box 427
Brampton, Ontario, Canada L6V 2L4

Climate Monitor
Climatic Research Unit
University of East Anglia
Norwich, England NR 4 7TJ

Climatic Change
Lincoln Building

160 Old Derby Road
Hingham, MA 02043

Disasters: The International Journal of Disaster
Studies and Practice
c/o Journals Division/ Pergamon
Press

Maxwell House
Fairview Park
Elmsford, NY 10523

Environmental Review

J. Donald Hughes, Editor
History Department
University of Denver
Denver, Colorado

Jet Steam

60 Talfourd Avenue
Reading, England RG6 2BP

Journal of Climatology

c/o John Wiley & Sons
Baffins Lane
Chichester, Sussex, England

Mariners' Weather Log

National Oceanographic Data Center
Room 400, Page Building 1
Washington, D.C. 20235

Weather

Royal Meteorological Society
Greenville Place
Bracknell, England RG 12 1 BX

Weatherwise

Suite 504
400 Albemarle St., S.W.
Washington, D. C. 20016

II. PHASE I: RECONSTRUCTING PAST CLIMATE AND WEATHER

Layers in Nature

In a variety of ways, the natural environment produces annual accumulations of what physical scientists call "proxy data." These layers of matter

can be subjected to chemical analysis which will reveal indirect information about past climatic conditions. Such layers in nature include the shells of marine organisms deposited in the ocean floor, speleothems (formations on stalagmites in caves), glacial ice, sediments which contain fossilized pollen, or evidence of fires, and the annual growth of tree rings.[7] Although the techniques used to gain climatic information from these sources may be unfamiliar to most professional historians, both social and physical scientists are discovering that their respective research methods can complement each other. The findings from one general approach will often verify findings from the other.

Oxygen isotopes and history

Oxygen isotope analysis is central to the study of samples taken from each layer. Stated simply, the colder it was at a given time, the less the quantity of O^{18} relative to O^{16} there will be in the sample. A. T. Wilson (University of Waikato, New Zealand) is studying stratigraphic sequences of cave calcite to determine the nature of the atmosphere at the time each deposit was laid down.[8] His research is similar to that of Harold Urey and Cesare Emiliani who derived past oceanic temperatures from examination of the distribution of oxygen isotopes between the calcium carbonate laid down on the shells of marine organisms (foraminifera) and the water in which the organisms lived.

While cores taken from the ocean floor can give a general record of temperatures over thousands of years of prehistoric time, Wilson's technique may support more precise historical study. Carbon dioxide given off from plant roots dissolves up limestone ($CaCO_2$) to form calcium bicarbonate which, dissolved in ground water, enters the cave. Carbon dioxide is given off in reaction as the water flows over the surface of the speleothem. The distribution between the oxygen isotopes of the remaining calcite and the ground water records the temperature of the cave. This will not be the same as the temperature above ground, but a time series will nonetheless reveal trends.

Wilson, in fact, has found that the past temperature of New Zealand included a warm period as in medieval Europe and a colder period as in the

"Little Ice Age." He regards both the Polynesian and Viking exploratory voyages, simultaneously beginning in the warm period and abruptly halting with the onset of colder conditions, as perhaps being due to significantly increased windiness in both the South Pacific and North Atlantic. Wilson also suggests that the evident great increase in carbon dioxide in the atmosphere after 1870 was due to the unprecedented expansion of agricultural frontiers throughout the world.[9] More farms meant fewer trees to absorb this gas. As explained below, an increase in carbon dioxide should lead to a warming which did indeed occur.

A similar study of glacial ice layers can yield evidence from which the direction of climatic change can be inferred.[10] Small glaciers are found in many different places. They are therefore suitable for assessing the nature of global rather than local fluctuations. As historical documents show, glaciers anywhere will expand or retreat in response to general change in temperature. Again, the research of the physical and social scientist will overlap. Stephen Porter (University of Washington) has found that mountain glacier analysis can be complex and lack continuity over time since non-climatic factors intervene. Nevertheless, ice cores from polar glaciers contain recognizable annual layers that permit precise dating and isotopic analysis. The Camp Century core from Greenland provides such a record of annual fluctuations for several hundred years.

Pollen from the past

H.J.B. Birks (Cambridge) and Thompson Webb III (Brown University) have reconstructed past climatic conditions through palynology, the study of layers of pollen remains in lakes and bogs.[11] This type of investigation shows when plants which thrive in warm places once grew in locations now much colder or when fluctuations in temperature trends occurred in the past in one locale. Approximate past summer temperatures, amount of precipitation, and the length of growing seasons can be deduced through comparing certain species and quantities of fossilized pollen with the conditions necessary for the contemporary distribution of that plant life. This approach assumes that climate is the principal cause of variations in pollen found rather than other factors.

Those other factors could include human intrusion, soil conditions, and competitive plant migration. Palynology further assumes that the relationship between climatic conditions and vegetation has remained constant. Probably the retreat of a species from an area is more clearly climatically significant than the arrival of a species. Some of the difficulties in this approach are overcome by the study of several species in one locale and by verifying the palynological findings with data from other kinds of layers. Pollen data, like that from the Kirchner Marsh in Minnesota, have provided information for up to 14,000 years. As is true of other layers research, a sample core is taken which contains levels of pollen-bearing sediment which may be dated by radiocarbon methods. And, as is true of other indicators, the North American pollen record confirms a "Little Ice Age" temperature relatively lower than twentieth century averages.

Significant Sediment

Core samples of other sediment layers reveal past climate variability, too. Varves, for example, are annual summer and winter deposits with structure that enables each to be dated to the exact year. The thickness often depends on rainfall.[12] In addition, forestry offers another example. Cores from Georgia's Okefenokee Swamp indicate drought approximately every twenty-five years. This conclusion comes from the periodic annual layers containing burned peat and charcoal deposits due to lightning initiated fires in the dried swamp.[13]

Tales Tree Rings Tell

Finally, dendrochronologists study the ringed layers formed by the annual growth of trees. Harold C. Fritts (University of Arizona) is an authority on this type of research.[14] Evidence from ring width variations in conifer growth can be especially useful to historians because it can be dated to the exact year and often the season. Data are increasingly available from more countries in the temperate zone. The Arizona researchers have collected samples from western North America; J. R. Pilcher and M.G.L. Baillie (Queen's University, Belfast) have begun a dendroclimatic interpretation of the Irish Sea basin. The Federal Institute of Forestry Research has reconstructed past Swiss climate from the tree ring

record. Dendrochronologists are interested in the size, structure, and chemical composition of tree rings. Each ring must be identified by year and the relatively smaller growth in older trees standardized with non-climatic wider rings from earlier in the tree's life. The correlation between ring size and temperature or precipitation depends upon the species, the season of the year, and the site in which a sample grows. Many samples are taken and rings are cross dated among those samples to assure that the information is repeated among all of them. Known instrument-based meteorological data can be used to interpret twentieth century rings and this interpretation can be applied for pre-instrument earlier rings as far back as 1520 in the United States. Thin rings mean drought years. Again, evidence from other kinds of layers as well as historical documents further verifies dendrochronological findings.

Summary and Evaluation

The climatic record layers in nature differ as to the time span they encompass and the precision to which specific data can be assigned to a point in time. Ocean cores cover thousands of years and trends revealed therein start or end give or take hundreds of years. Pollen series involve less time and dating is more in focus, give or take fifty to a hundred years. Speleothems and some ice layers or sediments can be assigned specific years like tree rings. Unlike dendrochronology, glacial sequences are not always continuous. Tree rings can also indicate weather for past growing seasons but historic documents can often describe weather for all seasons in great detail.

III. PHASE I: RECONSTRUCTING PAST WEATHER: THE HUMAN RECORD

What to Look For

The modern human record, of course, includes precise data from instruments. The invention of certain instruments like the hygrometer (to measure humidity) and the anemometer (to measure wind) are attributed to Leonardo da Vinci, with obvious improvements over the years. Galileo Galilei designed a thermometer in 1592; Evangelista Toricelli, a barometer, in 1644; Christopher Wren, a rain gauge, 1662. Interestingly, the deterioration

in climatic conditions during the "Little Ice Age" seemed to challenge inventive minds to learn more about the weather of their time. Early instruments to measure evaporation and solar radiation were products of the mid-nineteenth century. The historian who seeks to reconstruct past weather episodes and trends, then, is looking for data about aridity, wind velocity and direction, temperature, atmospheric pressure, precipitation, and amount of cloud cover. Unfortunately, the earlier use of instruments was not universal, nor was it a standardized approach where it did happen. Helmut Landsberg (University of Maryland), however, has found numerous documentary sources for western Europe which compensate for these problems. As historians learn to identify climatically sensitive literary data that people in Europe and elsewhere have left behind, they will build an important bridge between the layers in nature, discussed above, and the twentieth century instrumental record.

Evidence from Archaeology and Anthropology

Historians may, first, want to borrow some ideas from archaeologists who study the human past which occurred before writing developed.[15] Indirect climatic evidence should be apparent in more technologically primitive cultures which had few options when they reacted to variability. For example, Takeo Yamamoto (Tokuyama University, Tokyo) believes that the absence of Chinese goods in Japanese Yayoi graves in the second century of the Christian era can be attributed to climatic deterioration which rendered trade difficult. Likewise, an optimal period around A.D. 400 may have contributed to the renewed cultural prosperity of the Kofun Age. Robert McGhee (National Museum of Man, Ottawa) finds evidence of variability in Arctic Canada: the use of large skin boats for whaling in times past indicates that oceans now filled with ice were once open water. The diverse bones of hunted animals suggest wildlife migrations due to variability on land. Barbara Bell (Harvard-Smithsonian Center for Astrophysics) has reconstructed ancient Egyptian weather from wall inscriptions. Likewise, E. C. Baity (Solana Beach, California) is seeking to tie oral traditions of weather disasters to tangible evidence for cultural discontinuity. Y. Waisel (Tel-Aviv University) theorizes that colder and more humid conditions

prevailed in late bronze age Israel than was subsequently true, based on changes in common wood species for building.

To these examples might be added such archaeological evidence of climatic variability as structural remains at variance with modern water levels, Saharan pictures of animals now found in moist regions, changing well usage, or a decrease in the average size of corn cobs. Historians will also see notable changes in clothing or architectural styles implying differing weather trends.

Direct Archival Materials, With Examples

Similarly, historians can locate weather data within the written record, even when such information is not apparent at first.[16] Conventional book indexes rarely cite the references necessary for weather reconstruction. Nevertheless, many investigators with innovative techniques have already used an interesting assortment of documents. Travelers, particularly diplomatic representatives and missionaries, along with physicians, often kept weather diaries which sometimes included amateur instrument observations. Less important people who kept diaries may have written about weather for lack of anything else to do. Local histories often include mention of exceptional weather events. More deeply religious cultures recorded times prayers were offered for deliverance from weather hazards. Beyond these more obvious sources, researchers attempting to reconstruct past weather can consult secular or monastic chronicles, personal accounts of military campaigns, ships' logs, the archives of trading companies, business records for commercial agriculture, city council meeting minutes, regional reports to central governments, petitions for tax exemptions, and early periodicals which might summarize conditions during key growing months in lieu of giving statistics.

Numerous specific examples of successful research are available. A. T. Battagel and J. M. Grove (Girton College, Cambridge) have found evidence of weather-based economic deterioration in eighteenth century Norway within tax relief records. Astrid Ogilvie (University of East Anglia) relied on Icelandic reports to the Danish crown. H. E. Hallam (University of Western Australia) reconstructed weather patterns for East Anglia, c. A.D. 1250-1350,

by examining extant manorial account rolls, particularly crop yield ratios and harvest dates. In a parallel investigation, Derek Stern (University of East Anglia) has explored seeding rates as reported in the records of lands owned by Westminster Abbey. A. Mackay (University of Edinburgh) compared evidence in cathedral records of good and bad harvests with dates of religious processions to assuage drought to reestablish past Castilian weather. Understanding that the occurrence of locust plagues follow the ecological stimuli of certain temperature and rainfall patterns, M. Barcelo (Universidad Autonoma de Barcelona) has inferred Spanish patterns for the sixth and seventh centuries from insect infestations.

Two studies have been much more extensive.[17] Christian Pfister (Geographisches Institut der Universitat Bern) has determined annual May and June temperatures from Switzerland from the early seventeenth century by consulting tithe auction dates. This is similar to the pioneering research of Emmanuel LeRoy Ladurie (College de France) who prepared a time series of grape harvests from the fifteenth to nineteenth centuries; phenological evidence (maturation dates) form the basis of his reconstruction of past French summer temperatures. Many of these techniques could be applied to other, although not necessarily all, places.

Since Europeans had the most elaborate instruments earlier than other people with which to record climatic variability, the most extensive reconstruction efforts have gone on there, and in the United States. Nevertheless, certain investigators have undertaken reconstruction research elsewhere.[18] These include: Pao-Kuan Wang (China), H. Arakawa (Japan), Sharon Nicholson (Africa), C. Burrows (New Zealand), Robert McAfee (Australia), and Robert Claxton (Latin America).

Criteria of "Normality"

Anyone who is trying to reconstruct past weather must first understand what an optimal or "normal" weather year should be for a regular growing cycle in the locale under investigation. In seeking to verify apparently standard patterns, the investigator will discover episode anomalies in the process of compiling a year by year time series which can also

reveal trends. The investigator must also be concerned with the frequency, intensity, duration, and extent of each episode under study. Historians who reconstruct past weather will look at facts generally overlooked before. Among some additional specifics to be compared for many years are: the number of days of snow in each winter, the amount of daily snowfall, dates of first frosts or the onset of spring, number of days of clear skies or rain in a given month, the incidence of forest or grassland fires which indicate drought, and pluvial registers in lake level changes or river overflows. The first step in this research is locating weather data; the second step is interpretation and that is filled with problems.

Evaluating Evidence Found in Documents

Historians who reconstruct weather need to ask several questions as they sift through evidence. Is the report complete and accurate? Are modern (rather than old calendar) dates used? Did a report exaggerate a weather-based disaster to hide a non-meteorological cause of problems? Is there a "band wagon" effect? (In other words, does one report of bad weather encourage more of the same without justification?) What did writers mean when they used particular nouns like "haze" or "autumn" or modifiers like "excessive"? Did the author's personal discomforts or literary style correctly reflect intensity of conditions?

There are also certain traps to avoid. How extensive was the observer's acquaintance with the locale described? This writer recalls a relative's visits to Georgia in three different years. Coincidentally, three different weather anomalies occurred each time: record-breaking rapidity and distance of barometer fall, late season snowfall, and record-breaking heat. If my relative keeps a diary, it reveals Georgia as a place of harsh weather extremes, a totally unwarranted conclusion. Weather patterns do seem cyclical, but hardly with simplistic predictability. There may be both weather and non-weather causes for the same consequence. Did low farm productivity result from heavier rains or from simultaneous political unrest? Annual averages or totals may obscure the fact that the opposite from the apparent is true. The mean temperature for 1950 in one place may be "normal" until it is found to

include unusually warm winter months and a relatively cooler summer; "average" rainfall for June is not "normal" if it falls entirely during the first ten days only. Anomalies receive more attention which may make them seem more extreme than they really were. In some places, there may be a proliferation of data, even trivia about weather. On the other hand, in African and Latin American areas, there is a paucity of long term and continuous records. In either case, the documents may be widely scattered. Meteorological and political areas are not necessarily congruent. Obviously in a large nation, some people can enjoy a mild winter while others suffer from extremes. A complete weather reconstruction with an analysis of its impact could require the skills of paleography, meteorology, agronomy, demography, and political science as well as historical investigation itself.

Confronting Research Problems

The experience of various researchers offers suggestions for meeting the challenge of such obstacles. Historians themselves could keep weather diaries for several months, first, to contribute non-station data and, second, to gain insight into the way earlier records under study might have been compiled. Historians should select data from writers deemed best by reason of their motives and training. They should give priority to eye-witness accounts and indisputable physical evidence. A lower stream flow or lake level is better indication of drought than literary impressions. Two or more independent witnesses should agree. Reports from one administrative unit should be parallel with those of adjacent districts. Natural layers and documents should corroborate each other. References to increases in one direction should accompany indications of decreases in the opposite. Researchers ought to think in terms of century-long time series of particular seasons or months, like "comparative winters." Focusing upon the growing months or harvest time can be a research short-cut. Generally, the most successful research is being done by interdisciplinary teams.

One fundamental research goal is the ability to translate literary data into statistics and to make statistics readily comprehensible in standard descriptive terms.[19] One device to reach this goal

is making a content analysis of the frequency of certain weather terms in diaries for one place and time. Another is a practice of having more than one researcher examine the same source and assign numerical values to each descriptive phrase. Average values cancel personal values as readers think in terms of degrees from clear to overcast skies or from breezes to a hurricane or from a mist to a cloudburst. Sometimes instrument records are available to verify at least part of a diary and to make a judgment about the rest. Looking at the reverse procedure (statistical to literary mode), in the case of relative moisture excess or deficiency, there is a standard (Palmer Method) numerical definition of "extreme," "moderate," or "slight" drought and shades of differences in the opposite direction. Related to this basic goal of quantification is the desirability of creating synoptic weather maps for pre-instrument days when adequate data can be gathered. J. A. Kington (University of East Anglia) is preparing such maps for significant dates in European history.

IV. PHASE II: EXPLAINING VARIABILITY

Apparent Contemporary Trends

In the 1970s, science fiction film-makers anticipated scientific controversy in their exaggerated projecting of future climatic catastrophes.[20] In The Man Who Fell To Earth, the audience learns of another planet devastated by global drought. Heart, in "The Dog and the Butterfly," recorded the lament that "[t]he earth's getting colder/ we're all growing older" about the same time Quintet depicted an ice calamity on this planet, presumable within the next century. On the other hand, Soylent Green offered movie goers the possibility of a future New York, warmed by a carbon dioxide greenhouse. H. F. Diaz and R. Quayle (National Climatic Center/Asheville) have indeed found that over the past quarter century many sections of the United States have experienced cooling. Most of this cooling, however, has occurred in the East. Likewise, precipitation increases have been occurring, but mainly in the East. In 1973, Walter Orr Roberts (Aspen Institute/Boulder) identified a twenty-two year periodicity in the drought record for the high plains: 1823, 1843, 1868, 1890, 1913, 1934, and 1954. He correctly

projected another between 1974 and 1978. Beyond the usual realm of historically producing evidence of climatic variability, there is research into the fundamental causes of such changes or trends or episodes.

There are a number of possible explanations for climatic variability, all subject to much debate. Most leave man at the mercy of a mechanistic universe while a few see people able to make some determined and successful effort to affect, or not to affect, weather. Among the explanatory theories are variations in the activity of the sun itself, changes in the earth's magnetic field, the nature of the movement of the earth through space, differing amounts of volcanic dust in the stratosphere, the influence of atmospheric pollutants derived from human activities, and deliberate weather modification. Conceivable, all of these factors, and others, could affect climate.

Sunspots

John Eddy (Harvard-Smithsonian Center for Astrophysics) is examining documented past solar activity. For at least two thousand years, earth dwellers have observed spots on the surface of the sun. The records show that, in a fairly regular cycle of eleven years, the number of spots increases from none to few to as many as several hundred. In the past century at least one thousand publications have claimed to have identified some statistical correlation between this cycle and certain aspects of weather, among other things. Until recently, the evidence was contradictory and lacked any sun-earth physical linking mechanism.[21] It is now known that streams of "solar wind," charged atomic particles from the sun, interact with the earth's magnetic field. Because of this, there is a correlation between times of higher solar activity and the occurrence of the aurora borealis and aurora australis. Perhaps the most famous anomaly in solar behavior is the "Maunder Minimum" from A.D. 1645 until 1715. As in the "Spörer Minimum" of 1420 to 1570, this was a time both of general cooling and years with few observable sunspots. Dendrochronological research verifies these changes, since high solar activity depresses the rate of ^{14}C production revealed in tree ring layers.

Atmospheric Electricity

The research of Ralph Markson (Massachusetts Institute of Technology) into atmospheric electricity complements the work of Eddy in the search for a sun-earth climatic link.[22] Thunder and lightning may be the first phenomena which come to mind when one thinks of weather, but the historic incidence of greater or lesser electrical activity in a given place is generally uninvestigated. Nevertheless, thunderstorms are going on constantly somewhere over the earth's surface since they maintain the electric field of the planet. The relationship between general climate and atmospheric electricity needs to be explored.

The Movement of the Earth in Space

Milutin Milankovitch popularized the idea forty years ago that regular, easily predictable changes in the orientation of the earth's orbit and manner of rotation affect the distribution of sunlight on the surface.[23] The tilt of the earth's axis, "obliquity," causes seasonal changes and that tilt slowly varies from 22.1 to 24.5 degrees in 41,000-year cycles. The axis tilt also changes the relative direction in which it is pointed, "precession." That determines at what point in distance from the sun summer and winter will occur. Precession is modified by "eccentricity" or the variance from a perfect circle of the path of the earth around the sun. Varying obliquity and precession mean changing amounts of solar radiation reaching different latitudes.

Volcanic Eruptions

Dust veils or sulfuric oxides in the upper atmosphere, due to eruptions, may affect world climate for short terms. Such probably was the case in the 1780s when Benjamin Franklin hypothesized that, by reflecting solar radiation back into space, volcanic particles left the earth's surface cooler by default. Stephen Porter found a correlation between glacial variation and eruptions.[24] Even so, R. W. Fairbridge (Columbia University) doubts that volcanism alone accounts for such cooling trends of a decade or longer.

Man-Made Climatic Variability

Human activity may also produce at least microclimatic variability. Sometimes such activity is uninformed and unintentional; sometimes it is deliberate.[25] In the former case, examples include overgrazing which sends dust into the atmosphere, the burning of fossil fuels or the removing of forests which release gases, increasing the amount of heat-reflective urban surfaces, and the addition of thermal pollution through industrial production. In the latter case, weather modification schemes range from rain dances to lightning rods, cloud-seeding, and airport fog dissipation to more ambitious plans. Those include diverting river flows, transporting icebergs, or modifying wind storms.

PHASE III: ANALYZING THE IMPACT OF WEATHER UPON HUMAN AFFAIRS

Hazards and disasters in history

An obvious physical impact results from a weather based emergency. This is true in history as in current events. The immediate response of the people affected is not difficult to ascertain. The indirect and long-term consequences of hazardous weather episodes and trends seem to be apparent also, but closer examination of the matter frequently leads to a conclusion that there must be a "missing link."

"Doomsday" intellectuals and a repeated movie theme accentuated disaster in the 1970s. Any human institution is vulnerable to natural hazards, including weather, but whether or not the presence of a hazard leads to a disaster is largely a matter of how a given society operates. This is true in terms of immediate rescue and relief efforts as well as any long-term effects discussed below. Disasters happen to people who are unprepared or unprotected.

Students of disaster, like students of climate, think in terms of degrees of intensity. Whether a calamity is an "accidental event" or a "disaster" or a major "catastrophe" depends upon the magnitude of death and destruction.[26] They also consider degrees of stress upon the individual and the societal infrastructure. "Moderate" impact means, for example, that everyone is aware of the hazardous event but only mildly inconvenienced; a "catastrophic" impact alters or destroys physical

surroundings and leaves few survivors. At the same time, those marginal to society pay the greatest share of the recovery cost. Modern reconstruction is fairly rapid, but that may obscure subtle lasting effects.

Searching for the "missing link"

There are several seemingly self-evident ways in which climate variability could have more than temporary significance. These include the shortening of the average growing season, the decline in the upper limits of elevation to which crops might be cultivated, late arriving springs which could create a grain or hay shortage for man and beast, glaciers overrunning farms and villages, sea ice expanding and fish populations being displaced, and coastal flooding when ice melts. Again, the importance of weather and the importance of human institutions must both be assessed and some relationship needs to be established between the two.

Some researchers have looked for this "missing link" without much success.[27] Andrew Appleby (San Diego State University) explored the mortality crisis of Europe, particularly London, between 1550 and 1700. He concluded that there was little correlation at all between trends toward colder weather and high mortality. Likewise, a general warming did not necessarily correlate with a mortality decline. He did, however, see weather as one among many contributing factors in the occurrence of epidemics. Of course, it is possible that only major illnesses were documented. Further research may discover a more direct correlation when more is known about the weather of each month rather than years or decades, the health of rural as well as urban people, and possible weather and health connections in places outside of Europe. Jan de Vries (University of California, Berkeley) has found quantitative data regarding Dutch canal freeze-ups which reveal much about past severe winters. Nevertheless, these data were not reflected at all in significantly higher prices. The numbers of travelers actually increased in the cold decades. While de Vries found that heavier rainfall in any one single year did not matter, a series of wetter years did have an impact due to slow natural drainage. On the other hand, he found no consistent increase in fuel prices in colder winters. Again, more case studies in nations less a

part of international commerce and advanced technology might produce very different results.

D.M.G. Sutherland (Brock University, Ontario), nevertheless, found no weather-based crisis in Upper Brittany on the eve of the French Revolution, despite droughts and one poor harvest. His explanation lies in the nature of the peasant society; priests turned tithes to charity, landlords delayed rent collections, and farmhands accepted postponements of wages. T. H. McGovern (Columbia University) gives greater weight to the organization of the Norse subsistence economy than to Greenland weather itself to explain that colonial failure. B. D. Shaw (University of Lethbridge, Alberta) dismisses the popular notion of increasing aridity in North Africa destroying the "granary of Rome" as unsubstantiated. J. Oeppen and R. Schofield (Cambridge Group for the History of Population and Social Structure) experimented with possible correlations among birth, death, and marriage rates on the one hand and real wages, annual rainfall totals, and summer and winter temperatures on the other. Weather, namely temperature extremes, affected only death-rates. At first glance, these findings might be discouraging.

Other investigators have offered suggestions for proceeding, but with caution.[28] J. L. Anderson (La Trobe University, Melbourne) advises that the relationship between weather and disease is indirect and due to weather-based malnutrition or migration. Simultaneous climatic and economic variability should not imply a causal link, although variability itself may be more important than the direction it takes. The absence of a societal crisis implies the presence of an adequate relief system. Studies should be made of societal buffers against scarcity. Martin Parry (University of Birmingham, U.K.) recommends "the retrodictive technique" or first determining the most likely places in a model for long-range weather impact to occur in theory and then consider all the possible alternative outcomes in such circumstances before exploring the real chain of events. In general, studies need to become more specific before any conclusions can be attempted. Crops are not only grown and harvested under climatic conditions; weather can also affect their being dried, transported, stored, or milled. Even if production totals are not lower due to bad weather, the totals may tell us nothing of additional labor expanded to

keep totals high. Climate generally milder in one place may subtly attract business relocation.

Detecting the Link

With varying degrees of caution, numerous writers insist that some "missing links" have been found between climatic variability and human history. John Post (Northeastern University) identifies several periods in which dense volcanic dust veils in the stratosphere, cold weather, and elevated commodity prices due to food scarcities all coincide, particularly in the last great European subsistence crisis of 1816 to 1819. Jerome Namias (Scripps Institution) presents ample evidence of twentieth century drought impact to presume even greater historic impacts occurred in less technologically advanced times. M. J. Freeman (Oxford) finds both droughts and freeze-ups impeded English canal traffic in financially significant ways. Gisli Gunnarson (Lunds Universitet) shows that variability caused starvation in Iceland, but social sanctions prevented a switch from agriculture to fishing to supplement the diet. G. Pichard (Marseille) links heavier rainfall to soil erosion and agricultural stagnation in seventeenth century Provence. S. Lindgren and J. Neumann have published several articles on the theme of "great historical events that were significantly affected by the weather."

Summary

In general, historians can make a contribution to the understanding of past weather and its impact by examining initial coping response to hazards and by carefully documenting any weather-cause and economic-effect linkages. Correlations in time and space between weather phenomena and an economic event, obviously, only imply a relationship. This is one new area of research among several others. It is possible that modern coping behavior in marginal areas could serve as a model for earlier times. Likewise, contemporary weather episodes may themselves serve as models for understanding previous variability. Table II lists some centers of research in this endeavor.

Table II

Some Climate Impact ResearchAgencies

Agriculture Research Service. Science and Education Administration. U.S. Department of Agriculture. Washington, D.C. 20205.

Aspen Institute for Humanistic Studies. 1229 University Avenue, Boulder, Colorado 80302.

Carbon Dioxide Effects Research and Assessment Project. U.S. Department of Energy, Washington, D.C. 20545.

Center for Agricultural Meteorology and Climatology. University of Nebraska, Lincoln, Nebraska 68588.

Center for Climatic and Environmental Assessment. Environmental Data and Information Service, NOAA, 600 E. Cherry Street, Columbia, Missouri 65201.

Center for Technology, Environment, and Development. Clark University, Worcester, Massachusetts 01610.

Climate Change to the Year 2000 Project. National Defense University, Fort Wesley J. McNair, Washington, D.C. 20319.

Climate Dynamics Research Program. National Science Foundation, Washington, D.C. 20550.

Climate History Research Group. University of Maine, Orono, Maine 04469.

Climate Research Unit. The University of East Anglia, Norwich, NR4 7TJ U.K.

Committee on Climate and Weather Fluctuations and Agricultural Production. National Research Council, National Academy of Sciences, Washington, D.C. 20418.

Geographic Institute. University of Berne, CH 3012 Berne, Switzerland.

Institute for Environmental Studies. University of Wisconsin, Madison, Wisconsin 53706.

Laboratory for Environmental Data Research. 3100
Marine Avenue, Boulder, Colorado 80302.

Laboratory of Tree Ring Research. University of
Arizona, Tucson, Arizona 85721.

Meteorological Institute. University of Bonn, Bonn
FRG.

National Center for Atmospheric Research. Boulder,
Colorado 80303.

National Climate Center. Asheville, North Carolina
28801.

Natural Hazards Research and Applications Information
Center, Institute of Behavioral Science #6,
University of Colorado, Boulder, Colorado 80309.

VI. NEW FRONTIERS

Research Possibilities

While physical scientists seek an understanding of the variability of environmental factors, social scientists may begin to discover new supportive research needs and possibilities in the history of human actions.

Researchers now lack certain reference works. Historical dictionaries of weather terms, for example, would help investigators to know what modern words meant to people in past times. In fact, some study is underway concerning the artistic use of weather allusions and the general influence of variability upon creativity. One subtopic here might be the "meteorological novel" like The Sixth Winter by Douglas Orgill and John Gribbin.[29] It would also be useful to understand past explanations for inclement weather, folk wisdom as well as mythology associated with weather, and examples of altogether erroneous past notions of climatic variability.[30] Both the general and the local histories of the atmospheric sciences remain unwritten.[31]

Data Banks

Additional new research aids could also be

helpful both to verify old evidence and to locate new data. Investigators need a conventional procedure for accepting or rejecting information on past weather. As noted above, they need a standard method of converting literary data into statistics and vice versa. This would facilitate comparisons among places and the validating of old data with new evidence. It would also enable researchers to store data in computer banks for easier retrieval. Christian Pfister has provided leadership in this direction through the Swiss Historical Documentation Project. Research guides should list such data collections as well as known but unexplored primary source locations. Interdisciplinary bibliographies would help to create a network among diverse people who ordinarily would not have professional contact with each other.

Teleconnections

One fundamental goal of climate reconstruction from any type of source is a comprehensive view of global climate over a long period of time. Once reconstruction is done in many localities, additional research can explore the nature of "teleconnections" among synchronous anomalies. Students of past climate are already aware of simultaneous historic variability in the rainfall in the Brazilian Northeast, the level of Lake Chad, the depth of the annual Nile flood, the intensity of the Indian monsoon, and the appearance of the warm Pacific waters of El Nino. Clusterings of transition years for these and other possibly related events may lead to new periodizations in weather history.

Conclusions

Throughout human history, climatic factors have provided both hazards like drought and resources like wind power. Climate history can be a tremendously practical as well as imaginative endeavor. We are living at a time when unprecedented tools exist and are being developed for the investigation of climate: high speed computers to store or retrieve data and simulate outcomes of complex climatic models, satellites to monitor world weather constantly, sophisticated infrared radiometry to measure temperature and atmospheric water content, dopplar radars to determine the three-dimensional wind field over large areas, and unmanned space vehicles to

derive insights from the climatic factors of other planets. Students of climate anticipate a comprehensive synthesis of many disciplines which can fully explain how "the weather machine" has operated, now operates, and could operate.[32] Historians can and should bring social scientists and humanists into this emerging explanatory system. Weather history contributes to historical geography, agricultural and economic history, and public policy studies. The history of climate variability may provide a vital link between physical science research and public appreciation of climatology.

The National Science Foundation funded supporting research for this paper through grants nos. 78 27047 and 76 11380. Portions of this paper appeared in The Historian, February, 1983.

ENDNOTES

[1] Extensive bibliographies were made available for distribution during the conference workshop.

[2] Public Law 95-367: September 17, 1978. Background: United States Congress. House of Representatives. Committee on Science and Technology. Subcommittee on Environment and Atmosphere. A Primer on Climatic Variation and Change (1976) and Climate Research and a National Climate Program (1976).

[3] Some early works include: E. Huntington, The Pulse of Asia (Boston: Houghton Mifflin, 1907); C.E.P. Brooks, Climate Through the Ages (New York: Dover, 1949); H. Shapley (ed.) Climatic Change (Cambridge: Harvard University Press, 1953).

[4] R. Silverberg, The Challenge of Climate (New York: Meredith Press, 1969); R. Claiborne, Climate, Man, and History (New York: Norton, 1970); W. Gates and J. Imbrie, Climatic Change (Rand, 1975); John Gribbin, Forecasts, Famines, and Freezes (New York: Walker, 1976); S. Schneider and L. Mesirov, The Genesis Strategy (New York: Plenum, 1976); R. Bryson, Climates of Hunger (Madison: University of

Wisconsin Press, 1977); M. Budyko, Climate Changes (American Geophysical Society, 1977); Crispin Tickell, Climate Change and World Affairs (Pergamon, 1978); Stephen Rosen, Weathering: How the Atmosphere Conditions your Body, your Mind, your Moods, and your Health (New York: Evans, 1979).

[5] A. B. Pittock and others (eds.) Climate Change and Variability (Cambridge: University, 1978) contains the Melbourne Monash University conference papers; WMO. Proceedings of the World Climate Conference, A Conference of Experts on Climate and Mankind (Geneva: WMO Publication # 537, 1979); for a summary of the Norwich meeting, see H. Lamb and M. Ingram, "Climate and History," Past and Present August 1980), pp. 136-141; some of the papers appear in C. Smith and M. Parry (eds.) Consequences of Climatic Change (U. of Nottingham: Department of Geography, 1981) and in a forthcoming publication; many of the researchers cited in this paper presented papers at the Norwich conference which circulated Abstracts. The spring 1980 issue of the Journal of Interdisciplinary History contains the Harvard workshop papers.

[6] Helpful references: R. G. Barry and R. J. Chorley, Atmosphere, Weather & Climate (3rd. ed.; London: Methuen, 1976) explains basic dynamics while The United States Committee for the Global Atmospheric Research Program (GARP), Understanding Climatic Change (Washington: National Academy of Sciences, 1974) defines long-range research goals. The latter is supplemented by the 1978 publication, Elements of the Research Strategy for the United States Climate Program. See also: C. Newton, "A Fifty-Book Library and Journal Selection for a Certified Consulting Meteorologist," Bulletin of the American Meteorological Society (Jan. 1981) 62: 71-77.

[7] A fairly detailed general introduction: Joseph Moran, "Reconstructing the Climatic Past," Journal of Geological Education (1977), 25: 78-81; see also: Alan Hecht (ed.) "Paleoclimatic Research: Status and Opportunities," Quaternary Research 12 (1979): 6-17.

[8] A. T. Wilson, "Isotope Evidence from Past Climatic and Environmental Change," Journal of Interdisciplinary History 10 (180): 795-812.

[9] Wilson, "Pioneer Agriculture Explosion and CO₂ Levels in the Atmosphere," Nature (1978), 273: 40-41.

[10] Examples: Stephen Porter and George Denton, "Chronology of Neoglaciation in the North American Cordillera," American Journal of Science (1967), 265: 177-210; C. Hammer and others, "Dating of Greenland Ice cores by Flow Models, Isotopes, Volcanic Debris, and Continental Dust," Journal of Glaciology (1978), 20: 3-26.

[11] Palynology research: T. Webb and R. Bryson, "Late and Postglacial climatic change in the northern Midwest, U.S.A.: quantitative estimates derived from fossil pollen spectra by multivariate statistical analysis," Quaternary Research (1972): 2: 70-115; H.J.B. Birks and others, "Pollen Maps for the British Isles 5000 years ago," Proceedings of the Royal Society of London (1975), 189: 87-105.

[12] D. J. Schove and R. W. Fairbridge (eds.), Ice Cores, Varves, and Tree-Rings (forthcoming) and R. Lewin, "Lake Bottoms linked with human origins," Science (February 6, 1981), 211: 564-6.

[13] Robert Izlar, "Some Comments on Fire and Climate in the Okefenokee Swamp-Marsh Complex," in M. Andrejko and others (eds.) Okefenokee Swamp: Its Natural History, Geology, and Geochemistry (Columbia: U. of S. Carolina Press, 1980).

[14] H. C. Fritts, Tree Rings and Climate (London: Academic Press, 1976); V. C. LaMarche, Jr., "Tree Ring Evidence of Past Climatic Variability," Nature (1978), 276: 334-338.

[15] R. C. Euler and others combined pollen and tree ring data with archaeological evidence in "The Colorado Plateaus: Cultural Dynamics and Paleoenvironment," Science 205 (1979): 1089-1101; Barbara Bell, "Climate and the History of Egypt: The Middle Kingdom," American Journal of Archaeology 79 (1975): 223-269.

[16] For further background reading on this point: J. Anderson, "Climate and the Historians," in Pittock, Climatic Change; Martin Ingram and others, "Historical Climatology," Nature (1978) 276:

329-334; Martin Parry, Climatic Change, Agriculture, and Settlement (Hamden, Ct.: Shoestring, 1978), Hubert Lamb, Climate History and the Future, volume II of Climate: Present, Past, and Future (London: Methuen, 1977); E. LeRoy Ladurie, "History without People: The Climate as a New Province of Research," in The Territory of the Historian, pp. 287-319 (Chicago: Harvester, 1979).

[17] Christian Pfister, "Climate and Economy in Eighteenth-Century Switzerland," Journal of Interdisciplinary History (Autumn, 1978), 9: 223-243; E. LeRoy Ladurie, Times of Feast, Times of Famine (New York: Doubleday, 1971).

[18] Pao-Kuan Wang, "Meteorological Records from Ancient Chronicles of China," Bulletin of the American Meteorological Society (1979), 60: 313-317; H. Arakawa, "Climate Changes as Revealed by Data from the Far East," Weather (1957), 12: 46-51; Sharon Nicholson, "The Methodology of Historical Climate Reconstruction and its Application to Africa," Journal of African History (1979), 20: 31-49; C. Burrows and D. Greenland, "An Analysis of the Evidence for Climatic Change in New Zealand in the Last Thousand Years: Evidence from Diverse Natural Phenomena and from Instrumental Records," Journal of the Royal Society of New Zealand (1979), 9: 321-373; Robert J. McAfee, "The Fires of Summer and the Floods of Winter: Towards a Climatic History for Southeastern Australia, 1788-1860," Dissertation in Progress; Robert H. Claxton and Alan D. Hecht, "Climatic and Human History in Europe and Latin America: An Opportunity for Comparative Study," Climatic Change (1978), 1: 195-203.

[19] These comments are based on discussions with Robert McAfee, now with the University of Oklahoma Law School, and Robert Baron who wrote the following dissertation: "Tempests, Freshets, and Mackerel Skies: Climatological Data from Diaries using content analysis," (University of Maine/Orono, 1980). See also: Wayne C. Palmer, Meteorological Drought (U.S. Commerce Department, Weather Bureau, 1965) and also D. W. Moodie and A.J.W. Catchpole, Environmental Data from Historical Documents by Content Analysis: Freeze-Up and Break-Up of Estuaries on Hudson Bay, 1714-1871 (Manitoba: University Press, 1975).

[20] Peter Lamb, "An Attempt to Address the Question, 'Are weather patterns changing?' for a Non-specialist Audience," Bulletin of the American Meteorological Society (March 1981), 62: 376-380.

[21] Summaries of contemporary research: G. L. Siscoe, "Solar-Terrestrial Influences on Weather and Climate," Nature (1978) 276: 348-52 and A. B. Pittock, "A Critical Look at Long-Term Sun-Weather Relationships," Reviews of Geophysics and Space Physics (1978), 16: 400-420. Updating: R. H. Dicke, "Solar Luminosity and the Sunspot Cycle," Nature (1979), 280: 24-27; John Eddy, "Climate and the Role of the Sun," Journal of Interdisciplinary History (1980), 10: 725-748; Tom Wigley, "Sun-Climate Links," Nature (1980) 288: 317-319; M. Stuiver, "Solar Variability and Climatic Change during the Current Millennium," Nature (1980), 286: 868-871.

[22] Ralph Markson, "Solar Modulation of Atmospheric Electrification and Possible Implications for Sun-Weather Relationship," Nature (1978) 272: 103-109.

[23] See: Richard Kerr, "Climate Control: How Large a Role for Orbital Variations?" Science (1978) 201: 144-146; John Gribbin, "Geomagnetism and Climate," New Scientist (1981), 89: 350-353; G. Wollin and others, "Climatic Changes, Magnetic Intensity Variations, and Fluctuations of the Eccentricity of the Earth's Orbit," Earth and Planetary Science Letters (1978) 41: 395-397.

[24] M. R. Rampino and others, "Can Rapid Climatic Change Cause Volcanic Eruptions?" Science (1979) 206: 826-829; S. Porter, "Recent Glacier Variations and Volcanic Eruptions," Nature (1981), 291: 139-142. See Science (February 20, 1981) 211: 815-838 for a series of thematic articles on the effects of the Mount Saint Helen's eruption.

[25] Wilfrid Bach, "Short-Term Climatic Alterations Caused by Human Activities: Status and Outlook," Progress in Physical Geography (1979), 3: 55-83; Robert Fleagle, "The Impact of Man on Climate," Water, Air, and Soil Pollution (1979) 12: 9-21; G. Breuer, Weather Modification (Cambridge: University Press, 1980).

[26] Introductory background considerations: Harold Foster, "Assessing Disaster Magnitude: A Social Science Approach," The Professional Geographer (1976), 28: 241-247; Barry Turner, "The Development of Disasters--A Sequence Model for the Analysis of the Origins of Disasters," Sociological Review (1976), 24: 753-774; "Preparing for Natural Disasters," Mosaic (1973), 4: 30-35; John B. Whittow, Disasters: The Anatomy of Environmental Hazards (Athens U. of Georgia Press, 1979).

[27] Andrew Appleby, "Epidemics and Famine in the Little Ice Age," Journal of Interdisciplinary History (1980), 10: 643-664; Jan de Vries, "Measuring the Impact of Climate on History: The Search for Appropriate Methodologies," ibid., 599-630.

[28] An especially helpful annotated bibliography on this point: J. McQuigg, Economic Impacts of Weather Variability (Columbia: U. of Missouri Atmospheric Sciences Department, 1975). See also: J. Seamann and others, Agrometeorology (Springer Verlag, 1979).

[29] Douglas Orgill and John Gribbin, The Sixth Winter (London: Bodley Head, 1979).

[30] P. Travis, "Changing Climate in Kansas: A Late Nineteenth Century Myth," Kansas History (1978), 1: 48-58 or T. Saarinen, Perception of the Drought on the Great Plains (University of Chicago: Department of Geography Research Paper No. 106, 1966).

[31] Recent contributions: R. Friedman, "Vilhelm Bjerkness and the Bergen School of Meteorology, 1918-1923: A Study of the Economic and Military Foundations for the Transformation of Atmospheric Science," (The Johns Hopkins University History Dissertation, 1979) and Paul Waite, "The History of the Atmospheric Sciences in Iowa," Proceedings of the Iowa Academy of Science (1975), 82: 88-93.

[32] Richard Flint, "Three Theories in Time," Quaternary Research (1974), 4: 1-8 and Alan D. Hecht, "Climate dynamics Program," National Science Foundation Program Report (June 1979), 3: 45-56.

SOUTH AMERICAN AND WORLD CLIMATIC HISTORY

Cesar N. Caviedes
University of Florida

While climatic history is a well-established historical discipline and disposes of abundant sources in Europe and Angloamerica, it is true that in Latin America research in that field is sparse and much remains to be explored. The underdevelopment of environmental history in Latin America cannot be blamed on a lack of pertinent documents or surrogate historical sources, for there exists sufficient indirect evidence on climatic oscillations that can be utilized in the reconstruction of climatic series when instrumental records are not available. Scattered documents report on the occurrences of rainy or stormy years, decimating droughts, cold masses outbreaks, and heat waves. Since many of these disasters meant violent disruptions of the rather dull and uneventful life in Spanish/Portuguese colonies and wreaked havoc among the incipient populations of Latin America, such events found prompt accommodation in the chronicles of these times, and access is relatively easy for the interested researcher.

From a strictly historical view point the determination of climatically anomalous years is relevant because of their bearing on contemporaneous political, social and economic history. Moreover, research on past climatic oscillations serves the double purpose of expanding the time series beyond the limit of instrumentally documented meteorological series and of establishing timely linkages between anomalies in Latin America and global climatic oscillations. Indeed, the second consideration is the one that has prompted this paper.

For the purpose of climatic reconstructions and of establishing connections between climatic anomalies in Latin America and the rest of the world, South America makes an excellent case study. Apart from the thin continental bridge of Panama, the South American continent is almost an island between the Pacific and the Atlantic oceans. This means that any disruption in the ocean-atmosphere interface of the Pacific or Atlantic oceans will be felt, eventually, on the South American continent or, at least, at its margins. It is to be noted that the oceans are the

surfaces on earth that absorb the maximum levels of solar radiation and that the ocean masses furnish the highest water vapor supply to the global atmospheric humidity. Thus, any variation that may occur in the energy budget influences, first, the heat-humidity input of the sea into the atmosphere, and, second, the established climatic patterns. Following this line of thought, it becomes clear that the atmospheric circulation in the tropical belt is the first to react to climatic anomalies. From the tropics, deficit or surplus of heat and moisture is transported into the middle and high latitudes. Thus, it is in the tropical maritime regions where many climatic fluctuations have their origin, and it is there where the first signs of an altered state in the ocean-atmosphere interaction are observed. Considering that the South American continent has the largest part of its mass located in the tropical belt and owing to its insular position, that continent experiences the effects of upset global climatic conditions before any other.

The axiom was dramatically proven in the winter of 1982-83. Following an abnormal warming of the tropical Pacific and torrential rains on the west coast of South America, the Pacific coast of South America experienced one of the worst winters of this century. For the first time, the media let the man in the street know that the bad weather he was experiencing was caused by a climatic anomaly thousands of miles away, namely, El Niño phenomenon.

When searching for the relationships between climatic oscillations in and around South America and the rest of the world, another fact must be taken into account, namely that oceans react slower than continental masses to external radiation stimuli and that, therefore, climatic oscillations nurtured by anomalous oceanic-atmospheric conditions take a long time to develop and their effects vanish also at a slower pace. Sea-air interaction, solar stimulation of ocean masses, or input of volcanic cinders into the atmosphere trigger off climatic oscillations whose onset, timely development, and ensuing effects do not conform to our concepts of seasons or years. In fact, meteorologists who are concerned with global climatic anomalies recognize the existence of quasi-permanent atmospheric circulation anomalies whose effects are felt in cycles, or frequencies, that are different from the yearly or seasonal cycles

that characterize weather development in middle and high latitudes (Flohn, 1980). Fluctuations of this kind--the Southern Oscillation is one of them--show up as pulsations and counterbalances of pressure centers and wind systems between the Western Pacific and the Eastern Pacific, or between the South Pacific and the North Pacific, across the equator-line (Wright, 1977). Thereby, the disturbing effects of upset meteorological conditions in one place of the globe can be transmitted into long distances (teleconnections) and different regions appear affected--not always at the same time--by a common climatic anomaly.

Climatic oscillations that develop in the southern hemisphere during the summer months are felt in the northern hemisphere during the winter months, and their effects may last until the summer months of the northern hemisphere. Thus, abnormal summers in the tropical areas of the southern hemisphere coincide with altered winter conditions in the middle and high-latitudes of the northern hemisphere. Moreover, with the summer semester in the southern hemisphere extending from September of one year into March of the following year, anomalous atmospheric conditions surpass the conventional limits of one year. This means that, when looking at a climatic oscillation over a series of years and in different areas of the globe, "synchronism" has a different connotation than "simultaneity" in that it implies the occurrence of climatic anomalies spanning over more than one calendar year. Moreover, disastrous climatic anomalies usually become conspicuous as sequences of abnormal seasons that span for more than a calendar year. For instance, northeastern Brazil experiences devastating droughts in those years when an abnormal rainless summer occurs between two normal dry winters. Such a sequence encompasses two years. If the anomaly persists and the following summer is again dry, the sequence of seasons will be like this: dry winter - rainless summer - dry winter - rainless summer - dry winter. Such a catastrophe, which encompasses almost three calendar years, is properly named grande seca (Caviades, 1973). The tendency of anomalous seasons to occur in clusters has been readily pointed out by meteorologists. H. Flohn (1980) remarks that between 1971 and 1973 there was a particular clustering of cold winters in the North Atlantic--as evidenced by an abnormally high frequency of erratic icebergs--and, that between 1977

and 1979 winters were particularly severe in the Midwest and Eastern United States, just to mention a few recent examples.

The Sources of a Climatic History of South America

Although scattered, sources for climatic history and climatic reconstruction in Latin America, and more particularly in South America, are available. The legalistic spirit of the Spanish colonial administration made sure that, among others, records were kept about environmental events that had a strong impact on the otherwise rather uneventful life in the colonies. Rogativas (prayers) during periods of prolonged dry spells have been preserved in the archives of the bishopdoms of Lima, Santiago, and Buenos Aires. The minutes of the Cabildos (city councils) of the mentioned cities and also of others in Peru, Chile, and Argentina record presentations by prominent vecinos (also powerful landowners) in order to have taxes on agricultural exports waived in years of crop failures due to droughts or excessive rain. Road and bridge destructions are also minutely reported in colonial documents, offering thus important clues about extreme weather occurrences. The problem now is to build with these scattered pieces of information a sequence of climatically normal and abnormal years sufficiently reliable to be contrasted with similar sequences from elsewhere.

In a recent work, Caviedes (1980) utilized a detailed listing of shipwrecks that had happened along the coast of Chile since 1540 to determine if years with numerous accidents can be related with years of unusually bad weather and active cyclogenesis in the Southeast Pacific. The list of shipwrecks was checked against a list of rainy and dry years compiled by the Oficina Meteorologica de Chile (1968) for a period of 429 years. It could be demonstrated that the maximum numbers of shipwrecks occurred during rainy years in which frequent winter storms inflicted damage along the coast of Chile. Moreover, several of these stormy winters coincide with summers of copious rains that were originated by the climatic-oceanic phenomenon of El Niño along the coast of Peru. These findings support the assumption that, during those particular years, climatic conditions were upset not only in temperate South America but also all across the continent in response

to the altered conditions of the equatorial-tropical circulation over the Pacific.

But actually, the climatic implications of these phenomena reach even further. In 1973 Caviedes drew attention to the rather synchronous occurrence of El Niño and torrential rains on the Pacific coast of South America and of droughts in northeastern Brazil, as exemplified in 1971-73. In those years, not only the Pacific, but also the Atlantic facade of tropical South America were altered in their normal weather patterns. Even more intriguing is the fact that these anomalies were not at all disconnected from major anomalies which affected many a part of the globe between 1971 and 1974: droughts in the Sahel, famines in Ethiopia, droughts in the western Soviet Union, and the extremely severe winter of 1971 in North America (Bryson and Murray, 1977).

The Proven Teleconnections

In order to establish a coherent sequence of the climatic anomalies in South America and the southeastern Pacific and of their connections with meteorological disasters elsewhere, a series of 440 years (1540-1980) was examined. Places of reference in South America were: (a) the coast of Chile, for which meteorological records, historical accounts, and shipwreck chronicles are available; (b) the northern coast of Peru, for which occurrences of catastrophic summer rains and oceanic perturbances have also been kept in chronicles; and (c) northeastern Brazil, whose catastrophic droughts have been recorded not only in official documents but also in church archives. Along with these three major climatic anomalies of South America, mention is made in Table 1 of the years in which volcanic eruptions of widespread effects were recorded in the world, and the years in which catastrophic climatic oscillations (sequences of cold winters, droughts, rainless summers, heat waves) occurred in Europe and Asia.

On seven occasions since 1891, the three catastrophic events mentioned above occurred within the frame of our accepted synchronism. In a backward count, the last time anomalies were reported from different parts of the world was during the years 1971-73. Before, in 1957, a very extreme El Niño upset the whole Pacific and altered the productivity of fisheries in Peru and Chile. One year later,

northeastern Brazil was affected by drought. In 1952 droughts in northeastern Brazil anticipated 1953 El Niño in Peru and abnormally heavy winter rains and storms in central Chile. It is, perhaps, of interest to note here that in 1951 intense volcanic activity developed in the world (Bray, 1978).

In 1940-41 El Niño caused havoc in northern Peru, and violent winter storms and numerous shipwrecks occurred along the Chilean coast, especially in 1941. One year later, northeastern Brazil was again affected by drought. That these climatic anomalies of the early forties were as global as those of 1971-73 is sustained by the severity of the 1941-42 winter in eastern Europe, during which Hitler's offensive against the Russians was brought to a halt (Michel, 1975).

In 1931-32 global climatic anomalies were conspicuous; and volcanic eruptions were reported in 1932 (Bray, 1978). In 1917 El Niño struck eighteen months before northeastern Brazil was affected by a severe drought and central Chile experienced a stormy winter, in 1919.

Numerous storms and shipwrecks in central Chile coincided, in 1891, with El Niño in northern Peru, with drought conditions in northeastern Brazil, and with pronounced volcanic activity in the world, suggesting again that these climatic anomalies were of global extent.

Only twice during those eighty-two years (1891 to 1973) were there reported stormy winters and numerous shipwrecking incidents in Chile in phase with El Niño phenomena without a drought being mentioned in northeastern Brazil. Those were the years of 1925-26, which witnessed one of the most dramatic El Niño occurrences, and the extremely rainy year of 1965 (Bjerkness, 1972).

On the other hand, there were rainy and stormy winters in central Chile, such as those of 1914, 1904, and 1900 which coincided with devastating droughts in northeastern Brazil, but not with El Niño occurrences, while only in one year, 1915, did Brazil suffer a drought without anomalies being reported on the west coast of South America.

Examination of the years before 1891--when

records on El Niño become more sparse and unreliable--reveals 1888 as a year of heavy winter storms and numerous shipwrecks in central Chile, a drought-year in northeastern Brazil, and a year of heightened volcanic activity. That year stands out also because of an abnormally high incidence of storms and shipwrecks along the coasts of South Africa (Caviedes and Niddrie, 1984). In fact, H. Lamb (1967) observes that it is precisely that year that marks the beginning of a climatic period in the world that is characterized by increasingly drier conditions. Thus, although not classified as an El Niño year, 1888 seems to have been a threshold in climatic history.

1877-78 again brought numerous shipwrecks in Chile and South Africa, and drought conditions prevailed in northeastern Brazil. No reference exists about El Niño occurrence in northern Peru but, significantly, in 1878 volcanoes were active in different parts of the world (Bray, 1978).

Very stormy years in central Chile between 1853 and 1855 were not matched by any other anomaly in the southern hemisphere, but they coincided with a cold and bad weather period in central Europe (Flohn, 1979) that might be associated with volcanic activity in 1855. That year also marked the end of a decade of bad weather that had brought poor harvests and political instability in Europe and glacial reactivation in the Alps (Flohn, 1979). This bad-weather period had started between 1843 and 1846, which were, interestingly enough, years of pronounced pluviosity in central Chile, of droughts in northeastern Brazil, and of volcanic eruptions. From 1842 to 1847 particularly stormy winters were also experienced in South Africa and numerous shipwrecks were reported.

Between 1829 and 1831, very rainy winters and frequent shipwrecks were registered in central Chile, and droughts in northeastern Brazil appear to have occurred almost immediately after sustained volcanic activity in 1829, which also provoked below-average temperatures in North America and Europe (Bray, 1978).

The eruption of volcano Tambora (Indonesia) in 1815 led to widespread climatic anomalies (Bryson and Murray, 1977). No direct effects appear to have been

felt in South America, unless the copious rains of 1817 in central Chile and the Brazilian drought of 1820 are considered as repercussions of that event. In North America, 1817 has been referred to as "the year without summer," and in central Germany grain shortages were reported in that critical year (Flohn, 1979).

Particularly strong volcanic activities during 1803-05 (Bray, 1978) relate well with an abnormally rainy year in northern Peru in 1803 and with a drought in northeastern Brazil in 1804. In central Chile there is, however, no evidence of unusual climatic conditions.

The end of the 1780s stands out as a period of crises. The French Revolution, crop failures in the Alps and central Germany, and severe winters in Scandinavia (Flohn, 1979) are signs of upset climatic conditions in Europe, while central Chile as well as South Africa report high incidences of shipwrecks. Droughts affected northeastern Brazil in 1780 and 1784. Be it noticed, also, that 1783 was a year of strong volcanic activity (Bray, 1978).

The 1720s were another decade of climatic crises. El Niño phenomena affected northern Peru in 1720, 1726, and 1728. There are no records of frequent shipwrecks in central Chile during that decade, but 1722 is a particularly critical year in that respect for South Africa (Burman, 1976), and droughts are reported for northern Brazil in 1721 and 1723. All this appears also to fit in with a period of renewed volcanic activity (Bray, 1978).

From 1692 to 1694 severe winter storms occurred in South Africa and a drought had devastating effects in northeastern Brazil. Volcanoes were also active in 1693 and 1694.

In even earlier years, for which information about shipwrecks in central Chile and South Africa, droughts in Brazil, and El Niño phenomena in northern Peru are scarce, only 1673, 1647, and 1616 stand out as years in which numerous shipwrecks occurred during rainy winters in central Chile. Volcanic activity was extraordinary in those years. 1614 was a drought year in northeastern Brazil, coinciding with unusual volcanic activity (Bray, 1978).

Around 1600 volcanic activity is reported, and this occurrence is paralleled by a drought in northeastern Brazil in 1603 and by a very rainy year (1600) with many recorded shipwrecks in central Chile.

In the sixteenth century, Cabildo records from Chile and numerous shipwrecks point to 1574-75 as years of high pluviosity but without accompanying evidence of abnormalities in other areas of South America. On the other hand, the rainy years of 1550-51 and 1581 in central Chile are related with reported volcanic activity in the world, for which, however, no "dust-veil" values have been calculated (Bray, 1978).

The Emerging Trends

From the facts mentioned above it becomes evident that the most dramatic climatic events that affect South America occur within the limits of an accepted synchronism and that they are, therefore, linked to common causes, namely anomalies in the equatorial and tropical circulation. Since these anomalies originate in the Atlantic and Pacific oceans (the Pacific Ocean has its maximum width precisely at the equatorial belt) it follows that the major climatic oscillations in South America are not isolated from oscillations of planetary extent but synchronous according to climatic time scales. This closeness in time shows that if--in consideration of the time required for a climatic anomaly to appear, spread, and be felt in distant areas--other chronological scales were used, the synchronism would be almost exact.

It has been gathered from Table 1 that climatic anomalies in South America are conspicuously related in time with climatic crises of global scale. This finding in itself would not be so special, were it not for the circumstance that, until very recently, the possibility of relating anomalies from tropical regions with distant high-latitudinal regions (Europe, North America, and Western Asia) had not been sufficiently documented.

At the time of completion of the original manuscript, early in 1981, the last solid evidence of global climatic anomalies went back to the years 1971-73. However, when this book went to press, new

facts added further weight to the argumentation. In early 1982, the eruption of volcano Malinche in Mexico sent a dense cloud of cinders into the atmosphere of the tropics. The winter of that year in temperate South America was rainier than usual, and by December of 1982 many instrumental measurements as well as ecological disruptions (fish migration, sea-bird starvation) pointed toward an abnormal warming of the waters in the equatorial Pacific. By January 1983, the impulses generated over the overheated tropical Pacific were creating repeated bad weather waves in the Pacific, off North America, and winter storms over the west coast and the center of the continent far into spring. As the last snow in continental North America melted in May, the winter of 1983 entered the records as one of the longest and stormiest of the century.

Therefore, then, the most dramatic events in South American climatic history must be regarded as integrated episodes of world climatic history, as exemplified by the widespread climatic anomalies that occurred between 1971 and 1975 and also in 1982-1983. Looking at it this way, regional climatic fluctuations are but episodes of a wider assemblage which spans over a series of years. We believe that, because these climatic crises occur within an undeniable time closeness and because they affect large sectors of mankind, climatic history is an area of relevance within environmental history that deserves to be looked into closer. Unfortunately, not much is being done by contemporary hazard specialists.

A question remains open once these groups of abnormal years have been sorted out. Do these years occur at random or do they appear at regular intervals (cycles)? Among the recorded climatic oscillations there are some that occur at random. They follow abnormally high inputs of aerosols from volcanic eruptions into the atmosphere. In view of this, it must be accepted that there are groups of abnormal years that have been triggered by such unforeseeable natural catastrophes of geophysical origins, and that do not occur in cycles.

Other climatic anomalies appear to occur at rather regular intervals. Statistical analyses of drought years in Brazil (Markham, 1972) lend support to the hypothesis that major climatic oscillations in

the tropics of South America may be related to the eleven-year cycles of sunspots. In temperate central Chile, winters of lessened precipitation have been related to periods of slackened sunspot activity (Oficina Meteorológica de Chile, 1968). Records of instrumentally measured precipitation from Santiago de Chile, available since 1871 (Oficina Meteorológica de Chile, 1965), suggest, indeed, that years of abnormally low winter precipitation (technically "dry years") occur at intervals of eleven years. Conditions of dryness in temperate Chile are associated with the blocking action of anticyclones which are strengthened in winter (Schneider, 1975). Similar conclusions can be drawn from the records of precipitation of meteorological stations in the Argentinean Pampas (Prohaska, 1961). Remarkably enough, a study on precipitation in Caracas (Grosske, 1968) reveals that extremely rainy years in Venezuela occur in-phase with major El Niño anomalies and that years of extreme dryness (1960, 1945, 1933, 1930, 1923, 1912) tend to coincide with years of waning sunspots. From these findings it seems that, if a relation exists between climatic events in South America and the variations of solar activity, this is more pronounced in the case of dry years than in years of abnormally high precipitation.

The question of the influence of sunspots on climatic oscillations has been approached cautiously by global meteorologists. Reid Bryson and Thomas J. Murray (1977) agree that the effects of the eleven-year cycles in sunspot activity should not be felt at the moment of their occurrence but probably during the waning period of such activity. M. I. Budyko (1977) attributes great importance to secular variations in solar radiation upon climate, but he does not commit himself to acknowledging the existence of cycles in solar activity. Hermann Flohn (1978) rejects the idea of cyclical recurrences with regard to climatic anomalies, but not with regard to large-scale geophysical events. All four climatologists coincide, however, in pointing out that noticeable fluctuations in solar radiation (not necessarily occurring in cycles) are of severe consequences for climatic development. Using records on solar radiation, temperatures, and precipitation M. I. Budyko (1977) found that dramatic climatic oscillations which resulted in temperature anomalies in the northern hemisphere occurred about 1890, 1900, 1917, 1941, and 1951 (see his Figure 11, page 73).

The interesting aspect, here, is that it was precisely around those years that most of South America experienced climatic anomalies, and that these anomalies did not happen in or around years in which the patterns of atmospheric circulation were affected by volcanic eruptions.

From all the arguments presented above and from the historical references made in this paper, the following points need to be emphasized:

1. Major climatic crises in South America do not occur independently, but they are tied--directly or indirectly--to major climatic oscillations. In this sense, the climatic history of South America must not be seen as unattached from global climatic history, but in close association with it. Moreover, considering the fact that major climatic oscillations tend to develop first over large ocean bodies, and considering the position of South America between the tropical Pacific and the tropical Atlantic, it can be stated that some major climatic oscillations that were generated from changing conditions in the oceans have been felt first in tropical and subtropical South America and later in North America, Europe, or Asia. This is particularly true of the climatic crises that were initiated in 1970-71.

2. Synchronisms that were unleashed by volcanic eruptions exist between climatic crises in South America and elsewhere. It has been during periods of increased volcanic activity that the climatic crises in South America have coincided with climatic upsets in other regions of the world.

3. Certain climatic oscillations observed in South America indicate that the possibility of cyclical recurrences--particularly of dry periods--is not to be disregarded. These anomalies can be linked to solar radiation variations that are not felt with the same intensity in other parts of the world, where "climatic noises" exist. That

sunspot-related anomalies are felt in South America more than in other areas is possibly due to a better atmospheric transmissibility in the southern hemisphere and to the existence of a simplified "interacting subsystem" when compared with the subsystem operating in the northern hemisphere.

In view of these three commanding characteristics of the climatic oscillations in South America, accessory sources of information on climatic history that reach beyond the short time span covered by instrumental records should be investigated. The mentioned analysis of Cabildo records or the use of indirect evidence of climatic anomalies, such as reports on harvest failures or shipwrecks, are but a few examples of how these supplementary sources of information can be utilized to enlarge the series of years to be worked with and to permit further comparisons with other parts of the world.

SOURCES

Bjerkness, J. "Large-scale Atmospheric Response to the 1964-65 Pacific Equatorial Warming." Journal of Physical Oceanography 2, 1972, pp. 212-217.

Bryson, R. R. and Murray, T. J. Climates of Hunger. Mankind and the World's Changing Weather. The University of Wisconsin Press, Madison, 1977.

Bray, J. R. "Volcanic Eruptions and Climate During the Past 500 Years." In A. B. Pittock et al. (eds.) Climatic Change and Variability: A Southern Perspective. Cambridge University Press, Cambridge, 1978.

Budyko M. I. Climatic Changes. American Geophysical Union, Washington, D.C., 1977.

Burman, J. The Bay of Storms: Table Bay 1503-1860. Human and Rousseau, Cape Town, 1976.

Caviedes, C. N. "Sêcas and El Niño: Two Simultaneous Climatic Hazards in South America."

Proceedings of the Association of American Geographers, Vol. 5, 1973, p. 44-49.

Caviedes, C. N. "Five Centuries of Winter Storms in the Southeast Pacific." Paper read at the 35th Annual Meeting of the Southeastern Division of the Association of American Geographers. Blacksburg, 1980, 11 pp.

Caviedes, C. N. and Niddrie, D. "Shipwrecks and Cyclonic Passages in the Southeastern Pacific and Southeastern Atlantic." (In preparation).

Flohn, H. "Die Zukunft unseres Klimas: Fakten und Probleme." Promet 2:3 (1978), pp. 1-21.

Flohn, H. "A Scenario of Possible Future Climates: Natural and Man-made." Proceedings of the World Climate Conference. Geneva, February 1979, pp. 243-266.

Flohn, H. "Lessons from Climatic History." Contributions to Atmospheric Physics, 53:2, 1980, pp.204-212.

Grosske, F. Sobre la Pluviosidad en Caracas. Ediciones del Concejo Municipal del Distrito Federal, Caracas 1968, 143 pp.

Lamb, H. H. "On Climatic Variations affecting the Far South." World Meteorological Organization. Technical Notes, 85, 1967, pp. 428-453.

Markham, C. G. Aspectos Climatológicos da Sêca no Brasil-Nordeste. Superintendencia de Desenvolvimento do Nordeste, Recife, 1972.

Michel, H. The Second World War. Vol. 1, Praeger Publishers, New York, 1975.

Prohaska, F. El problema de las sequías en la región semiárida pampeana y la sequía actual. Instituto de Tecnología Agropecuaria, Pub. 71, Buenos Aires, 1961, pp. 53-67.

Oficina Meteorológica de Chile. Pluviometría de Chile: Fascículo II. Oficina Meteorológica de Chile, Santiago, 1965, 268 pp.

Oficina Meteorológica de Chile. Estudio de las

Precipitaciones de Chile durante 429 años y la Sequía del año 1968. Oficina Meteorológica de Chile y W.M.O., Santiago 1968, 18 pp.

Schneider, H. "Un aporte al estudio de la sequía en Chile." Revista Geografica 83:2, 1975, p. 109-125.

Wright, P. B. The Southern Oscillation-Patterns and Mechanisms of the Teleconnections and the Persistence. Hawaii Institute of Geophysics, Publication 77-13, Honolulu, 1977, 107 pp.

Table 1. Years of major climatic anomalies in South America, and their correspondence with shipwrecks in Central Chile and major volcanic eruptions.

Frequent shipwrecks in Central Chile	El Niño phenomenon	Drought in NE Brazil	Volcanic Eruptions	Climatic crisis elsewhere
	1982-83		1982	1982-83
	1972-73	1971		1971-74
1965	1965			
1963			1963	
1957	1957	1958		
1953	1953	1952	1953	
			1951	
1941	1941	1942		1941-42
1934				1934
	1932	1931	1932	1931-33
1926	1925			
1919		1919		
	1917		1921	
		1915		
1914				1914
	1911		1912	
		1907	1907	
1905			1905	
1904		1904	1904	
1903				
1902		1902	1902	1902
1900		1900		
1897		1898	1898	
1896			1895	
1894				
1891	1891	1891	1890	
1888		1888	1888	1888
1886			1886	
1884			1883	1883
1881			1881	1881
1878			1878	1878
1877		1877	1877	
1874			1875	1876
1872			1872	
1869			1868	1869
1867			1867	
1865				
1860			1861	
1858			1858	
1855			1855	1855

Frequent shipwrecks in Central Chile	El Niño phenomenon	Drought in NE Brazil	Volcanic Eruptions	Climatic crisis elsewhere
1853			1852	
1850			1852	
		1846	1846	1845
			1845	1844
1839		1844		
		1833	1833	
1830		1830	1830	
			1829	1829
		1826	1826	
1823			1822-24	
		1820	1821	
1819				1815-17
			1815	
			1812	
			1811	
			1807	
	1804	1804	1803	
1802				
			1799	
			1795	
		1792		
1789		1790		1788
		1784	1783	
		1777	1777	
		1774		
		1772	1772	
1763			1763	1763
		1760	1760	
			1755	
			1752	
		1774	1744	
1741				
			1727	
	1728			
	1726			
		1723		
	1720	1721	1721	
			1717	
			1712	
			1707	
		1692	1693-94	1693-94
1673			1673	
			1660	
			1650	

Frequent shipwrecks in Central Chile	El Niño phenomenon	Drought in NE Brazil	Volcanic Eruptions	Climatic crisis elsewhere
-----------------------------------------	-----------------------	-------------------------	-----------------------	---------------------------------

1647			1646	
1629			1629	
1616				
		1614	1614	
			1606-07	
		1603		
1600			1601	
			1597-98	
			1593	
			1586	
1575				
1567			1565	

Sources: Cavedes, C.N. "Five Centuries of Winter Storms in the Southeastern Pacific," (1980), and Bray, J.R. "Volcanic Eruptions and Climate During the Past 500 Years," in A.B. Pittock et al. (eds.) Climatic Change and Variability: A Southern Perspective (1978)

THE WOMEN OF THE PROGRESSIVE CONSERVATION CRUSADE:
1900-1915

Carolyn Merchant
University of California, Berkeley

In his book The Fight For Conservation (1910), Gifford Pinchot praised the women of the progressive era for their substantial contributions to conservation. He cited the conservation committee of the Daughters of the American Revolution (chaired by his mother), the Pennsylvania Forestry Association, "founded by ladies," which carried out some of the earliest work done in that state, the National Forests preserved by Minnesota women, and the Calaveras Big Trees set aside by the women of California after a nine year fight.[1]

Writing his definitive history of the progressive conservation campaign in 1959, Samuel Hays also acknowledged the enthusiasm of women's organizations for conservation and their staunch support, until 1913, for Pinchot as leader of the movement. Historians Robert Welker (1955) and Stephen Fox (1981) amplify other female contributions, especially to the Audubon movement and the hiking clubs, while admitting that much remains to be learned regarding women's role in conservation.[2]

In the nineteenth century, women had developed interests and organizations that paved the way for their work in the conservation and reform movements of the progressive era. Literary clubs oriented toward culture drew women together for mutual improvement and shared experiences, while the women's rights and abolition movements exposed them to the political process and the public arena. Leisure time had afforded middle and upper-class women opportunities for botanizing, gardening, birdlore, and camping. Women visited the National Parks and scenic wonderlands of the West or, sometimes casting off skirts and donning Turkish pants, joined the Appalachian Mountain Club (founded in 1876) or the Sierra Club (founded in 1892).[3]

Propelled by a growing consciousness of the panacea of bucolic scenery and wilderness, coupled

with the need for reform of the slums and squalor of the cities, women burst vividly into the public arena in the early twentieth century as a force in the progressive conservation crusade. Behind the brief tributes by historians to their substantial contributions lies an untold story of immense energy, achievement, and dedication by thousands of women to the cause of conservation. Although only the most prominent women appear in the archives of history, without the input of women in nearly every locale in the country, conservation gains in the early decades of the century would have been fewer and far less spectacular.

Who were these women of the conservation crusade? What were their accomplishments, objectives, and ideals? How did they interact with the men who promoted conservation? What ideological framework did they bring to the crusade and to the conflicts that developed within it?

I. Feminist Conservation: The General Federation of Women's Clubs

In 1900, Mrs. Lovell White of San Francisco, the brilliant, dynamic, and resourceful founder and president of the California Club, took up the cause of forestry. Founded at the home of Mrs. White on a cold rainy evening in 1897 in the wake of the first and abortive California suffrage campaign--a campaign "brilliant, rich in experiences" with "a spirit of wholesome comradeship,"--the California Club merged in January of 1900 with women's clubs throughout the state to form the California Federation of Women's Clubs. With Mrs. Robert Burdette of Pasadena as president and Mrs. White as vice-president at large, the first meeting was steeped in conservation ideals.[4]

"The preservation of the forests of this state is a matter that should appeal to women," declared Mrs. Burdette in her opening address. "While the women of New Jersey are saving the Palisades of the Hudson from utter destruction by men to whose greedy souls Mount Sinai is only a stone quarry, and the women of Colorado are saving the cliff dwellings and pueblo ruins of their state from vandal destruction, the word comes to the women of California that men whose souls are gang-saws are meditating the turning of our world-famous Sequoias into planks and fencing

worth so many dollars." The forests of the state, she went on, were the source of the state's waters and together they made possible the homes and health of the people of California. "Better one living tree in California, than fifty acres of lumberyard. Preserve and replant them and the State will be blessed a thousandfold in the development of its natural resources . . . "[5]

Nationally, the General Federation of Women's Clubs, (G.F.W.C.) founded in 1890, had been active in forestry since the turn of the century as part of women's civic obligation to become informed on the most urgent political, economic, and social issues of the day. Selecting women in each state who were familiar with the principles of forestry to head the clubs' forestry committees, local members first conducted cosmetic campaigns to save waste paper and clean up their towns and cities. They formed coalitions with civic organizations which engaged in the beautification of yards, vacant lots, school yards, and public buildings through planting trees and shrubs. Following the example of German women, with whom they corresponded, they planted long avenues of shade trees. They also worked toward the acquisition and preservation of wooded tracts of land wherein "Nature should be left unrestrained." [6]

Local forestry committees formed study groups that emphasized both the aesthetic and utilitarian aspects of forestry and the conservation of wood and water. The Forest Service provided literature and sent guest lecturers on trees and forestry to club meetings. Century magazine supplied them with articles on conservation, while local libraries were encouraged to acquire books on the principles of forestry.

In addition to keeping 800,000 members informed of the conservation policies and achievements of Roosevelt and Pinchot, the General Federation's Forestry Committee played an influential role in the passage of legislation to protect forests, waters, and birdlife. Under the direction of Mrs. Lydia Phillips Williams (for 1904-6), an enthusiastic conservationist who had learned forestry at the family's Peterson Nursery in Chicago and on her numerous excursions to forests in Norway, Sweden, and Germany; Mrs. F. W. Gerard (1908-10) from Connecticut, and Mrs. Lovell White (1910-1912), who

had established a national reputation in saving the Calaveras Big Trees of California, the committee coordinated efforts to support such projects as the creation of national forest reserves in New Hampshire and the Southern Appalachians and passage of the Weeks Bill for protection of the watersheds of navigable streams. In 1910, 233 clubs reported that they had sent letters and petitions for state and national legislation on forest fire laws, tax remission for reforestation, and the appropriation of demonstration forests, while 250 were active in the movement for bird and plant protection.[7]

In 1909, under the leadership of Mrs. John Wilkinson of Louisiana the Federation formed a Waterways Committee to promote the development of water power, clean water, and cheaper, higher volume transportation. The rationale for women's involvement lay in the effect of waterways on every American home: Pure water meant health; impure meant disease and death. Additionally, beautification of waterfronts, as had occurred in the watertowns of Europe, would lead to patriotism and love of one's country.

Joseph Ransdell, chair of the National Rivers and Harbors Committee speaking to the Tenth Biennial Convention of the Federation in 1910, acknowledged the important contributions of the women's clubs to conservation. "I appeal to you as a representative of the men who need and wish the help of women. We know that nothing great or good in this world ever existed without the women. We consider our movement one of the greatest and best ever inaugurated in the union and we know that women can help us." [7a]

In 1910 the Federation reorganized its forestry and waterways committees under a Department of Conservation headed by Mrs. Emmons Crocker of Fitchburg, Massachusetts and added a birdlife representative, Mrs. Francis B. Hornbrooke, also of Massachusetts. This new Department sent representatives to the Second National Conservation Congress in St. Paul, Minnesota in 1910 and the National Irrigation Congress at Pueblo, Colorado.[8]

During the period 1907-1912, women contributed notices, news items, reports, and articles to Forestry and Irrigation, the journal of the American

Forestry Association. They pointed out women's work to save forests in places such as Colorado, Vermont, Maine, and New York, printed lengthy summaries of progress in conservation as reported at the Federation's biennial meetings, and announced protest actions such as that taken by Mrs. D. M. Osborne of Auburn, New York who, outraged by telephone pole workers who had mercilessly trimmed her trees without permission, drove off the workmen and cut down the poles." [9]

Mrs. Lydia Adams-Williams, a self-styled feminist conservation writer and member of the Women's National Press Association was particularly vociferous in her efforts to popularize women's accomplishments. Her article "Conservation--Women's Work," (1908) in which she characterized herself as the first woman lecturer and writer on conservation, complained that "man has been too busy building railroads, constructing ships, engineering great projects, and exploiting vast commercial enterprises" to consider the future. Man the moneymaker had left it to woman the moneysaver to preserve resources. She placed women's role in conservation squarely in the context of feminist history:

To the intuition of Isabella of Spain, to her tenacious grasp of a great idea, to her foresight and her divine sympathy the world is indebted for the discovery of a great continent, for the civilization we enjoy today and for the great wealth of resources . . . And as it was the intuitive foresight of a woman which brought the light of civilization to a great continent, so in great measure, will it fall to woman in her power to educate public sentiment to save from rapacious waste and complete exhaustion the resources upon which depend the welfare of the home, the children, and the children's children. [10]

In "A Million Women for Conservation," (1908) again taking liberal notice of her own accomplishments, Mrs. Adams-Williams discussed the resolutions passed by the women's clubs in support of the conservation efforts of Roosevelt, Pinchot, the Inland Waterways Commission, the Forest Service, the Geological Survey, and the American Mining Congress.

The Federation in Washington, D.C., of which she was a member, was the first to pass these resolutions followed by four other national women's organizations the combined membership of which totalled one million.[11]

By 1908, the General Federation had begun to play an important role in the national conservation movement. Mrs. Philip N. Moore, president of the Federation from 1908-1910, was a member of the executive committee of the National Conservation Congress during its first four years, was a presiding officer in 1912, and became its vice-president in 1913. Tribute was paid by the president of the Congress to her "rare ability" to organize and preside over large numbers of enthusiastic women. Mrs. Moore of St. Louis, Missouri, a leader in educational and philanthropic work, was born in Rockford, Illinois, graduated from Vassar College, and later became one of its trustees. She had been active for many years at the local, state, and national levels of the Federation. The voice of Mrs. Moore and dozens of other women were heard loudly and forcefully at the National Conservation Congresses held from 1909-1912.[12]

Woman's National Rivers and Harbors Congress

In 1908, seven women in Shreveport, Louisiana banded together to form the Women's National Rivers and Harbors Congress that would cooperate with the National Rivers and Harbors Congress then headed by Joseph E. Ransdell. Within fourteen months, under the leadership of its president, Mrs. Hoyle Tomkies, it had grown to 20,000 members and had held a national congress in Washington, D.C. at which twenty states were represented. As Mrs. Tomkies expressed it, "Our work is mainly to educate upon the subject . . . We are putting forth all the energy and influence we can muster for the cause, lest the enemy come while we are sleeping and sow in the peoples' minds the tares of 'individualism' and non-conservation." [13]

The Daughters of the American Revolution

In 1909 Mrs. Matthew T. Scott was elected President General of the 77,000 member Daughters of the American Revolution. A representative of the more liberal wing of the D.A.R. who had recently

defeated the conservatives in a national election, Mrs. Scott was an enthusiastic conservationist who encouraged the maintenance of a conservation committee consisting of 100 members representing every state. The chair of this committee was Mrs. James Pinchot, mother of Gifford Pinchot, who by that token as well as her conservation efforts was said to have "done more for the cause of conservation than any other woman." [14]

Pinchot himself addressed the 18th D.A.R. Congress in Washington in 1909 praising the members for their efforts against "land grabbers" and suggesting certain conservation projects for further action. At the 1912 convention Pinchot thanked the women for their efforts in aiding the passage of the Alaska coal bill and the LaFollette legislation regulating grazing, and invited them to take up the cause of water power. The D.A.R., Pinchot said on another occasion, "spells only another name for the highest form of conservation, that of vital force and intellectual energy." [15]

Other conservation efforts of the D.A.R. were directed toward the preservation of the Appalachian watersheds, the Palisades, and Niagara Falls (then threatened by over usage of water by power companies). In fact, as Mrs. Carl Vrooman pointed out to the National Conservation Congress of 1911, "these 77,000 women do indeed represent a perfect Niagara of splendid ability and force--enough, if intelligently directed, to furnish the motive power to keep revolving all the wheels of progress in this country." In 1905-6 women nationwide had responded to Horace MacFarland of the American Civic Association whose editorials in the Ladies' Home Journal on the preservation of Niagara Falls had produced tens of thousands of letters to Congress. [16]

The Audubon Movement

The post-civil War resurgence of high fashion for ladies had, by the end of the century, taken an immense toll on American bird-life in the creation of exotic styles in millinery. Bird feathers and whole birds nestled atop the heads of society's upper and middle-class women. The first Audubon societies, organized in 1886, protested the "abominable" habit of wearing feather fashions. Women who sought to

educate their sisters to the peril of birds formed Audubon clubs, such as the one at Smith College where two young female students developed a plan to protect plume birds.

In 1898 "a score of ladies met in Fairfield," Connecticut to form the Audubon society of the State of Connecticut, electing as president Mrs. Mabel Osgood Wright. With the publication in 1899, of the first issue of the Audubon Societies' official journal, Bird Lore, Mrs. Wright took on the task of editing the magazine's Audubon section and of reporting the latest developments in the politics of bird preservation. She requested that the secretaries of the initial nineteen state societies, all but one of whom were women, send news and notes to broaden and strengthen the movement.

In 1905 the Audubon Society appealed to the National Federation of Women's Clubs for help: "The club women of America with their powerful influence should take a strong stand against the use of wild birds' plumage, and especially against the use of the Aigrette A close affiliation between this Association and the National Federation of Women's clubs would be mutually helpful." [17]

At the Conservation Congress of 1909, William Finley of the national Audubon Societies addressed the assemblage on the agricultural benefits of birds and urged that the vandalism of the plume hunters be halted. "As long as women demand these plumes, he said, men will be found to supply them."

In cooperation with the request made by the Audubon Society, Mrs. Gerard, Chair of the General Federation of Women's Clubs' Forestry Committee appealed to women at the Federation's 1910 Biennial Convention: "Our work for the Audubon Society is not as active as it should be. Can we logically work for conservation and expect to be listened to, while we still continue to encourage the destruction of the song birds by following the hideous fashion of wearing song birds and egrets upon our hats?"

And speaking to the 1912 Conservation Congress, Mrs. Crocker of the GFWC's Conservation Committee asked a personal favor of the women present: "This fall when you choose your fall millinery . . . I beg you to choose some other decoration for your hats . .

." After a long campaign, in October 1913, a new Tariff Act was passed that outlawed the importing of wild bird feathers into the United States. It was so vigorously enforced that newspapers were filled with accounts of "the words and actions of indignant ladies who found it necessary to give up their aigrettes, paradise plumes, and other feathers upon arriving from Europe. Two days after the new law went into effect, Audubon Save the Birds Hats were being advertised in New York for \$45 to \$15 apiece. Congratulations poured in from all over the world for the Audubon Society's great victory.[18]

So rare as to be on the verge of extermination a few years before, by 1915 egrets in guarded rookeries in the southern United States, numbered 10,580 along with 50,000 Little Blue Herons, and an equal number of Ibis. Owing to the combined efforts of the Audubon Societies and the women's clubs, public opinion had shifted so far toward bird protection that far fewer "bad bird-laws" were being introduced into state legislatures. The work of a decade and a half had begun to show results.

Conservation and the Country Woman: Farm Organizations

Women of the rural U.S. were also vitally affected by the implications of scientific agriculture and the conservation of natural resources. Their interests were represented at the Conservation Congress of 1911 by Mrs. Harriet Wallace Ashby of Des Moines, Iowa and Miss Frances Brown of Kansas.

Mrs. Ashby was actively engaged in the formation and promotion of country women's clubs. The farmer's wife, often her husband's business partner and assistant manager, played an important role in farm efficiency and hence in soil conservation. She was both "wife and mother of the soil."

To achieve their objectives, country women organized clubs for discussion, study, and comradery. Improving children's schools and the communities' resources--libraries, churches, and social centers--meant improvement of the country way of life, thus conserving the family farm by retaining the interest of the sons in farming.

Mrs. Frances Brown of the Kansas Agricultural College was active in creating auxiliaries to Farmer's Institutes addressing efficiency and improvement of the farm home. Women studied the cost of installing lighting, heating, plumbing, and water facilities to correct the inconveniences that fostered the exodus from farm to city. Mrs. Brown also helped the public schools to form girls' home economics clubs to teach domestic science to young farm women. The underlying objective was to create under "every roof in Kansas a harmonious home where we will find every single thing that will tend to the highest efficiency and the needs of every member of the family"[19]

II. Conservation Ideology

The Conservation Trilogy

Although the women of the organizations represented at the National Conservation Congresses were public activists in their local communities, they nevertheless accepted the traditional sex roles assigned to them by late nineteenth century American society as caretakers of the nation's homes, husbands, and offspring, supporting rather than challenging the two spheres ideology of the nineteenth century.

At the National Congresses, women repeatedly called on the traditions assigned them by society in justifying the public demands they were making. Unwilling and unable to break out of these social roles, and supported by the men of the Congresses, they drew on a trilogy of slogans--conservation of womanhood, the home, and the child.

The Conservation of True Womanhood

The "conservation of true womanhood" was a subject repeatedly stressed by women at the Conservation Congresses. Mrs. Scott of the D.A.R. pleaded "as the representative of a great National organization of the women of the land, for the exalting, for the lifting up in special honor, of the Holy Grail of Womanhood." Just as the agricultural college prepared prospective farmers, so schools of domestic science would produce prospective housewives.

Speaking to the Conservation Congress of 1909, Mrs. Overton Ellis of the General Federation of Women's Clubs, called conservation "the surest weapon with which women might win success. Centuries of turning last night's roast into hash, remaking last year's dress and controlling the home's resources had given women a heightened sense of the power of the conservation idea in creating true womanhood. "Conservation in its material and ethical sense is the basic principle in the life of woman . . ."[20]

In her presidential address to the General Federation's Tenth Biennial Meeting in 1910, Mrs. Philip N. Moore set conservation in its context for women as "no new word, no new idea," but a unifying theme for the contributions of women to society as the conservors of life. "There is a 'new woman,' the product of evolution the result of social and commercial changes. She rebels, however, when she sees woman spelled with capital letters or harnessed to the word "Career." [21]

Mrs. Carl Vrooman, also of the D.A.R., emphasized the ideal woman's subservience to the man in conservation. "We may not, it is true, formulate any new policies for you, or launch any issues, or make any very original contributions to your program, but there is one thing women can bring to a movement of this kind--an atmosphere that makes ideas sprout and grow, and ideals expand and develop and take deeper root in the subsoil of the masculine mind." [22]

The Conservation of the Home

The home as the domain of true womanhood became the second theme in the conservation trilogy. The National Congress of Mothers, represented by Mrs. Orville Bright of Chicago, dedicated itself to the conservation of natural resources for "the use, comfort, and benefit of the homes of the people." "Life, health and character all depend on the home and its efficiency." Mrs. Bright adopted the utilitarian philosophy of the progressives in stressing that conservation primarily benefitted human life rather than that of other organisms, since the fate of forests, land, waters, minerals, or food would be of little consequence were there "no men, women, and children to use and enjoy them."

Margaret Russell Knudsen of Hawaii, of the Women's National Rivers and Harbors Congress argued (at the 1909 Conservation Congress) that the conservation of the home was the special mission of woman. The "mark of civilization was the arrival of woman on the scene In no national movement has there been such a spontaneous and universal response from women as in this great question of conservation. Women from Maine to the most Western shore of the Hawaiian Islands are alive to the situation, because the home is woman's domain. She is the conserver of the race." [23]

Conservation of the Child

Third in the trilogy was the link between the conservation of natural resources and the conservation of the children and future generations of the United States. According to Mrs. John Walker, a member of the Kansas City chapter of Daughters of the American Revolution, woman's role in conservation was dedicated to the preservation of life, while man's role was the conservation of material needs. "Woman, the transmitter of life" must therefore care for the product of life--future generations. The children of the nation should not be sacrificed to "factories, mills, and mines," but must be allowed "to enjoy the freedom of the bird and the butterfly . . . and all that the sweet breast of Nature offers so freely." [24]

Mrs. Overton Ellis of the General Federation of Women's Clubs promoted the conservation of children's lives at the 1909 Congress: "Women's supreme function as mother of the race gives her special claim to protection not so much individually as for unborn generations." [25]

Males active in the movement helped to reinforce the role of woman as "guardian of the child," "consecrated utterly to conservation." Reverend Charles Goss of Cincinnati, speaking to the Federation of Women's Clubs' Biennial Convention in 1910 on "Conservation in its Broadest Sense," assured them that "woman was designed by God to be the great Conservator."

Conservation and Eugenics

Conservation was far more than an umbrella word

used to promote many different social causes. It became an ideology for the preservation of middle-class American life. The conservation movement in America coexisted with and was linked to the eugenics movement that supported the supremacy of the white race and its manifest destiny over other races.

To many conservationists and eugenis, immigration of peoples from Asian and Southern European nations diluted the pure Anglo-Saxon and Nordic stock that had settled the country, and seemed to be as threatening to the progress of the race and of middle-class America as the depletion of natural resources. Many women, like the men of the progressive movement, revealed class and racial biases in their rhetoric. "We, the mothers of this generation--ancestresses of future generations," pronounced Mrs. Scott of the D.A.R. who came from old Virginia stock, "have a right to insist upon the conserving not only of our soil, forest, birds, minerals, fishes, waterways, in the interest of our future homemakers, but also upon the conserving of the supremacy of the Caucasian race in our land . . . we may be destined to see our cup of liberty . . . grow to the proportion of a grand mixing-bowl of races; but if so will it not at least be wise to see our own race dominate?" "Man's battle with nature" that had remade the planet could be attributed to the superiority of the white race. "It is the degree of success in this struggle for the triumph of the spiritual and the intellectual that marks the differences in racial types." [26]

Mrs. Elmer Black of New York City, who spoke on "War the Policy of Waste--Peace, the Policy of Conservation," at the Fourth Conservation Congress, lamented the world-wide loss through militarism of "seventeen million men, the strongest and best types, whose brain and muscle should be used for the advancement of their kind." Conservation and peace on the other hand preserved life and harnessed natural resources that could benefit the "reeking human rookeries in the cities of Europe that are a menace to the human race." [27]

Woman Suffrage and the Conservation Movement

Although the women who attended the National Conservation Congresses were speaking out on public

affairs of interest to the nation's welfare, they were limited in their influence on legislation through lack of the vote. By the time of the Conservation Congresses, several states (Colorado, Idaho, Wyoming, and Utah) had given women the vote and a nationwide woman suffrage campaign was underway. Although women representatives at the congresses did not have a platform that related suffrage to conservation, nevertheless, the issue was frequently mentioned.[28]

Mrs. Scott of the D.A.R. noted the possibility that women might sometime in the future "undertake, in addition to their other duties, the heavy responsibilities of the voter and political worker." Mrs. Holland Day who was introduced to the Congress as having migrated to Idaho because of the attractiveness of women's suffrage, replied that in the state she had left, Missouri, "the female suffrage movement is going straight along." [29]

Judge Ben B. Lindsey, in his address "Is the Child Worth Conserving?" argued that "one of the prime duties of the Nation--its duty to the child--is to extend to the women the same rights as the men, that they may go to the polls and vote on these measures."

Mr. Howard Gross, president of the National Soil Fertility League speaking to the General Federation's 1912 Biennial, supported the women's rights movement for social equality: "I am convinced that women are able to deal with twentieth century questions and conditions, and I am prepared to support any movement that has for its object the absolute equality of the sexes in every walk of life." [30]

It was the anti-suffragists, however, who self-consciously drew on conservation rhetoric--"the watchword of the hour"--in arguing against the extension of the vote to women. Suffrage was not a "natural" right bestowed on human beings at birth, proclaimed Alice Chittendon of Brooklyn. On the contrary,

"in opposing the extension of suffrage to women, we are seeking to conserve woman's natural forces for the great work Nature has given her to do I would have woman seriously consider whether she may

not better serve her day and generation by conserving her God-given powers for her own great work as a Home-maker, rather than diffuse her forces by seeking to do man's work also." [31]

Denouement

The Fifth National Conservation Congress opened in Washington, D.C. on November 18, 1913 and proceeded for three days. Its vice-president, Mrs. Philip N. Moore of the General Federation of Women's Clubs did not speak. Nor did any other woman from the Federation, the D.A.R., the Country Women's Clubs or the Women's National Rivers and Harbors Congress. The sole female voice heard was Miss Mabel Boardman from the American Red Cross who lectured on "Conservation of Life in the Lumber Camps." [32]

American Forestry (the new name of the journal of the American Forestry Association) carried a full report on the meeting in its November issue. Descriptions of the activities of the Congress were accompanied by the portraits of fifty men who had chaired or worked on the committees. A photograph taken the night of the Forestry Banquet on November 19 showed some 160 men seated at round tables before a speaker's platform. Mrs. Philip N. Moore was not among them. [33]

A brief note in the Forestry Committee's report to the Congress seems to provide the explanation for the absence of women:

The desirability of . . . an organization [to represent the mutual forestry and lumbering interests] was emphasized by the presence at [the Fourth National Congress in] Indianapolis [1912] of a number of men who were no longer in need of the general educational propaganda relative to the conservation of natural resources, but attended the Congress for the purpose of meeting progressive men in their own and related lines and securing specific information helpful in the solution of their own problems.

Conservation and forestry had come of age as technical professions. As such they were no longer

accessible to women. After 1912 the American Forestry Association ceased to print articles or news items on the work of women in forestry. Lydia Adams-Williams disappeared from the scene.[34]

A second explanation for the disappearance of women also seems plausible. That same year the popular nationwide struggle for the preservation of Hetch Hetchy Valley, a part of California's Yosemite National Park, reached its conclusion. With the passage of the Raker Act by Congress in 1913, the City of San Francisco won its long battle for a public water supply. The women of the conservation crusade had worked hard to preserve the valley as an integral part of the park.

Gifford Pinchot, the women's early inspiration and supporter in conservation efforts had taken the opposing side, recommending at the congressional hearings that a dam be constructed across the valley to serve the interests of thousands of city people rather than accommodate the needs of the few who camped and hiked in the area.

Soon after a City of San Francisco referendum in November 1903 favored construction of the dam, John Muir had taken the Hetch Hetchy issue to the nation. Preservationists rallied to support its retention in the park through letters and telegrams to the House Committee on Public Lands which held hearings in January 1909. Among them were women who had camped in the valley, who were members of the Sierra Club or Appalachian Mountain Club, or who were opposed to the commercial use of such a scenic wonderland.[35]

By December of 1909, Muir had begun to bombard the popular magazines with articles and photographs describing the scenic wonders of the valley. The Federation Courier, official organ of the California Women's Clubs ran his "Brief Statement of the Hetch Hetchy Question" in December announcing that the bill would soon come before Congress. As president of the Society for the Preservation of National Parks (formed because the San Francisco based Sierra Club was divided 589 to 161 against the dam), Muir had collected the endorsement of the General Federations of Women's Clubs, the California Federation, and many other State Federations who all adopted resolutions protesting the scheme. On the east coast Muir's article was carried in the Federation's Woman of

Today published in Boston. By the end of 1910, 150 women's clubs throughout the country were actively engaged in the preservation of Hetch Hetchy Valley.[36]

The women's support for the Hetch Hetchy Valley was viewed dimly by the men of the opposition. Marsden Manson, San Francisco's city engineer who supervised the surveys and plans for the dam, believed that his opponents consisted largely of "short-haired women and long-haired men" who were members of the "so-called nature-loving societies like the Appalachian Club of Boston, the Saturday Evening Walking Club of Chicago, et id genus omne." He maintained a "list of names and addresses of people objecting to [the] use of Hetch Hetchy," that included numerous women and believed it was necessary to dispell fallacies perpetrated by "individuals and corporations acting behind the screen of well meaning and innocent nature lovers." [37] Manson found an ally, however, in Caroline K. Sherman of Chicago who had met him on a visit to Yosemite and told the Forestry Department of the Chicago Federation of Women's Clubs that he was not a "cold-blooded engineer, ignorant of forestry, and indifferent to beauty," and that Muir although a poet and artist "could not speak with the authority of a sanitary engineer." [38]

In 1913, the National Committee for the Preservation of Yosemite National Park headed by Robert Underwood Johnson, editor of The Century, and Charles Eliot, president of the First Conservation Congress circulated brochures on "The Hetch Hetchy Grab" and "The Invasion of Yosemite National Park" documenting oppositon from over 100 newspapers. Among the prominent citizens listed as preservationists for the park were Mrs. Emmons Crocker, chair of the Conservation Committee of the General Federation of Women's Clubs. On the committee, which represented most of the states of the union were twenty-five women, some of whom, like Mrs. Philip N. Moore, were General Federation leaders now openly opposed to Pinchot.

Although preservationists lost the battle over Hetch Hetchy in December 1913, they had aroused the nation. The passage of the National Parks Act in 1916 that established an administration in the Department of the Interior for the numerous parks

created since 1862, gave them some compensation for its loss.

On a national level the conservation movement slackened during the second decade of the twentieth century, with the erosion of government backing, the narrowing of support for Gifford Pinchot, and the professionalization of forestry and water-power engineering. Although women were not active in the professions or as visible on the national level as they had been at the height of the conservation crusade, their interest in the creation of parks, gardens, and bird preserves did not vanish with the decline of organized conservation. The General Federation of Women's Clubs continued to maintain a Conservation Committee, and the Audubon societies provided women with avenues for leadership as secretaries and presidents of local chapters. Constituting approximately 35% of the Audubon national membership in 1905, the number of women had risen to slightly over 50% by 1915.[38] The Sierra club afforded women expanded opportunities for wilderness and on many club trips, female members began to outnumber males. More women than men had become members of the National Parks Association by 1929.[39]

During the decade and a half that introduced the century, women's organizations had helped the nation to achieve enormous gains in the conservation of natural resources and the preservation of scenic landscapes. Yet the platform for promoting these objectives had been a mixed one. Working closely with the men of the movement, women frequently saw themselves as ideologically opposed to what they perceived as commercial and material values. Feminist and progressive in their role as activists for the public interest, they were nevertheless predominantly conservative in their desire to uphold traditional values and middle-class life styles rooted in these same material interests. These contradictions within the women's conservation movement, however, were in reality manifestations of the similar mixture of progressive and conservative tendencies that characterized the progressive era itself.

ENDNOTES

[1] Gifford Pinchot, The Fight for Conservation (New York: Doubleday and Page, 1910), pp. 101, 105-6.

[2] Samuel Hays, Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920 (New York: Atheneum, 1975; originally published 1959), pp. 142-144; Robert Welker, Birds and Men (Cambridge: Harvard University Press, 1955) pp. 184-199; Stephen Fox, John Muir and His Legacy: The American Conservation Movement (Boston: Little Brown and Company, 1981) pp. 341-5, 173-8.

[3] Karen Blair, The Clubwoman as Feminist: True Womanhood Redefined, 1868-1914 (New York: Holmes & Meier, 1980); Aileen S. Kraditor The Ideas of the Woman Suffrage Movement, 1890-1920 (New York: Columbia University Press, 1965); Hans Huth, Nature and the American (Lincoln, Nebraska: University of Nebraska Press, 1957) ch. 7, 9; Liz Keeney, "Women and Popular Botany: A Study in Nineteenth-century American Social Values," paper given at the Berkshire Conference on Women's History, Vassar College, 1981; Fox, p. 341. Peter Schmitt, Back to Nature: The Arcadian Myth in Urban America (New York: Oxford University Press, 1969).

[4] Mary S. Gibson, editor, A Record of Twenty-five Years of the California Federation of Women's Clubs, 1900-1925 (n.p.: The California Federation of Women's Clubs, 1927), pp. 6, 7.

[5] Gibson, ed. pp. 10-11.

[6] Mrs. Welch, General Federation of Women's Clubs, "Address," Proceedings of the Second National Conservation Congress at Saint Paul, September 5-8, 1910 (Washington: National Conservation Congress, 1911), p. 161; Mrs. F. W. Gerard, Chairman, "Report of the Forestry Committee," in the General Federation of Women's Clubs, (cited as G.F.W.C.) Tenth Biennial Convention (Newark, New Jersey, 1910), pp. 127-31; Lydia Phillips Williams, "Announcement of the Forestry Committee," Federation Bulletin: Official Organ of the Massachusetts State Federation of Women's Clubs, 2, no. 6 (March, 1905), p. 192; Federation Bulletin, 4, no. 5 (February, 1907), pp.

201-3; Mrs. P. S. Peterson, chairman, Forestry Committee, "Suggestions to Club Women of the United States," Federation Bulletin, 5, no.2 (November, 1907), pp. 58-9, quotation on p. 58.

[7] Mrs. Overton Ellis, "The G.F.W.C.s in Conservation Work," First National Conservation Congress, pp. 149-58; Welch, Second National Conservation Congress, p. 161; Gerard, G.F.W.C. Tenth Biennial, p. 130; Mary L. Wood, The History of the General Federation of Women's Clubs (New York: G.F.W.C., 1912), pp. 149, 170-1, 195, 208-9, 217, 221, 231, 245, 253, 257, 263, 282, 296.

[7a] Mrs. J. D. Wilkinson, Chairman Waterways Committee, "Report of the G.F.W.C., Second Conservation Congress, pp. 412-413. Wilkinson, Report of the Waterways Committee, in G.F.W.C., Tenth Biennial, 1910, pp. 140-3; Joseph Ransdell, "Our National Waterways," G.F.W.C. Tenth Biennial, pp. 144-150, quotation on p. 150.

[8] Wood, History of the G.F.W.C., p. 282.

[9] Lydia Adams-Williams, "Forestry at the Biennial," Forestry and Irrigation, Official Organ of the American Forestry Association, 14, (1908), pp. 435-7; "Fighting for her Trees," Forestry and Irrigation, 14 (1908), p. 230. See also pp. 17, 127, 231.

[10] Lydia Adams-Williams, "Conservation--Woman's Work," Forestry and Irrigation, 14 (June, 1908), pp. 350-1, quotation on p. 350. See also Adams-Williams, "Waste of Natural Resources and Need for Conservation," Forestry and Irrigation, 14 (1908), pp. 266-9, on the expenditures and projects of the U.S. Reclamation Service, the Inland Waterways Commission, rate of consumption of coal and wood, and the need for scientific management.

[11] Lydia Adams-Williams, "A Million Women for Conservation," Conservation, Official Organ of the American Forestry Association, 15 (1909), pp. 346-7; Adams-Williams, "Upholding the Government," Forestry and Irrigation, 14 (May, 1908), p. 270.

[12] Fourth Conservation Congress, pp. 240-1, 248; Wood, History of the G.F.W.C., pp. 244-5.

- [13] "The Women's National Rivers and Harbors Congress, Conservation, 15 (909), p. 642.
- [14] Margaret Gibbs, The D.A.R. (New York: Holdt Reinhart and Winston, 1969), pp. 79-80. Mrs. Carl Vrooman, D.A.R., "Address," in Proceedings of the Third National Conservation Congress at Kansas City, Missouri September 25, 26, and 27, 1911 (Kansas City, Missouri 1912), pp. 117-9, quotation on p. 117.
- [15] Gibbs, pp. 78, 82; American Monthly, April 19, 1909; Third Conservation Congress, p. 117.
- [16] Third Conservation Congress, p. 117. J. Horace McFarland, "How the Power Companies Beautify Niagara," Ladies Home Journal, 23, no. 11 (October, 1906); ibid., 22 (Sept. 1905) and 23 (Jan. 1905).
- [17] Bird-Lore, 7, no. 6 (December, 1905), p. 308; T. Gilbert Pearson, "The White Egrets," Bird-Lore, 14, no. 1 (Jan.-Feb., 1912), p. 62. Welker, Birds and Men, pp. 189, 196-9, 207; "The Connecticut Society" Bird-Lore, 1, no 1 (Feb., 1899), pp. 30-1.
- [18] William F. Finley, "Conservation of Wild Birds," First Conservation Congress, p. 112. Mrs. F. W. Gerard, "Report of the Forestry Committee," G.F.W.C. Tenth Biennial, p. 129. Bird-Lore, 15, no. 6 (Nov.-Dec., 1913), p. 399.
- [19] Harriet Wallace Ashby, "The Farmer's Wife," Third Conservation Congress, pp. 121-25, quotation on p. 125. Frances Brown, "Address," Third Conservation Congress, pp. 128-9, quotation on p. 129.
- [20] Mrs. Overton Ellis, "The General Federation of Women's Clubs in Conservation Work," First Conservation Congress, p. 150.
- [21] Mrs. Philip N. Moore, Tenth Biennial, pp. 29-30.
- [22] Mrs. Carl Vrooman, Third Conservation Congress, p. 119.
- [23] Margaret Russell Knudsen, First Conservation Congress, p. 208.

- [24] Mrs. John Walker, Fourth Conservation Congress, p. 255.
- [25] Mrs. Overton Ellis, First Conservation Congress, p. 155.
- [26] Mrs. Matthew T. Scott, Second Conservation Congress, pp. 277, 276.
- [27] Mrs. Elmer Black, "War, the Policy of Waste, Peace the Policy of Conservation," Fourth Conservation Congress, pp. 254-5.
- [28] Aileen Kraditor, The Ideas of the Woman Suffrage Movement, 1890-1920 (New York: Columbia University Press, 1965), pp. 4-6.
- [29] Mrs. Matthew T. Scott, Fourth Conservation Congress, p. 254; Mrs. Holland Day, Third Conservation Congress, p. 28.
- [30] Judge Ben B. Lindsey, "Is the Child Worth Conserving?" Fourth Conservation Congress, pp. 180, 181. Howard Gross, "Conservation of the Soil," G.F.W.C., Eleventh Biennial, p. 260.
- [31] Alice Chittendon, "Anti-Suffrage," G.F.W.C., Tenth Biennial, pp. 243, 251-2, 253.
- [32] Report of the Forestry Committee of the Fifth National Conservation Congress, Washington, D.C., 1913), especially pp. 385-9.
- [33] American Forestry, 19 (November, 1913), banquet photograph on p. 970.
- [34] On women in the forestry profession in recent years see Sally K. Fairfax and Lois Whitte, "Women in Forestry," Proceedings of the Eighth World Forestry Congress, Jakarta, Indonesia, October 16-18, 1978.
- [35] U.S. Congress, House, Committee on Public Lands, Hearings on HJ Res 223, "San Francisco and the Hetch Hetchy Reservoir," 60th Congress, 2nd, session (January 9, 12, 20, 21, 1909).
- [36] John Muir, "Brief Statement of the Hetch Hetchy Question," G.F.W.C., Federation Courier, 1, no. 2 (December, 1909), p. 2. Muir, "Brief Statement,"

The Federation Bulletin for the Woman of Today, 7, no. 4 (Boston, January, 1910), pp. 110-111. Gerard, "Report of the Forestry Committee, G.F.W.C., Tenth Biennial, p. 130. Nash, Wilderness, p. 169.

[37] Marsden Manson to G. W. Woodruff, April 6, 1910, Manson correspondence, Bancroft Library, University of California, Berkeley, Manson "Names and Addresses of people objecting to use of Hetch Hetchy", ms., n. d.

[38] Caroline K. Sherman, to Marsden Manson, Oct. 15, 1909, Manson Correspondence, Bancroft Library, U. C. Berkeley.

[39] National Committee for the Preservation of the Yosemite National Park, "The Hetch Hetchy Grab," Bulletin no. 1 (1913). Idem, "Comments of the United States Press on the Invasion of the Yosemite National Park," Bulletin no. 2 (1913). Hays, Conservation and the Gospel of Efficiency, pp. 185-98; Fox, John Muir, pp. 343-5; "List of Members," Bird-Lore, 7 (November-December, 1905), pp. 345-8; "List of Members," Bird-Lore, 17 (November-December, 1915), pp. 541-8. Prager, "Remembering the High Trips," p. 8; Fox, John Muir, p. 343 and note, p. 422.

CONSERVATION, ENVIRONMENTALISM, AND THE ENGINEERS:
THE PROGRESSIVE ERA AND THE RECENT PAST

Carroll Pursell
University of California
Santa Barbara, California

American engineers played an important role in the conservation movement which burst upon the public in May of 1908 at the White House conference of governors. Technical professionals both within and without the government had nurtured and helped guide the movement from its beginnings in the post-Civil War decades.[1] They gave this support for two primary reasons--because the concept of efficient utilization of natural resources was congenial and indeed basic to the thought and practice of the engineer, and also because their professional status and interests made it an attractive vehicle for their own advancement, and that of the other interests they served. There were, of course, always engineers who tempered their enthusiasm for the movement with a concern for the fact that it might fall into the wrong hands. Fueled by public outrage, steered by moral rhetoric, and aimed at political action, the conservation crusade appeared like people themselves, creatures of passion held in check only by a constant recourse to reason.

Virtually all engineers agreed that conservation, properly considered, meant efficient use of the nation's resources. The definition given to civil engineering by Thomas Tredgold in 1828 as "the art of directing the great sources of power in Nature for the use and convenience of man" was taken as sufficient warrant to give the engineer a clear responsibility in the field of conservation. For them it was an old goal, not a new cause. When the movement was publicized in 1908 engineers saw it as their own, applauded its new support, and hoped to continue to direct it into what they saw as useful and reasonable paths.

Conservation had its origin in part in the increasing awareness that the American frontier was closed and that the nation faced, for the first time, the need to adjust its resource policy to the requirements of a closed system. At the same time, scientists and engineers in a score of Federal agencies felt increasingly able to collect and

interpret basic physical and biological data concerning the country's resources. The need and the ability came together nicely during the administration of Theodore Roosevelt. Concurrently, a growing appreciation of the American wilderness was leading to the establishment of a handful of national parks. The two movements did not always cooperate and, indeed, were often antagonistic. Despite an occasional victory by the preservationists, such as the creation of a separate National Park Service, in 1916, it was the conservationists led by the Forester Gifford Pinchot who dominated the counsels of policy.

Those who would preserve resources, whether for aesthetic or future use, like those who were complacent in the face of waste, found few defenders among engineers. John Birkinbine told the American Institute of Mining Engineers in 1909 that conservation was a "practical development for which able men have labored conscientiously, persistently, and not unsuccessfully, for many years." Every process, he said, "which reduces the fuel consumed or the power applied per unit of product; every utilization of waste material, or employment of the formerly rejected, to obtain something of value; every feature of construction or operation which lessens the labor required or increases the output per employee, is an advance in the direction of true conservation." [2] John Hays Hammond, a wealthy mining engineer and close friend of William Howard Taft, attended the 1908 White House conference, as he said, to explain "the 'professional view': avoid waste and concentrate on utilization." [3] Furthermore, it was only one manifestation of a general engineering approach. Three years after the White House conference Frederick Winslow Taylor opened his epoch-making book Principles of Scientific Management with a quotation from Theodore Roosevelt's remarks to that gathering: "The conservation of our national resources is only preliminary to the larger question of national efficiency." [4]

Engineers were led to support the movement as much by their professional needs and their traditional concerns. In the fall of 1908 the insurgent engineer Morris L. Cooke told his seniors in the American Society of Mechanical Engineers that "in the work of the engineer there are three parties

interested, i.e., the engineer, his employer and the public." [5] By cooperation with the conservation movement engineers could hope to satisfy all three interests with a harmony of results not always forthcoming from technical activities. The conservation crusade in 1908 appeared to provide an avenue through which engineers could serve their own professional status by providing expert knowledge not to be found elsewhere; serve their employers because the large corporations, which were the most likely to employ engineers were the most likely to benefit from the imposition of conservation methods; and serve the public by educating them to their own long-term self-interest in the efficient and orderly disposition of resources.

The number of engineers in the United States grew from 7,000 in 1800 to 136,000 in 1920, making it one of the most numerous of those groups whom Robert Wiebe has identified as viewing their problems more in terms of occupation than of local community. [6] Indeed, engineers had taken a lead in this movement, for while most professional groups were organized along national lines only between 1895 and 1905, the four founder societies of the engineering profession had been set up in 1852, 1871, 1880, and 1884. [7] Despite this early urge toward professionalism, however, the engineers' dual nature as part scientist and part businessperson continued to create a tension between their desire for professional independence and their need to serve the large corporation for which they typically worked. [8] Two roadblocks seemed to stand in the way of triumphant expertise: a long tradition of amateur success and a democratic theory which had long ago been vulgarized in the Jacksonian concept that any person ought to be able to do any job.

The first objection could be answered by assuming that the nation was moving out of one era into another. Samuel P. Sadtler pointed out to his fellow chemical engineers in 1909 that the history of natural resources in this country had gone through three stages: the first was one of "exploration or discovery"; the second stage was one of "exploitation, when these lavish gifts of nature are worked with a view mainly of increasing production, and usually in a wasteful way, with no thought of the exhaustion of the supply." The third stage, just begun, was that of conservation. While amateurs

might discover and exploit, only engineers could conserve. It was an inevitable step in the process of progressive civilization.[9]

The argument of equality was more difficult. One answer was given in the pages of Science: "True democracy," it was said, "is scientific method applied in politics But whether verified or falsified, it is not the generalization itself, but the test of it, which is the sum and the substance of the principle of equality. This is a doctrine of method, not a statement of results." It behoved those who resisted the intrusion of experts, of course, to come up with reasons for that resistance, rather than the reverse, and it is doubtful whether many engineers bothered with such explicit self-justifications. The proper role of the expert in a democratic society, however, was one of the most interesting questions of the day and one which was frequently worried over during the first two decades of this century.[10] For most engineers it was enough that conservation required experts and therefore offered a vast new field for their unique talents.

The engineers also had to serve their employers. "The work of the expert," wrote one observer in 1914, "is largely carried on as a branch of corporate activity. Our men of science, pure and applied . . . while they may practice their specialties alone, very commonly also serve some corporation, and in great numbers serve a corporation exclusively"[11] Engineers in this country had always been bureaucrats and even the four great engineering societies were to varying degrees influenced by corporate as well as professional considerations.[12] "The public outcry against corporations for wasting the natural resources of the nation," wrote one mining engineer, "is unjust in so far as it fails to recognize what we have done and are doing in the direction of conservation, and inasmuch as it gives the working-staff of these great corporations so little credit for the marvelous progress the world has made through their instrumentality." In the best tradition of the mill owner who thought of himself as only another worker, he insisted "that neither our largest mining and metallurgical companies nor ourselves, as their working agents, are recklessly indifferent to the preservation of those very materials upon which the wealth of the corporations

and our own salaries depend." [13]

The engineers' first obligation to their employers, of course, was not simply to exonerate but to make money for them--or, as one engineer phrased it, to 'conserve capital'. [14] There were other ways in which they could be of use, however. Speaking for his colleagues one chemical engineer in 1909 claimed that their most important function was "in counseling and indicating how the wholesome influence of conservation can be applied so as to broaden and extend the scope of the industry, to maintain and add to its remunerative character and to give it stability and promise of permanence." [15] Thus was the engineer to be the instrument of transmission from the industrial anarchy of the 19th century to the new industrial state of the 20th.

Some embarrassment was encountered in the fact that resources undeniably had been exploited by corporations in a wasteful way. This difficult fact was met by spreading the blame widely, then insisting that the corporations were acting only in response to outside (usually economic) pressures. The habit of waste, it was said, was widespread throughout American society. One mining engineer claimed that "the waste in our kitchens and at our tables involves a greater national loss than the waste in our coal-mines," a charge that another mining engineer, Herbert Clark Hoover, was to look into within a few short years. [16] The journal Engineering Record insisted in 1908 that the waste of resources "cannot fairly and properly be attributed in general to greed." Instead, it was consumers rather than producers, who were responsible, through their insistence on only the best and their refusal to purchase run-of-the-mine material. [17] It was alleged, on the other hand, that experience had shown that captains of industry, when informed where their true interests lay, had usually done the right thing with regard to eliminating waste.

Another threat to corporations was the imposition of policies based on pure theory, unleavened by experience. Being committed to business as well as to science, engineers saw themselves as more level-headed than their colleagues trained only in the sciences. A letter to the editor of Science, signed "Industrial Engineer," complained in 1911 that "scientists in the government bureaus

often have no adequate knowledge of the industries affected by the regulations which they are called upon to draw up and enforce and hence they are not in a position to properly distinguish between attempts to evade the law and real protests concerning unnecessarily restrictive rulings". Warning that "the industries of the country appear to be the financial foundation upon which our government rests," he asked that regulatory agencies be staffed with technical men with more than "theoretical study and teaching" in their background.[18]

The same note of frustration was struck by another author, responding to an article on water conservation by the scientist-bureaucrat W J McGee. "A class of theorists in the east," he complained, "has taken up the same subjects de novo, treating them as if they had never before been touched by the hand of man and the way were free for any sort of plan to be carried out It wears the patience of the people of the west to be obliged to deal with such persons, who have a missionary zeal"[19] Their textbook theories tempered by the hard experience of the business world, engineers believed that they were more likely to lead the conservation movement into realistic and practical channels.

Nor were scientific theories the only ones to be guarded against. Socialism itself seemed very near the surface of the conservation movement in several places, and engineers thought they could aid in dealing with this threat as well. The idea of preventing waste, claimed one mechanical engineer, "is not the idle dream of the socialist but it is the result of years of experience." [20] An employee of the Bureau of Standards urged engineers to support the research efforts of that agency as an aid to utility valuation and rate fixing. Proper regulation was now accepted by all parties as a legitimate function of government. "How infinitely better," he pointed out, "is this method of regulation than the building of publicly-owned utilities to compete with private plants already in existence." It "is not socialistic," he urged, "but rather the reverse, for it is the alternative of state ownership." [21]

This same technician saw the method of regulation as proper for trusts as well as utilities: "namely, less dependence on law and the courts, and

more dependence on engineers, statisticians and business experts; . . . the government should prescribe affirmative duties for the great corporations, and not merely negative ones . . . "[22] For those who saw waste lurking behind protection,[23] one mechanical engineer warned that while it was true that "the tariff built up the trusts, . . . the trusts have built up the country, and the change from present conditions must be made slowly to avoid destruction." [24] Indeed in 1916 the journal Engineering News looked with editorial favor upon a movement developing, with the aid of engineers, within the National Chamber of Commerce to promote the idea that firms operating in the natural resource industries should be specifically exempted from anti-trust legislation.[25] There was a tendency among politicians, it noted, to worry more about the question of ownership than about the more important problem of efficient utilization.

Such cautionary messages on the part of engineers may have led some observers to suspect that they served only the interests of their employers, but such was not the case. Indeed they were increasingly aware of the need to serve what the Progressive engineer Morris Cooke called "that great employer, the people, for whom in the last analysis all ultimately useful work is done." As professionals, engineers hoped to transcend the traditional dichotomy of the labor-management struggle. For Cooke, who was a leading spokesman for this urge, the time seemed "near when in matters in which they are specially qualified engineers must, individually and collectively, labor for the public interest with just as much fidelity and zeal as they work for their employers, and this not as public spirited citizens but rather as members of a public spirited profession." [26]

The danger, of course, was that the public interest might in fact not always coincide with the private interests which engineers were hired to further. A few engineers proposed to meet the problem head on. In a letter to the editor of Science in 1912 one pointed out that "as soon as remedial legislation is attempted, the forces of monopoly show themselves to be stronger than science, stronger than governors or presidents." Consequently, he urged that "distasteful as it may be to men of science to enter into the sphere of

politics, the lesson which the laborers have been slowly learning, that the needs of industry receive no attention until pushed to the center of the political arena, must apparently be taken home by science also." [27] Asserting that the engineer was "needed in politics to combat its dishonesty and slouchiness of thought and method," one technical writer claimed that "our country calls for such men and they are needed in the councils of the nation. The businessman has broken into the preserves of the lawyers in legislative halls and administrative offices. Why should not the "live-wire" engineer be there also? Why should he not be a maker of policies, instead of a mere technician, retained to work disadvantageously under the direction of the incompetent?" [28]

Most engineers, however, while agreeing that the profession should act in the public interest, thought that interest might better be served by a less partisan and potentially less divisive course of action. Addressing a joint meeting of the founder societies, called in 1909 to discuss the problem of conservation, one speaker asserted that "the engineer is year by year coming into more important relation to the public as its trusted guide on some of its larger matters of welfare, and in order to maintain this confidence and gain still greater opportunity for doing good, he must not join in the shouting until he has studied into the merits of both sides of the case and must then be steadfast to common sense and to the truth." [29] An electrical engineer told the same meeting that "in our offices and in the field, we may be retained properly to represent this or that special interest, but on the floors of our engineering societies our proper attitude is that of the man of science interested solely in the facts, their causes, relations, and consequences." [30] To many engineers, the confines of the dignified and scholarly professional meeting marked the proper bounds of public service. Most applauded the idea that conservation should be "kept out of politics."

When the movement for the conservation of natural resources became a public concern in the spring of 1908, engineers embraced it as a familiar and constructive activity, one which they had always attempted to keep in mind even as they served the corporate exploiters of those same resources. As servants of their own self-interest, their employers,

and the public at large, they saw in the movement not a threat to any one of these but, on the contrary, an important concern which if pursued would tend to benefit all three.[31] There were, of course, certain dangers involved. John Hays Hammond later felt that after 1908 both Interior Secretary James R. Garfield and Gifford Pinchot were "overenthusiastic" and advocated locking up resources for the future, an "exaggerated and a sentimental view . . . [which] exactly suited the crusading and capricious spirit of my friend Pinchot." [32] Some of the supporters of the movement made uncomfortable bedfellows for engineers. The latter, it was hoped, would "prescribe saner remedies for the evils--whose existence they will be the last to deny--than either the politicians or the irresponsible, anonymous writers in the public press." [33]

The dangers of "getting into politics" were seldom minimized, and many engineers professed to have a greater faith in research and education than in legislation. Decrying "ignorant and sentimental altruism" and believing that "the everlasting multiplication of statutes is a crying nuisance of our generation," one engineer asserted that "in my judgement, the progressive education of the people and the steady pressure of economic conditions will effect this result [the prevention of waste], as a general rule, better than any legislation can do it." The greatest danger was "that of hasty and ill-considered action, taken under the influence of an ignorant though well-meaning public sentiment, roused or guided, in too many instances, by selfish interests." [34]

The conservation movement was at the crux of the Progressive Era not merely because Theodore Roosevelt said so, but more importantly because so many of the key threads of the period became tangled there: the search for order, the groping for a new social role by emerging professionals, the working out of a new way of government which would substitute expert administration for political battle, and the attempt to preserve values suitable to an older time in the new technical-industrial social setting. It was a movement aided and abetted by the nation's engineers, many of whom felt these new stirrings deeply within their own experience.

The actual number of engineers who were

concerned with something Gifford Pinchot would have called conservation was no doubt comparatively small, even during the years 1908-1909. This number, however, included some of the most articulate and influential members of the profession. A group of engineers succeeded in having the profession officially represented at the White House Governor's Conference, and the four founder societies met both separately and jointly to discuss the question. And if not all engineers expressed themselves on the subject, all had the opportunity to read about it--W J McGee noted jubilantly in the spring of 1908 that the engineering publications of the nation were giving "large attention" to the White House conference. [35]

The association of engineers with the conservation movement was not an unmixed blessing. Calls for more hard, scientific data could be used to delay action. [36] Hopes for new inventions (such as by-product coke ovens to save coal tars) could dull the demand for legislation. The sometimes self-imposed limits to professional competence could easily fragment the effort and militate against the broad systems approach to resource management advocated by Pinchot and his colleagues. On balance the involvement of engineers with the movement probably tended to make it more respectable and more conservative. The benediction of science and technology tended to give legitimacy to the concern, but also served to obscure (and sometime even denigrate) the fact that the basic problems were social and political rather than technological.

Even a cursory review of the engineering literature of our own time indicates a wide agreement between the concerns and strategies of the Progressive-era engineers and those of their colleagues today. From the beginnings of the environmental movement in the 1960s to the present, technical experts have expressed the same overarching fear of emotional politics and the same desire to transcend that danger with a rational appeal to facts. Now as then, the demands of the profession, the corporations for which they typically act, and of society at large appear to share a need for policies embodying less passion and more science.

In February 1970, writing in the atmosphere of the upcoming Earth Day and the shadow of the National

Environmental Protection Act, and the Air Quality Act of 1967, the Executive Director of the American Society of Civil Engineers warned that "the conservationists will do well to see that the engineer--and especially the civil engineer--is indispensable to environmental development! There is no other discipline competent to take his place." Insisting that "it is time that we converted pointless, inhibitive emotion into constructive, cooperative promotion," he concluded with the challenge "Builders of the environment, unite! There is work to be done!"[37]

As in 1908, professional organizations turned their attention to what was shaping up as one of the major political focuses of the decade. The 20th Annual National Engineers Week celebration in February 1970 spoke to the theme: "Engineering . . . Environmental Design for the 1970s." [38] In May the American Institute of Chemical Engineers organized a new Environmental Division to, among other things, "further the application of chemical engineering in the environmental field." [39]

Specific application ran from the bizarre, through the theatrical, to the practical. In January 1970 the physicist Edward Teller urged that the government "expand the Plowshare program" and use atomic bombs to "make the world cleaner". Specifically, he had in mind the creation of large underground storage caverns along the East Coast for everything from garbage to natural gas. [40] In April 1969 the South Texas Section of the American Institute of Chemical Engineers advertised what it called a "Pollution Solution" to a local waste problem: first a public demonstration was staged to show that a waste product of a nearby mill would clarify murky waters, then it was planned to dump a whole truckload directly into a polluted nearby bayou. It was noted that this demonstration had several "salutary effects": "Primarily, the efforts should result in a significant improvement on the local level, and the community will be the beneficiary. The chemical engineers, and the AIChE, are being viewed in a different, and much more favorable, light because of the publicity generated by the committee. Finally, a waste will be converted into a useful entity; a not unusual occurrence in the chemical industry." [41]

More significantly, it was reported in 1977 that as a result of the environmental movement in general, and the 1972 Federal Water Pollution Control Act in particular, the once technologically-backward paper industry was starting to hire a large number of engineers to design pollution-control devices. The paper industry is also a prime example of the way in which corporations were benefitted by environmentally inspired improvements in engineering utilization. Initially, by raising the cost of doing business, the regulations also raised the barriers to entry by potential new competitors. The antique working of the industry, once characterized by boom and bust competition between family dominated firms, was transformed by new capital, management, and engineering talent. The latter, brought in initially to design pollution devices, stayed to revolutionize the entire paper-making process. Recovery of byproducts was particularly important, and by the mid-70s Georgia-Pacific kraft paper mills were not only producing fifty percent of their own fuel requirements, but also chlorine, caustic soda, poly-vinal chloride, drilling muds, feed binders, swimming pool chlorine, waterproof and phenolic glues, suntan lotion, plastic containers, a detergent, and furniture polish. The journal New Engineer chronicled this story in an article titled, "How the Environmentalists Did the Paper Industry a Big Favor." [42] It was another example of engineers doing well by doing good.

Finally, today as in the Progressive Era, the service ethic of the engineering profession runs through all of the rhetoric of environmental concern. The public welfare is, in the last analysis, the formal and official goal of engineering practice. Analyzing the probable impact of the new Reagan administration, a chemical industry representative used the pages of Chemical Engineering Progress to remind its readers that the nation's courts had found that professionalism is "special knowledge in the arts and sciences; practical application of such learning and knowledge in advising, guiding, or serving the interest and welfare of others as distinguished from self." Echoing a lament hoary with age, he decried the tendency of engineers to hide their light under bushels. [43] In 1970 the then president of the American Institute of Chemical Engineers urged his colleagues to get into the public arena for the public good. "Conservation and urban

renewal groups," he wrote, "should welcome the knowledgeable aid of the chemical engineer. In fact," he added, "the chemical engineer's training in collecting data, assessing alternatives, and settling for the most feasible solution to a problem can be useful in many complex situations. But who--aside from their wives--will learn to appreciate chemical engineers unless we speak out?"[44] The vice president for public affairs of Shell lay down the challenge: "You, as a member of a respected professional society, can add that dimension of credibility and balance to the decision-making process that gives society the very best chance of coming up with workable laws and regulations."[45] Even the old notion of salvation through invention was dusted off.[46]

The implication that the Shell corporation would be willing to be guided by unbiased scientific facts rather than profit-maximizing strategies underlay the special appeal of both the conservation and the environmental movements for engineers. Concerned at once with enhancing their own occupational status, serving their employers, and behaving in a professionally responsible way toward the public at large, they saw in the environmental issue an opportunity to serve all three needs with a minimum of conflict. Such a hope, however, hinged on the continued tendency of Americans to look for technical solutions to political problems--or more accurately, to redefine social problems as technical ones so as to eliminate or disguise political choices. Throughout this century engineers have reacted to conservation and environmental crises on the basis of needs buried deep in the structure of their profession. Both the ideology and the economics of their situation led them to welcome reform movements--so long as they were defined in their own terms and led by their own kind.

NOTES

[1] The basic study of this movement is Samuel P. Hays, Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920 (Cambridge, 1959). See also Edwin T. Layton, Jr., The Revolt of the Engineers: Social Responsibility and the American Engineering Profession (Cleveland,

1971), pp. 63-64, 116-117, and 212-213.

[2] John Birkinbine, "The American Institute of Mining Engineers and the Conservation of Natural Resources," Transactions of the American Institute of Mining Engineers, 40 (1909), 417, 412.

[3] The Autobiography of John Hays Hammond (New York, 1935), II, 557.

[4] The standard study of this movement is the excellent Samuel Haber, Efficiency and Uplift: Scientific Management in the Progressive Era, 1890-1920 (Chicago, 1964).

[5] Morris Llewellyn Cooke, "The Engineer and the People: A Plan for a Larger Measure of Cooperation between the Society and the General Public," American Society of Mechanical Engineers Journal, 30 (Oct., 1980), 1205.

[6] See Robert H. Wiebe, The Search for Order, 1877-1920 (New York, 1967), especially chapter 5, "A New Middle Class."

[7] These were in order of establishment, the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

[8] See Edwin Layton, "Science, Business, and the American Engineer," in Robert Perrucci and Joel E. Gerstl, eds., The Engineer and the Social System (New York, 1969), pp. 51-72.

[9] Samuel P. Sadtler, "Conservation and the Chemical Engineer," Transactions of the American Institute of Chemical Engineers, 2 (1909), 105-106.

[10] See for example Felix Frankfurter, "Democracy and the Expert," Atlantic Monthly, 146 (Nov., 1930), 649-660. The problem of the expert bureaucrat in fixing conservation policy during this period is ably traced in James L. Penick, Jr., Progressive Politics and Conservation: The Ballinger-Pinchot Affair (Chicago, 1968).

[11] Benjamin Ives Gilman, "The Day of the Expert," Science, 39 (May 29, 1914), 772.

[12] For example see Monte A. Calvert, The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict (Baltimore, 1967), especially chapter 11, "Engineering: The Fragmented Profession."

[13] James Douglas, "Conservation of Natural Resources," Transactions of the American Institute of Mining Engineers, 40 (1909), 430.

[14] John R. Freeman, "The Conservation of Water," in American Society of Civil Engineers, Conservation of Natural Resources (New York, 1909), p. 16.

[15] Sadtler, 107.

[16] Douglas, 425.

[17] Engineering Record, 57 (May 23, 1908), 655.

[18] Science, 34 (Nov. 3, 1911), 603-604.

[19] Science, 35 (March 1, 1912), 338-340.

[20] M. L. Holman, "The Conservation Idea As Applied to the American Society of Mechanical Engineers," Transactions of the American Society of Mechanical Engineers, 30 (1908), 616.

[21] Edward B. Rosa, "The Function of Research in the Regulation of Natural Monopolies," Science, 37 (April 18, 1913), 592. This idea was perfectly compatible with the rise of corporate liberalism. See James Weinstein, The Corporate Ideal in the Liberal State, 1900-1918 (Boston, 1968).

[22] Rosa, 592.

[23] For a suggestion that abolition of the tariff on lumber would help conserve timber, see Henry G. Stott, "View of the Engineer," Proceedings of a Conference of Governors in the White House, Washington, D.C., May 13-15, 1908 (Washington, 1909), p. 404.

[24] Holman, 589.

[25] Engineering News, 76 (Dec. 14, 1916), 1144-1145.

[26] Cooke, 1205.

[27] Letter from Frank W. Very, in Science, 35 (Jan. 5, 1912), 32.

[28] Willard R. Smith, "The Relation of the Engineer to the Conservation of Natural Resources," Engineering News, 59 (April 9, 1908), 390.

[29] John R. Freeman, "The Conservation of Water," in ASCE, Conservation of Natural Resources, p. 16.

[30] Lewis B. Stillwell, "Electricity and the Conservation of Energy," in ASCE, Conservation of Natural Resources, p.53.

[31] See for example Holman, 578.

[32] Autobiography, II, 558.

[33] James Douglas, "Introductory Address," in ASCE, Conservation of Natural Resources, p. 6.

[34] R. W. Raymond, "The Conservation of Natural Resources by Legislation," in ASCE, Conservation of Natural Resources, pp. 29, 31, 25.

[35] W J McGee to J. McKen Cattell, March 2, 1908, Cattell papers, Library of Congress.

[36] For charges that attempts to complete the scientific record were delaying the preservation of the Appalachian forests, see letter from Frank W. Very to the Editor, Science, 35 (Jan. 5, 1912), 31-35.

[37] "A Word With the Executive Director About . . . The Civil Engineer and the Conservationist," Civil Engineering, 40 (Feb., 1970), 37.

[38] "America's Engineers Express Concern for Environment Plan Record National Engineers Week in February," Chemical Engineering Progress, 65 (Dec. 1969), 7.

[39] "Environmental Division Set," Chemical Engineering Progress, 66 (May, 1970), 39.

[40] Washington Post, January 16, 1970.

[41] "Pollution Solution via the Grass Roots," Chemical Engineering Progress, 65 (April, 1969), 27.

[42] William Marling, "How the Environmentalists Did the Paper Industry a Big Favor," New Engineer, 6 (Jan., 1977), 44-50.

[43] A. R. Price, "1980: A New Beginning or the Beginning of the End?" Chemical Engineering Progress, 77 (March, 1981), 15-18.

[44] Arthur L. Conn, "Let's Speak Out," Chemical Engineering Progress, 66 (Dec., 1970), 27.

[45] Quoted in Price, 18.

[46] See Robert Gottschalk, "Invention--Solution to Pollution," Natural Resources Lawyer, 6 (Winter, 1973), 117-126.

COMMENT: CONSERVATION AND ENVIRONMENTAL MOVEMENTS IN
THE UNITED STATES

Ronald C. Tobey
University of California, Riverside

In their papers, "The Women of the Progressive Conservation Crusade," and "Conservation, Environmentalism, and the Engineers," Professors Merchant and Pursell widen the spectrum of participants in the conservation movement prior to World War I. Women actively participated in the lobbying that led to forest conservation, to the extent that Professor Merchant boldly suggests that their participation was crucial to the preservation of a number of specific, threatened sites, including Niagara Falls and the Calaveras Grove, and to protection of endangered bird species. Professor Pursell reminds us that engineers, who ideologically shunned political involvement, also supported conservation, espousing the self-serving view that only engineers could properly make the technical decisions necessary for efficiency. Both historians perceive manifest and latent goals in the activities of their subjects. Women were moved to conservation, not simply as part of their role as guardians of culture consumption, as other historians have indicated, but for the indirect purpose of protecting somewhat traditional values of womanhood, the home, and the child. Engineers saw the conservation movement as a vehicle of professional advancement, bringing decision-making and management power to engineers.

Professors Merchant and Pursell analyze the ideology and behavior of women and the engineers with the explicit definitions of political roles provided by the women and engineers themselves in explanation of their own activities. While both historians are aware that these definitions were ideological, they do not develop a critical framework for their examination; consequently, they are unable to relate the activities of these participants in conservation to a broad understanding of modern political processes. Professors Merchant and Pursell cite Samuel P. Hays's Gospel of Efficiency as setting the standard interpretation of the conservation movement. Ironically, they do not avail themselves of Hays's full interpretation of post-Civil War politics. His view has been a major influence in the

historical profession leading to a new understanding of the emergence of contemporary liberalism. Hays perceives post-Civil War industrialism as an explosive force that shattered traditional social, economic, and political structures, requiring the creation of new institutions to serve the needs of national manufacturing corporations and finance capitalism. The national, two-party political system, based on electoral politics, was not suited to their requirements. A new political process built around the lobby was developed. It is important to see that the interest-group lobby was a political institution, despite the ideological repugnance of electoral parties toward the new constituencies in the conservation movement, for example. The lobby was symptomatic of the shift of politics from the contests of mass-suffrage political parties to interest groups working outside the schedule of periodic elections.

Hays's interpretation coincides with the prevailing approach to modern liberalism of contemporary political scientists. Theodore Lowi, for instance, whose work, The End of Liberalism, has been powerfully influential within the political science discipline, describes pluralistic American government as "interest group liberalism." Interest group liberalism is characterized by administrative processes conducted by agencies operating with delegated authority, rather than by electoral or party processes. Business and government (terms whose continued use belies antiquated meanings) act in partnership to manage the economy. Not statutory law, but "policy," is the typical result of the political activity of this partnership. Of course, this partnership is exemplified in the relationship between government and the other major interest-groups, such as consumers, farmers, labor, and the poor, which manage subsectors of the American political economy.

Within this larger interpretive framework, the conservation movement prior to World War I is to be viewed as one political expression of the reorganization of American politics from classical liberalism to interest group liberalism. Although participants in the conservation movement at the time frequently viewed conservation as an end-in-itself, that is, as a value, or tried to ride it for their own, narrowly defined purposes, as did the engineers,

the movement was but one example of the way the larger political process changed. The historical fits and starts of political reorganization manifested themselves as irregular phenomena called "issues." But "issues" were irregular only when viewed from the perspective of electoral politics based on periodic polls; viewed from the perspective of the emerging administrative state, conservation was made an issue as a normal part of the symbolic means by which groups identified their interests, competed to have their agenda placed before the administrative agencies (indeed, defined the notion of an administrative agency agenda), and determined the subsectors of the American economy to be administered by different interest group-governmental partnerships. These interest group activities are not external to politics; they are the mode of politics in our century. Hence, both Professors Merchant and Pursell are misguided when they accept their subjects' self-definition of their activities as outside politics (in the case of engineers) or as exemplifying the traditional two-sphere world that relegated women to "education." Women may have been excluded from participation in voting and engineers may have disdained party politics, but both groups were political, and participated in the dominant mode of twentieth century politics. Women may have expressed a "conservative" ideology and engineers may have expressed traditional faith in "education" and "research," but these expressions were mere symbolic moralism. They did not describe the activities or political interests of the groups.

When we apply a broad understanding of the evolution of western liberalism to the subjects of Professor Merchant's and Professor Pursell's papers, a research program suggests itself. Regarding Professor Merchant's female conservationists, we need, first of all, to identify their operational interest (in distinction to rhetorical interest) in conservation. Professor Merchant is not persuasive when she argues that the women sought to conserve the values of home, womanhood, and the child. How could destruction of scenery in the California mountains imperil far distant, socially segregated homes of presumably upper middle-class ladies? The operational interest of these politically active women can be determined only following an extensive prosopographical analysis of their associational network. We need, second, a detailed examination of

the women's activity as expressions of an interest group. It is not enough to know that they write letters and signed petitions. What was the context within which these letters and petitions were received in the departments of interior and agriculture and legislative offices? How did this activity effectively set an administrative agenda or redistribute access to policy makers? What made their ideological claims legitimate and the claims of other groups not legitimate?

We need similarly to reinterpret Professor Pursell's subject within a broad framework. What made the engineers' role so important that they could convince administrative agencies of their claim that an amoral rational calculus of efficiency ought to be substituted for the value-conflict of partisan parties in guiding conservation decisions? What was the relationship of these engineers to other technical groups in the managerial infrastructure of turn-of-the-century capitalism, all of whom espoused claims concerning rational knowledge similar to the engineers?

One of the signal features of interest-group liberalism is the replacement of free-market capitalism by a dualistic structure of private management and public management (with the familiar partnership of business and government expressed in the policy process). Costs and benefits in the new political economy are administered, rather than being determined by a free-market price mechanism. Historians have recently begun to delineate the emergence of the technical-managerial infrastructure in industrial and transportation corporations following the Civil War. In certain areas, such as utility regulation, the private and public management systems were closely intertwined. Professor Pursell's paper points to one of the major research needs regarding the engineering component of this personnel infrastructure. What structural needs in the political economy led to the functional definition of the engineers at the turn of the century (of which engineering participation in the conservation movement was a political expression), and--to complete the question--what shift in structural needs led to the breakdown of this functional definition of engineering in the 1920s, with the consequential change in the political expression of engineers? This question can probably

be answered, again, only with the aid of prosopographical analysis of associational and employment networks through which the infrastructure worked. As we answer these empirical questions, we will better understand the genesis, timing, definition, and function of major issues, such as conservation, at the turn of the century and the role of constituent interest groups in them.

FROM CONSERVATION TO ENVIRONMENT: ENVIRONMENTAL POLITICS IN THE UNITED STATES SINCE WORLD WAR II

Samuel P. Hays
University of Pittsburgh

The historical significance of the rise of environmental affairs in the United States in recent decades lies in the changes which have taken place in American society since World War II. Important antecedents of those changes, to be sure, can be identified in earlier years as "background" conditions on the order of historical forerunners. But the intensity and force, and most of the substantive direction of the new environmental social and political phenomenon can be understood only through the massive changes which occurred after the end of the War--and not just in the United States but throughout advanced industrial societies.

Such is the argument of this paper. I will identify a variety of ways in which one can distinguish the old from the new, the pre- from the post-War, and sequential changes within the decades of the Environmental Era themselves. My argument will emphasize change rather than continuity. In historical analyses we are constantly forced to cope with the problem of sorting out the strands of continuous evolution from the discontinuities which mark new directions. When we are close to a broad social and political change, displaying elements of what we call social movements, we often depart from that task by a temptation to ferret out "roots" in order to give historical meaning and significance to them. So it is with the "environmental movement." Here I prefer a larger view, shaped by the overarching historical problem of identifying patterns of continuity and change. Where do environmental affairs fit in those larger patterns of evolution in 20th century American society and politics? In my view that "fit" lies in an emphasis on the massive changes in America after World War II and on the War itself as a historical dividing point.

The Conservation and Environmental Impulses

Prior to World War II, before the term "environment" was hardly used, the dominant theme in

conservation emphasized physical resources, their more efficient use and development. The range of emphasis evolved from water and forests in the late 19th and early 20th centuries, to grass and soils and game in the 1930s. In all these fields of endeavor there was a common concern for the loss of physical productivity represented by waste. The threat to the future which that "misuse" implied could be corrected through "sound" or efficient management. Hence in each field there arose a management system which emphasized a balancing of immediate in favor of more long-run production, the coordination of factors of production under central management schemes for the greatest efficiency. All this is a chapter in the history of production rather than of consumption, and of the way in which managers organized production rather than the way in which consumers evolved ideas and action amid the general public.

Enough has already been written about the evolution of multiple-purpose river development and sustained-yield forestry to establish their role in this context of efficient management for commodity production.[1] But perhaps a few more words could be added for those resources which came to public attention after World War I.

Amid the concern about soil erosion, from both rain and wind, the major stress lay in warnings about the loss of agricultural productivity. What had taken years to build up over geologic time now was threatened with destruction by short-term practices. The soil conservation program inaugurated in 1933 gave rise to a full-scale attack on erosion problems which was carried out amid almost inspired religious fervor.[2] In the Taylor Grazing Act of 1934 the nation's grazing lands in the West were singled out as a special case of deteriorating productivity; it set in motion a long-term drive to reduce stocking levels and thereby permit recovery of the range.[3] Also during the 1930s, scientific game management came into its own with the Pittman-Robertson Act of 1936 which provided funds.[4] This involved concepts much akin to those in forestry, in which production and consumption of game would be balanced in such a fashion so as not to outrun food resources and hence sustain a continuous yield.

Perhaps the most significant vantage point from

which to observe the common processes at work in these varied resource affairs was the degree to which resource managers thought of themselves as engaged in a common venture. It was not difficult to bring into the overall concept of "natural resources" the management of forests and waters, of soils and grazing lands, and of game. State departments of "natural resources" emerged, such as in Michigan, Wisconsin and Minnesota, and some university departments of forestry became departments of natural resources--all this as the new emphases on soils and game were added to the older ones on forests and waters.[5] By the time of World War II a complex of professionals had come into being, with a strong focus on management as their common task, on the organization of applied knowledge about physical resources so as to sustain output for given investments of input under centralized management direction. This entailed a common conception of "conservation" and a common focus on "renewable resources," often within the rubric of advocating "wise use" under the direction of professional experts.[6]

During these years another and altogether different strand of activity also drew upon the term "conservation" to clash with the thrust of efficient commodity management. Today we frequently label it with the term "preservation" as we seek to distinguish between the themes of efficient development symbolized by Gifford Pinchot and natural environment management symbolized by John Muir. Those concerned with national parks and the later wilderness activities often used the term "conservation" to describe what they were about. In the Sierra Club the "conservation committees" took up the organization's political action in contrast with its outings. And those who formed the National Parks Association and later the Wilderness Society could readily think of themselves as conservationists, struggling to define the term quite differently than did those in the realm of efficient management. Even after the advent of the term "environment" these groups continued to identify themselves as "conservationists" such as in the League of Conservation Voters, especially when they wished to draw together the themes of natural environment lands and environmental protection. The National Parks Association sought to have the best of both the old and the new when it renamed its publication, The

Prior to World War II the natural environment movement made some significant gains. One thinks especially of the way in which Pinchot was blocked from absorbing the national parks under his direction in the first decade of the century and then, over his objections, advocates of natural environment values succeeded in establishing the National Park Service in 1916. Then there was the ensuing struggle of several decades in which an aggressive Park Service was able to engage the Forest Service in a contest for control of land and on many occasions won. One of the best described of these events concerns the establishment of the Olympic National Park in 1937, a former national monument under Forest Service jurisdiction until Franklin D. Roosevelt transferred all the monuments to the Park Service in June of 1933; in 1937 it was expanded by the addition of considerable acreage from the surrounding national forest.[8] Despite all this, however, the theme of management efficiency in physical resource development dominated the scene prior to World War II and natural environment programs continued to play a subordinate role.

After the War a massive turnabout of historical forces took place. The complex of specialized fields of efficient management of physical resources increasingly came under attack amid a new "environmental" thrust. It contained varied components. One was the further elaboration of the outdoor recreation and natural environment movements of pre-War, as reflected in the Wilderness Act of 1964, the Wild and Scenic Rivers Act of 1968, and the National Trails Act of the same year, and further legislation and administrative action on through the 1970s. But there were other strands even less rooted in the past. The most extensive was the concern for environmental pollution, or "environmental protection" as it came to be called in technical and managerial circles. While smoldering in varied and diverse ways in this or that setting from many years before, this concern burst forth to national prominence in the mid-1960s and especially in air and water pollution. And there was the decentralist thrust, the search for technologies of smaller and more human scale which complement rather than dwarf the more immediate human setting. One can find

decentralist ideologies and even affirmations of smaller-scale technologies in earlier years, such as that inspired by Ralph Borsodi not long before World War II.[9] But the intensity and direction of the drive of the 1970s was of a vastly different order. The search for a "sense of place," for a context that is more manageable intellectually and emotionally amid the escalating pace of size and scale had not made its mark in earlier years as it did in the 1970s to shape broad patterns of human thought and action.

One of the most striking differences between these post-War environmental activities, in contrast with the earlier conservation affairs, was their social roots. Earlier one can find little in the way of broad popular support for the substantive objectives of conservation, little "movement" organization, and scanty evidence of broadly shared conservation values. The drive came from the top down, from technical and managerial leaders. In the 1930s one can detect a more extensive social base for soil conservation, and especially for new game management programs. But, in sharp contrast, the Environmental Era displayed demands from the grass-roots, demands that are well charted by the innumerable citizen organizations and studies of public attitudes. One of the major themes of these later years in fact, was the tension that evolved between the environmental public and the environmental managers, as impulses arising from the public clashed with impulses arising from management. This was not a new stage of public activity per se, but of new values as well. The widespread expression of social values in environmental action marks off the environmental era from the conservation years.

It is useful to think about this as the interaction between two sets of historical forces, one older that was associated with large-scale management and technology, and the other newer that reflected new types of public values and demands.[10] The term "environment" in contrast with the earlier term "conservation" reflects more precisely the innovations in values. The technologies with which those values clashed in the post-War years, however, were closely aligned in spirit and historical roots with earlier conservation tendencies, with new stages in the evolution from the earlier spirit of scientific management of which conservation had been

an integral part. A significant element of the historical analysis, therefore, is to identify the points of tension in the Environmental Era between the new stages of conservation as efficient management, as it became more highly elaborated, and the newly evolving environmental concerns which displayed an altogether different thrust. Conflicts between older "conservation" and newer "environment" help to identify the nature of the change.

One set of episodes in this tension concerned the rejection of multiple-purpose river structures in favor of free flowing rivers; here was a direct case of irreconcilable objectives, one stemming from the conservation era, and another inherent in the new environmental era. There were cases galore. But perhaps the most dramatic one, which pinpoints the watershed between the old and the new, involved Hell's Canyon on the Snake River in Idaho.[11] For many years that dispute had taken the old and honorable shape of public versus private power. Should there be one high dam, constructed with federal funds by the Bureau of Reclamation, or three lower dams to be built by the Idaho Power Company? These were the issues of the 1930s, the Truman years and the Eisenhower administrations. But when the Supreme Court reviewed a ruling of the Federal Power Commission on the issue in 1968, it pointed out in a decision written by Justice Douglas that another option had not been considered--no dam at all. Perhaps the river was more valuable as an undeveloped, free flowing stream. The decision was unexpected both to the immediate parties to the dispute, and also to "conservationists" in Idaho and the Pacific Northwest. In fact, those conservationists had to be persuaded to become environmentalists. But turn about they did. The decision seemed to focus a perspective which had long lain dormant, implicit in the circumstances but not yet articulated, and reflected a rather profound transformation in values which had already taken place.

There were other realms of difference between the old and the new. There was, for example, the changing public conception of the role and meaning of forests.[12] The U.S. Forest Service, and the entire community of professional foresters, continued to elaborate the details of scientific management of wood production; it took the form of increasing input

for higher yields, and came to emphasize especially even-aged management. But an increasing number of Americans thought of forests as environments for home, work and play, as an environmental rather than as a commodity resource, and hence to be protected from incompatible crop-oriented strategies. Many of them bought woodlands for their environmental rather than their wood production potential. But the forestry profession did not seem to be able to accept the new values. The Forest Service was never able to "get on top" of the wilderness movement to incorporate it in "leading edge" fashion into its own strategies. As the movement evolved from stage to stage the Service seemed to be trapped by its own internal value commitments and hence relegated to playing a rear-guard role to protect wood production.[13] Many a study conducted by the Forest Service experiment stations and other forest professionals made clear that the great majority of small woodland owners thought of their holdings as environments for wildlife and their own recreational and residential activities; yet the service forester program conducted by the Forest Service continued to emphasize wood production rather than environmental amenities as the goal of woodland management. The diverging trends became sharper with the steadily accumulating environmental interest in amenity goals in harvesting strategies and the expanding ecological emphases on more varied plant and animal life within the forest.[14]

There were also divergent tendencies arising from the soil conservation arena. In the early 1950s, the opposition of farmers to the high-dam strategies of the U.S. Army Corps of Engineers led to a new program under the jurisdiction of the Soil Conservation Service, known as PL 566, which emphasized the construction of smaller headwater dams to "hold the water where it falls." This put the SCS in the business of rural land and water development, and it quickly took up the challenge of planning a host of such "multiple-use" projects which combined small flood control reservoirs with flat-water recreation and channelization with wetland drainage.[15] By the time this program came into operation, however, in the 1960s, a considerable interest had arisen in the natural habitats of headwater streams, for example for trout fishing, and wetlands for both fish and wildlife. A head-on collision on this score turned an agency which had

long been thought of as riding the lead wave of conservation affairs into one which appeared to environmentalists to be no better than the Corps--development minded and at serious odds with newer natural environment objectives.[16]

There was one notable exception to these almost irreconcilable tensions between the old and the new in which a far smoother transition occurred--the realm of wildlife. In this case the old emphasis on game was faced with a new one on nature observation or what came to be called a "non-game" or "appreciative" use of wildlife.[17] Between these two impulses there were many potential arenas for deep controversy. But there was also common ground in their joint interest in wildlife habitat. The same forest which served as a place for hunting also served as a place for nature observation. In fact, as these different users began to be identified and counted it was found that even on lands acquired exclusively for game management the great majority of users were non-game observers. As a result of this shared interest in wildlife habitat it was relatively easy for many "game managers" to shift in their self-conceptions to become "wildlife managers." Many a state agency changed its name from "game" to "wildlife" and an earlier document, "American Game Policy, 1930," which guided the profession for many years, became "The North American Wildlife Policy, 1973." [18]

If we examine the values and ideas, then, the activities and programs, the directions of impulses in the political arena, we can observe a marked transition from the pre-World War II conservation themes of efficient management of physical resources, to the post-World War environmental themes of environmental amenities, environmental protection, and human scale technology. Something new was happening in American society, arising out of the social changes and transformation in human values in the post-War years. These were associated more with the advanced consumer society of those years than with the industrial manufacturing society of the late 19th and the first half of the 20th centuries. Let me now root these environmental values in these social and value changes.

The Roots of New Environmental Values

The most immediate image of the "environmental movement" consists of its "protests," its objections to the extent and manner of development and the shape of technology. From the media evidence one has a sense of environmentalists blocking "needed" energy projects, dams, highways and industrial plants, and of complaints of the environmental harm generated by pollution. Environmental action seems to be negative, a protest affair. This impression is also heavily shaped by the "environmental impact" mode of analysis which identifies the "adverse effects" of development and presumably seeks to avoid or mitigate them. The question is one of how development can proceed with the "least" adverse effect to the "environment." From this context of thinking about environmental affairs one is tempted to formulate an environmental history based upon the way in which technology and development have created "problems" for society to be followed by ways in which action has been taken to cope with those problems.

This is superficial analysis. For environmental impulses are rooted in deep seated changes in recent America which should be understood primarily in terms of new positive directions. We are at a stage in history when new values and new ways of looking at ourselves have emerged to give rise to new preferences. These are characteristic of advanced industrial societies throughout the world, not just in the United States. They reflect two major and widespread social changes. One is associated with the search for standards of living beyond necessities and conveniences to include amenities made possible by considerable increases in personal and social "real income." The other arises from advancing levels of education which have generated values associated with personal creativity and self-development, involvement with natural environments, physical and mental fitness and wellness and political autonomy and efficacy. Environmental values and objectives are an integral part of these changes.

Extensive study of attitudes and values by public opinion analysts and sociologists chart these larger changes in social values in considerable detail.[19] Some have brought them together in comprehensive accounts. They can be best observed in the market analyses which have been sponsored by the American business community since the 1920s which

gave rise to the initial interest in attitude surveys. Such analyses have identified value changes in almost every subgroup in the American population, from different ages to ethnic and religious variations, to regional differences and rural-urban distinctions. Two of the most comprehensive and long-term studies are now in progress, financed by American business corporations, one the Values and Lifestyles Study (VALS) conducted by Arnold Johnson at Stanford Research Institute and the other, emphasizing content analysis of newspapers, being undertaken by John Naisbett, associated with the firm of Yankelovitch, Skelly and White in Washington, D.C.[20]

From these more general surveys, from studies specifically of environmental values, from analyses of recreational and leisure preferences undertaken by leisure research specialists, from surveys of the values expressed by those who purchase natural environment lands, and from the content of environmental action in innumerable grass-roots citizen cases one can identify the "environmental impulse" not as reactive but formative.[21] It reflects a desire for a better "quality of life" which is another phase of the continual search by the American people throughout their history for a higher standard of living. Environmental values are widespread in American society, extending throughout income and occupational levels, areas of the nation and racial groups, somewhat stronger in the middle sectors and a bit weaker in the very high and very low groupings.[22] There are identifiable "leading sectors" of change with which they are associated as well as "lagging sectors." They tend to be stronger with younger people and increasing levels of education and move into the larger society from those centers of innovation. They are also more associated with particular geographical regions such as New England, the Upper Lakes States, the Upper Rocky Mountain region and the Far West, while the South, the Plains States and the lower Rockies constitute "lagging" regions.[23] Hence one can argue that environmental values have expanded steadily in American society, associated with demographic sectors which are growing rather than with those which are more stable or declining.

Within this general context one can identify several distinctive sets of environmental tendencies.

One was the way in which an increasing portion of the American people came to value natural environments as an integral part of their rising standard of living. They sought out many types of such places to experience, to explore, enjoy and protect: high mountains and forests, wetlands, ocean shores, swamplands, wild and scenic rivers, deserts, pine barrens, remnants of the original prairies, places of relatively clean air and water, more limited "natural areas." [24] Interest in such places was not a throwback to the primitive, but an integral part of the modern standard of living as people sought to add new "amenity" and "aesthetic" goals and desires to their earlier preoccupation with necessities and conveniences. These new consumer wants were closely associated with many others of a similar kind such as in the creative arts, recreation and leisure in general, crafts, indoor and household decoration, hi-fi sets, the care of yards and gardens as living space and amenity components of necessities and conveniences. Americans experienced natural environments both emotionally and intellectually, sought them out for direct personal experience in recreation, studied them as objects of scientific and intellectual interest and desired to have them within their community, their region and their nation as symbols of a society with a high degree of civic consciousness and pride. [25]

A new view of health constituted an equally significant innovation in environmental values, health less as freedom from illness and more as physical and mental fitness, of feeling well, of optimal capability for exercising one's physical and mental powers. [26] The control of infectious diseases by antibiotics brought to the fore new types of health problems associated with slow, cumulative changes in physical condition, symbolized most strikingly by cancer, but by the 1980s ranging into many other conditions such as genetic and reproductive problems, degenerative changes such as heart disease and deteriorating immune systems. All this put more emphasis on the non-bacterial environmental causes of illness but, more importantly, brought into health matters an emphasis on the positive conditions of wellness and fitness. There was an increasing tendency to adopt personal habits that promoted rather than threatened health, to engage in physical exercise, to quit smoking, to eat more nutritiously and to reduce environmental

threats in the air and water that might also weaken one's wellness. Some results of this concern were the rapid increase in the business of health food stores, reaching \$1.5 billion in 1979,[27] the success of the Rodale enterprises and their varied publications such as Prevention and Organic Gardening, and the increasing emphasis on preventive medicine.[28]

These new aesthetic and health values constituted much of the roots of environmental concern. They came into play in personal life and led to new types of consumption in the private market, but they also led to demands for public action both to enhance opportunities, such as to make natural environments more available and to ward off threats to values. The threats constituted some of the most celebrated environmental battles: power and petrochemical plant siting, hardrock mining and strip mining, chemicals in the workplace and in underground drinking water supplies, energy transmission lines and pipelines.[29] Many a local community found itself faced with a threat imposed from the outside and sought to protect itself through "environmental action." But the incidence and intensity of reaction against these threats arose at a particular time in history because of the underlying changes in values and aspiration. People had new preferences and new personal and family values which they did not have before. Prior to World War II, the countryside, that area between the nation's cities and its wildlands, had been an area of rapid decline, a land much of which "nobody wanted," but in the years after the War it became increasingly occupied and hence defended.[30] Here was a major battleground for the contending environmental and developmental antagonists. Because of these new values developmental activities which earlier might have been accepted were now considered to be on balance more harmful than beneficial.

Still another concern began to play a more significant role in environmental affairs in the 1970s--an assertion of the desirability of more personal family and community autonomy in the face of the larger institutional world of corporate industry and government, an affirmation of smaller in the face of larger contexts of organization and power. This constituted a "self-help" movement. It was reflected in numerous publications about the possibilities of

self-reliance in production of food and clothing, design and construction of homes, recreation and leisure, recycling of wastes and materials, and use of energy through such decentralized forms as wind and solar. These tendencies were far more widespread than institutional and thought leaders of the nation recognized since their world of perception and management was far removed from community and grass-roots ideas and action. The debate between "soft" and "hard" energy paths seemed to focus much of the controversy over the possibilities of decentralization.[31] But it should also be stressed that the American economy, while tending toward more centralized control and management, also generated products which made individual choices toward decentralized living more possible and hence stimulated this phase of environmental affairs. While radical change had produced large-scale systems of management it had also reinvigorated the more traditional Yankee tinkerer who now found a significant niche in the new environmental scheme of things.

Several significant historical tendencies are integral parts of these changes. One involves consumption and the role of environmental values as part of evolving consumer values.[32] At one time, perhaps as late as 1900, the primary focus in consumption was on necessities. By the 1920s a new stage had emerged which emphasized conveniences in which emerging consumer durables, such as the automobile and household appliances were the most visible elements. This change meant that a larger portion of personal income, and hence of social income and production facilities was now being devoted to a new type of demand and supply. By the late 1940s a new stage in the history of consumption had come into view. Many began to find that both their necessities and conveniences had been met and an increasing share of their income could be devoted to amenities. The shorter work week and increasing availability of vacations provided opportunities for more leisure and recreation. Hence personal and family time and income could be spent on amenities. Economists were inclined to describe this as "discretionary income." The implications of this observation about the larger context of environmental values is that it is a part of the history of consumption rather than of production. That in itself involves a departure from traditional emphases

in historical analysis.

Another way of looking at these historical changes is to observe the shift in focus in daily living from a preoccupation with work in earlier years to a greater role for home, family and leisure in the post-War period. Public opinion surveys indicate a persistent shift in which of these activities respondents felt were more important, a steady decline in a dominant emphasis on work and a steady rise in those activities associated with home, family and leisure. One of the most significant aspects of this shift was a divorce in the physical location of work and home. For more people in the rapidly developing manufacturing cities of the 19th century the location of home was dictated by the location of work. But the widespread use of the automobile, beginning in the 1920s, enabled an increasing number of people, factory workers as well as white collar workers, to live in one place and to work in another. The environmental context of home, therefore, came to be an increasingly separate and distinctive focus for their choices. Much of the environmental movement arose from this physical separation of the environments of home and work.

One can identify in all this an historical shift in the wider realm of politics as well. Prior to World War II the most persistent larger context of national political debate involved the balance among sectors of production. From the late 19th century on the evolution of organized extra-party political activity, in the form of "interest groups", was overwhelmingly devoted to occupational affairs, and the persistent policy issues involved the balance of the shares of production which were to be received by business, agriculture and labor, and sub-sectors within them. Against this array of political forces consumer objectives were woefully weak. But the evolution of new types of consumption in recreation, leisure and amenities generated a quite different setting. By providing new focal points of organized activity in common leisure and recreational interest groups, and by emphasizing community organization to protect community environmental values against threats from external developmental pressures, consumer impulses went through a degree of mobilization and activity which they had not previously enjoyed. In many an instance they were able to confront developmentalists with considerable

success. Hence environmental action reflects the emergence in American politics of a new effectiveness for consumer action not known in the years before the War.

One of the distinctive aspects of the history of consumption is the degree to which what once were luxuries, enjoyed by only a few, over the years became enjoyed by many--articles of mass consumption. In the censuses of the last half of the 19th century several occupations were identified as the "luxury trades," producing items such as watches and books which later became widely consumed. Many such items went through a similar process, arising initially as enjoyed only by a relative few and then later becoming far more widely diffused. These included such consumer items as the wringer washing machine and the gas stove, the carpet sweeper, indoor plumbing and the automobile. And so it was with environmental amenities. What only a few could enjoy in the 19th century came to be mass activities in the mid-20th, as many purchased homes with a higher level of amenities around them and could participate in outdoor recreation beyond the city. Amid the tendency for the more affluent to seek out and acquire as private property the more valued natural amenity sites, the public lands came to be places where the opportunity for such activities remained far more accessible to a wide segment of the social order.

A major element of the older, pre-World War II "conservation movement," efficiency in the use of resources, also became revived in the 1970s around the concern for energy supply. It led to a restatement of rather traditional options, as to whether or not natural resources were limited, and hence one had to emphasize efficiency and frugality, or whether or not they were unlimited and could be developed with unabated vigor. Environmentalists stressed the former. It was especially clear that the "natural environments" of air, water and land were finite, and that increasing demand for these amid a fixed supply led to considerable inflation in price for those that were bought and sold in the private market. Pressures of growing demand on limited supply of material resources appeared to most people initially in the form of inflation; this trend of affairs in energy was the major cause of inflation in the entire economy. The great energy debates of

the 1970s gave special focus to a wide range of issues pertaining to the "limits to growth." [33] Environmentalists stressed the possibilities of "conservation supplies" through greater energy productivity and while energy producing companies objected to this as a major policy alternative, industrial consumers of energy joined with household consumers in taking up efficiency as the major alternative. In the short run the "least cost" option in energy supply in the private market enabled the nation greatly to reduce its energy use and carried out the environmental option. [34]

In accounting for the historical timing of the environmental movement one should emphasize changes in the "threats" as well as in the values. Much of the shape and timing of environmental debate arose from changes in the magnitude and form of these threats from modern technology. Technology was applied in increasing scale and scope, from enormous drag-lines in strip mining, to 1000-megawatt electric generating plants and "energy parks," to superports and large-scale petrochemical plants, to 765-kilovolt energy transmission lines. And there was the vast increase in the use and release into the environment of chemicals, relatively uncontained and generating a chemical "sea around us" which many people considered to be a long-run hazard that was out of control. The view of these technological changes as threats seemed to come primarily from their size and scale, the enormity of their range of impact, in contrast with the more human scale of daily affairs. New technologies appeared to constitute radical influences, disruptive of settled community and personal life, of a scope that was often beyond comprehension, and promoted and carried through by influences "out there" from the wider corporate and governmental world. All this brought to environmental issues the problem of "control," of how one could shape more limited personal and community circumstance in the face of large-scale and radical change impinging from afar upon daily life. [35]

Stages in the Evolution of Environmental Action

Emerging environmental values did not make themselves felt all in the same way or at the same time. Within the context of our concern here for patterns of historical change, therefore, it might be well to secure some sense of stages of development

within the post-World War II years. The most prevalent notion is to identify Earth Day in 1970 as the dividing line. There are other candidate events, such as the publication of Rachel Carson's Silent Spring in 1962, and the Santa Barbara oil blowout in 1969.[36] But any event definition of change in these matters seems to be inadequate. Earth Day was as much a result as a cause. It came after a decade or more of underlying evolution in attitudes and action without which it would not have been possible. Many environmental organizations, established earlier, experienced considerable growth in membership during the 1960s, reflecting an expanding concern.[37] The regulatory mechanisms and issues in such fields as air and water pollution were shaped then; for example the Clean Air Act of 1967 established the character of the air quality program more than did that of 1970. General public awareness and interest were expressed extensively in a variety of public forums and in the mass media. Evolving public values could be observed in the growth of the outdoor recreation movement which reached back into the 1950s and the search for amenities in quieter and more natural settings, in the increasing number of people who engaged in hiking and camping or purchased recreational lands and homes on the seashore, by lakes and in woodlands. This is not to say that the entire scope of environmental concerns emerged fully in the 1960s. It did not. But one can observe a gradual evolution rather than a sudden outburst at the turn of the decade, a cumulative social and political change that came to be expressed vigorously even long before Earth Day.[38]

We might identify three distinct stages of evolution. Each stage brought a new set of issues to the fore without eliminating the previous ones, in a set of historical layers. Old issues persisted to be joined by new ones, creating over the years an increasingly complex and varied world of environmental controversy and debate. The initial complex of issues which arrived on the scene of national politics emphasized natural environment values in such matters as outdoor recreation, wildlands and open space. These shaped debate between 1957 and 1965 and constituted the initial thrust of environmental action. After World War II the American people, with increased income and leisure time, sought out the nation's forests and parks, its wildlife refuges, its state and federal

public lands, for recreation and enjoyment. Recognition of this growing interest and the demands upon public policy which it generated, led Congress in 1958 to establish the National Outdoor Recreation Review Commission which completed its report in 1962.[39] Its recommendations heavily influenced public policy during the Johnson administration, leading directly to the Land and Water Conservation Fund of 1964 which established, for the first time, a continuous source of revenue for acquisition of state and federal outdoor recreation lands. It accelerated the drive for the national Wilderness Act of 1964 and the Wild and Scenic Rivers and National Trails Acts of 1968.

These laws reflected in only a limited way a much more widespread interest in natural environment affairs which affected local, state and federal policy. During the 1950s many in urban areas had developed a concern for urban overdevelopment and the need for open space in their communities. This usually did not receive national recognition because it took place on a more local level. But demands for national assistance for acquisition of urban open space led to legislation in 1960 which provided federal funds. The concern for open space extended to regional as well as community projects, involving a host of natural environment areas ranging from pine barrens to wetlands to swamps to creeks and streams to remnants of the original prairies. Throughout the 1960s there were attempts to add to the national park system which gave rise to new parks such as Canyonlands in Utah, new national lakeshores and seashores and new national recreation areas.

These matters set the dominant tone of the initial phase of environmental concern until the mid-1960s. They did not decline in importance, but continued to shape administrative and legislative action as specific proposals for wilderness, scenic rivers or other natural areas emerged to be hotly debated. Such general measures as the Eastern Wilderness Act of 1974, the Federal Land Planning and Management Act of 1976 and the Alaska National Interest Lands Act of 1980 testified to the perennial public concern for natural environment areas. So also did the persistent evolution of indigenous western wilderness groups in almost every state and the formation of a western umbrella organization, the Wilderness Alliance, headquartered in Denver,

1978.[40] One might argue that these were the most enduring and fundamental environmental issues throughout the two decades. While other citizen concerns might ebb and flow, interest in natural environment areas persisted steadily. That interest was the dominant reason for membership growth in the largest environmental organizations. The Nature Conservancy, a private group which emphasized acquisition of natural environment lands, grew in activity in the latter years of the 1970s and reached 100,000 members in 1981; this only further emphasized the persistent and enduring public concern for natural environment areas as an integral and important element of American life.[41]

Amid this initial stage of environmental politics there evolved a new and different concern for the adverse impact of industrial development with a special focus on air and water pollution. This had long evolved slowly on a local and piecemeal basis, but emerged with national force only in the mid-1960s. In the early part of the decade air and water pollution began to take on significance as national issues and by 1965 they had become highly visible. The first national public opinion poll on such questions was taken in that year, and the President's annual message in 1965 reflected, for the first time, a full fledged concern for pollution problems. Throughout the rest of the decade and on into the 1970s these issues evolved continually. Federal legislation to stimulate remedial action was shaped over the course of these seven years, from 1965 to 1972, a distinct period which constituted the second phase in the evolution of environmental politics, taking its place alongside the previously developing concern for natural environment areas.

The legislative results were manifold. Air pollution was the subject of new laws in 1967 and 1970; water pollution in 1965, 1970 and 1972.[42] The evolving concern about pesticides led to revision of the existing law in the Pesticides Act of 1972.[43] The growing public interest in natural environment values in the coastal zone, and threats to them by dredging and filling, industrial siting and offshore oil development first made its mark on Congress in 1965 and over the next few years shaped the course of legislation which finally emerged in the Coastal Zone Management Act of 1972. Earth Day in the spring of 1970 lay in the middle of this phase

of historical development, both a result of the previous half-decade of activity and concern and a new influence to accelerate action. The outline of these various phases of environmental activity, however, can be observed only by evidence and actions far beyond the events of Earth day. Such more broad-based evidence identifies the years 1965 to 1972 as a well-defined phase of historical development in terms of issues, emphasizing the reaction against the adverse effects of industrial growth as distinct from the earlier emergence of natural environment issues.

Yet this new phase was shaped heavily by the previous period in that it gave primary emphasis to the harmful impact of pollution on ecological systems rather than on human health--a concern which was to come later. In the years between 1965 and 1972 the interest in "ecology" came to the fore to indicate the intense public interest in potential harm to the natural environment and in protection against disruptive threats. The impacts of highway construction, electric power plants and industrial siting on wildlife, on aquatic ecosystems and on natural environments in general played a major role in the evolution of this concern. One of the key elements of evolving public policy was the enhanced role of the U.S. Fish and Wildlife Service in modifying decisions by developmental agencies to reduce their harmful actions.[44] The effects of pesticides were thought of then in terms of their impact on wildlife and ecological food chains, rather than on human health. The major concern for the adverse effect of nuclear energy generation in the late 1960s involved its potential disruption of aquatic ecosystems from thermal pollution rather than the effect of radiation on people. The rapidly growing ecological concern was an extension of the natural environment interests of the years 1957 to 1965 into the problem of the adverse impacts of industrial growth. [45, 46, 47]

Beginning in the early 1970s still a third phase of environmental politics arose which brought three other sets of issues into public debate: toxic chemicals, energy and the possibilities of social, economic and political decentralization. These did not obliterate earlier issues, but as some natural environment matters and concern over the adverse effects of industrialization shifted from legislative

to administrative politics, and thus became less visible to the general public, these new issues emerged often to dominate the scene. They were influenced heavily by the seemingly endless series of toxic chemical episodes, from PBBs in Michigan to kepone in Virginia to PCBs on the Hudson River, to the discovery of abandoned chemical dumps at Love Canal and near Louisville, Kentucky.[48] These events, however, were only the more sensational aspects of a more deep-seated new twist in public concern for human health.[49] Interest in personal health and especially in preventive health action took a major leap forward in the 1970s. It seemed to focus especially on such matters as cancer and environmental pollutants responsible for a variety of health problems, on food and diet on the one hand and exercise on the other. From these interests arose a central concern for toxic threats in the workplace, in the air and water, and in food and personal habits that came to shape some of the overriding issues of the 1970s on the environmental front. It shifted the earlier emphasis on the ecological effects of toxic pollutants to one more on human health effects. Thus, while proceedings against DDT in the late 1960s had emphasized adverse ecological impacts, similar proceedings in the 1970s focused primarily on human health.

The energy crisis of the winter of 1973-74 brought a new issue to the fore. Not that energy matters had gone unnoticed earlier, but their salience had been far more limited. After that winter they became more central. They shaped environmental politics in at least two ways. First, energy problems brought material shortages more forcefully into the realm of substantive environmental concerns and emphasized more strongly the problem of limits which these shortages imposed upon material growth.[50] The physical shortages of energy sources such as oil in the United States, the impact of shortages on rising prices, the continued emphasis on the need for energy conservation all helped to etch into the experience and thinking of Americans the "limits" to which human appetite for consumption could go. Second, the intense demand for development of new energy sources increased significantly the political influence of developmental advocates in governmental, corporate and technical institutions which had long chafed under both natural environmental and pollution

control programs. This greatly overweighted the balance of political forces so that environmental leaders had far greater difficulty in being heard. In the face of energy issues environmental leaders formulated their own energy proposals which they sought to inject into the debates, but not yet with overriding success amid an overwhelming emphasis on traditional approaches to increasing energy supply.

Lifestyle issues also injected a new dimension into environmental affairs during the course of the 1970s.[51] They became especially visible in the energy debates, as the contrast emerged between highly centralized technologies on the one hand, and decentralized systems on the other. Behind these debates lay the evolution of new ideas about organizing one's daily life, one's home, community and leisure activities and even work--all of which had grown out of the changing lifestyles of younger Americans. It placed considerable emphasis on more personal, family and community autonomy in the face of the forces of larger social, economic and political organization. The impact and role of this change was not always clear, but it emerged forcefully in the energy debate as decentralized solar systems and conservation seemed to be appropriate to decisions made personally and locally--on a more human scale--contrasting markedly with high-technology systems which leaders of technical, corporate and governmental institutions seemed to prefer. Issues pertaining to the centralization of political control played an increasing role in environmental politics as the 1970s came to a close.

To define stages in the evolution of environmental affairs in this manner helps to interweave those affairs with broader patterns of social change. One should be wary, perhaps, of the temptation to argue that by 1980 a "full-scale" set of environmental issues had emerged, bit by bit, to form a coherent whole. For there were many different strands which at times went off in different directions. Those whose environmental experience was confined to the urban context did not always share the perspective and interest in issues of those who were preoccupied with the wildlands. Yet it was rather striking the degree to which working relationships had developed amid the varied strands.[52] What was especially noticeable was the

degree to which the challenge posed by the Reagan administration tended to mobilize latent values and strengthen cooperative tendencies.[53] From the beginning of that administration, the new governmental leaders made clear their conviction that the "environmental movement" had spent itself, was no longer viable, and could readily be dismissed and ignored. During the campaign the Reagan entourage had refused often to meet with citizen environmental groups, and in late November it made clear that it would not even accept the views of its own "transition team" which was made up of former Republican administration environmentalists who were thought to be far too extreme.[54] Hence environmentalists of all these varied hues faced a hostile government that was not prone to be evasive or deceptive about that hostility. Its anti-environmental views were expressed with enormous vigor and clarity.

We can well look upon that challenge as an historical experiment which tested the extent and permanence of the changes in social values which lay at the root of environmental interest. By its opposition the Reagan administration could be thought of as challenging citizen environmental activity to prove itself. And the response, in turn, indicated a degree of depth and persistence which makes clear that environmental affairs stem from the extensive and deep-seated changes we have been describing. Most striking perhaps have been the public opinion polls during 1981 pertaining to revision of the Clean Air Act. On two occasions, in April and in September the Harris poll found that some 80% of the American people favored at least maintaining that Act or making it stricter, levels of positive environmental opinion on air quality higher than for polls in the 1960s or 1970s.[55] One can also cite the rapid increases in membership which occurred in many environmental organizations, most notably the Sierra club, as well as financial contributions to them.[56] And the initial forays into electoral politics which environmentalists have recently undertaken seems to have tapped activist predispositions mobilized by the fear of the new administrationn.[57]

We might take this response to the Reagan administration challenge, therefore, as evidence of the degree to which we can assess the environmental activities of the past three decades as associated

with fundamental and persistent change, not a temporary display of sentiment, which causes environmental values to be injected into public affairs continuously and even more vigorously in the face of political adversity. The most striking aspect of this for the historian lies in the way in which it identifies more sharply the social roots of environmental values, perception and action. Something is there, in a broad segment of the American people which shapes the course of public policy in these decades after World War II that was far different from the case earlier. One observes not rise and fall, but persistent evolution, changes rooted in personal circumstance which add up to broad social changes out of which "movements" and political action arise and are sustained.[58] Environmental affairs take on meaning as integral parts of a "new society" that is an integral element of the advanced consumer and industrial order of the last half of the 20th century.

The Environmental Economy and Environmental Ideology

There remain two larger modes of analysis which help to define the historical role of environmental affairs--one economic and the other ideological. In neither case can one associate environmental politics with either the pre-World War II economy or its ideology. In both cases we must look to innovations rooted in post-War changes.[59]

Environmental impulses served as a major influence in shaping the newer, more "modern," economy. They brought to the fore new demand factors which in turn generated new types of production to fill them; they placed increasing pressure on greater technological efficiency in production to reduce harmful residuals and resource waste. In many aspects of the economy one can distinguish between older and newer forms of demand and supply, institutions and modes of economic analysis. The transition represents a shift from the older manufacturing to the newer advanced consumer economy. In this transition environmental influences were an integral part of the emerging economy that was struggling for a larger role in America amid more established economic institutions. From this context of analysis we can establish further elements of the role of environmental affairs in long-run social

change.

In public debate there was a tendency to set off the "economy" versus the "environment" as if the latter constituted a restraint on the former.[60] But environmental affairs were a part of the economy, that part which constituted new types of consumer demand, giving rise in turn to new modes of production to supply that demand, some in the private market and some in the public. The ensuing controversies were between older and newer types of demand, and the allocation of resources as between older and newer types of production as patterns of demand changed. It was difficult for the older manufacturing economy, with its emphasis on consumer necessities and conveniences and physical commodities to fill them, to accept the legitimacy of the newer economy which gave rise to newer consumer needs and types of production.[61] The tension between old and new was reminiscent of the similar tension in the 19th century between the older agricultural and the newer manufacturing economies.

Much of the American economy had moved beyond necessities and conveniences to encompass amenities. It is difficult to identify this change if one begins the analysis with the traditional focus on modes of production; it is more easily identified if one starts with changing patterns of consumption. The former approach lumps together many and varied changes as one "service economy," that beyond raw material extraction and manufacturing. The latter identifies varied new sectors associated with consumption such as the "recreation economy," the "leisure economy," "the health economy," the "creative arts economy," and the "environmental economy" each of which identifies a new direction of economic change. Much of this involves discretionary income, the allocation of expenditures not just to amenities but also to reshaped and restyled necessities and conveniences themselves to make them aesthetically more appealing, to add to them elements other than traditional characteristics of "utility."

The most serious question of resource allocation raised by the environmental economy lay in the appropriate balance which should be struck between natural and developed environments. The new environmental consumer society called for more of the

former. This gave rise to massive debates over such issues as wilderness and other natural environment proposals. It was difficult, if not impossible, for those associated with the older developmental economy to accept the notion that natural environments should play a major role in modern economic affairs. Hence they tended to argue that in this matter a proper "balance" should involve only minimal allocation of air, land and water to natural environments. Often they maintained that such allocations should end. They might approve some role for natural environments in the modern economy but only if they were on sites which developers themselves did not want.[62] Hence, mining companies argued that wherever minerals were to be found they should be developed irrespective of their implication for the degradation of natural environments.

The environmental impulse also had major implications for the technology of production, serving as a force toward more rapid modernization of plant and equipment.[63] In any given segment of industry plants constituted a variable spectrum ranging from the most obsolete to the most modern. In the normal course of private market choices the more obsolete were discarded and the more modern added, giving rise to a general tendency for the entire industry toward modernization. But environmentalists felt that the pace of change was too slow. They were especially interested in the environmental efficiency of production, the degree to which it reduced the output of residuals per factor input; they believed that plants which were more obsolete in material product output were also more obsolete in environmental output. Hence, they urged that the most modern plants, the "average of the best," should serve as examples against which the rest of the industry should be judged. In focusing on these "best technologies" as models for achievement by all, environmentalists served as a force for technological innovation.[64]

It was often difficult, however, for industry to move at the pace which environmentalists desired. Many corporate leaders were from sales and marketing origins, rather than engineering and production, and tended not to press continually for cost-reducing technologies but to maintain cost-increasing ones so long as they were profitable.[65] At the same time the corporate response to regulatory requirements

often led to superficial changes to reduce the immediate burden of governmental decisions, such as legal action or limited "add on" pollution control technology, rather than to re-examine production technologies in order to seek combined efficiencies in both product and environmental output.[66] Those who took a leading role in that direction, such as Joseph Ling of the 3-M corporation were often thought of as "eccentrics," by their fellow executives. The internal politics of trade associations which spoke for business in the larger political scene often required that their public positions not be too "advanced," since their members included both the more obsolete and the more modern firms; in water pollution control, for example, they argued, that the median firm rather than the most efficient ten percent should serve as the model for the rest of the industry to follow. Corporate leaders often argued that regulation was a roadblock to greater production efficiencies, but when such a proposition was subject to empirical examination it was found, on the contrary, that if regulation was sufficiently firm it gave rise to more serious examination of manufacturing processes and resulted in innovation.

We might also profitably identify the environmental impulse more precisely in terms of its ideological component. What is the place of environmental ideas amid the political ideologies inherited from the recent past? These customarily divide political forces between the "liberal" and the "conservative." The corporate business community and critics of growth in government are thought of as "conservatives," while more subordinate sectors of society who look to government to aid them are thought of as "liberal." While these ideological patterns have roots deeper in history than the 1930s, they were given a new twist during the New Deal when controversies over public spending for social programs such as welfare and social security were added to those of earlier vintage which involved disputes among business, labor and agriculture over the distribution of the fruits of production.

Environmental issues and environmental ideas are difficult to classify in this way. If one raised the question as to whether or not environmentalists favored public or private enterprise in principle, one would have to observe that while they called for greater governmental initiatives in behalf of their

objectives such as in public land management or environmental controls on private production, they were as skeptical of public as they were of private enterprise. The Tennessee Valley Authority, the major example of public ownership of the means of industrial production in recent times was roundly condemned when its actions with respect to air pollution, dam building and coal and uranium mining were environmentally detrimental and was applauded when it took up innovative energy measures during the Carter administration.[67] Was it associated with ideological traditions sustained by the politics of the industrial working class? Certainly not with socialist ideologies and with more reformist movements only partially. For while worker movements grew out of the struggle among producers for varied shares of the profits of production, environmental values were associated more with consumption which tended to draw lines of demarcation between environmentalists and producers as a whole. Only when it came to environmental health, which brought occupational and community health concerns together, did workers and environmentalists find common ground.[68]

Environmental values and ideas tended not to fit into traditional political ideologies, but to cut across them.[69] They tended to define corporate leaders as radicals, as responsible for massive, rapid and deep-seated transformations in modern society that threatened to destroy prized natural environments, that uprooted stable ways of life, and generated pervasive and persistent chemical threats. Corporate leaders were ever demanding that people change their lives markedly in order to accommodate developmental objectives, and to accept the risks of their proposals for rapid and far reaching change. In response to these demands, environmentalists sought to slow up the pace of innovation, to restrain it. Hence they were conservative. It would not be accurate to describe them as one industry leader did as "stone-age neanderthals," for environmentalists shared, with approval, the material benefits of modern production. But they were willing to argue that the pace of change in America in the 1960s and 1970s was far too rapid and should be slowed down so as not to destroy values important to a society of modern patterns of life.[70]

They were also often fiscal conservatives when

the use of public funds was an important instrument of material development and engaged in many a political struggle to cut back public spending. The 1960s and 1970s were decades of rapid economic "growth" in which jobs and product increased dramatically and public programs with public funding played a major role in it: construction of dams and highways, rebuilding on flood plains after floods, channelization of streams and rivers, development of barrier islands, a host of "rural development" programs which had become extended from the "depressed" area of the Appalachians to the entire nation.[71] All these tended to encourage more rapid economic development. The most widely known cases of environmental action on this score pertained to funds for construction of public works in rivers and harbors under the auspices of the U.S. Army Corps of Engineers.[72] It was no wonder that in fashioning coalitions to scale back such expenditures environmentalists joined with the National Taxpayers Union and other "fiscal conservatives" in Congress who tended to give ideological support to reduced public spending.

At the same time, in social values environmentalists could be thought of as innovative rather than conservative. Their views about natural environments and human health were associated with newer rather than older ideas about human wants and needs; they had a larger association with other innovations in values such as the more autonomous role of women, more cosmopolitan rather than traditional ways of life, and "freer" ways of thinking that were associated with social modernization. Such value changes had taken place at a number of times in the nation's past and these historians understand by sorting out newer values from older, distinguishing those people who espoused the newer with enthusiasm from those who drew back in defense and fear against cultural change. In the mid-19th century, for example, the Republican party had been associated with innovations in cultural values and the Democratic party with a defense of older ones. But in the mid-20th century, the party roles were reversed, as the Democrats seemed to harbor cultural innovation and the Republicans spoke out in defense of older values. These patterns of cultural change tended to define what was "conservative" and what was "liberal" in terms different from the issues of economic controversy.

And so it was with environmental values in which environmentalists both expressed the defense of daily life from technological radicalism and espoused innovations in cultural values.[73]

Within the context of these more "modern" and more innovative values, however, there was in environmental affairs a deeply conservative streak in a different sense that went far beyond the role of corporations and their defense to the larger ideology of conservatism--a search for wider human meaning. Environmentalists tended to work out their values amid a "sense of place" that provided roots to life's meaning much in the same way as "local" community values long had displayed. It was their involvement with the natural environments of given places that engaged emotions and minds. It was the threat to that "place" of home, work and play from large-scale developments, from air and water pollution, and from toxic chemical contamination which aroused them to action. Environmentalists sought roots in the less developed and more natural world, and rapid change threatened those roots with impairment and destruction. Insofar as one could describe conservatism as more generally a search for roots, for stability and order amid the larger world of rapid change, then environmentalists shared that impulse.[74]

Summary

This essay has constituted an attempt to place the environmental affairs of the past three decades in the perspective of historical evolution. I have sought not just to search for antecedents which would serve to link the more recent and the more remote pasts through some similarity of human activity. Instead I have sought to determine the degree to which a relatively full range of characteristics of environmental affairs, from values to political controversy to economic change and political ideology constitute merely an elaboration of earlier tendencies or something that was relatively new, a departure from the past. I have argued that these cannot be understood adequately unless they are associated with the newer society, the newer economy and the newer politics of the decades after World War II. Moreover, they can be understood only as an evolving phenomenon within those post-War decades, amid the patterns of change in the advanced consumer

society as it steadily took shape. American society today is far different than it was in the 1930s. It can best be understood not as an implication of the New Deal years, but as a product of vast social and economic transformations which took place after World War II which brought many new values and impulses to the American political scene. And so it is with environmental affairs. While displaying some roots in earlier times they were shaped primarily by the rapidly changing society which came into being after the War which, in so many ways, constitutes a watershed in American history.

ACKNOWLEDGMENTS

The author wishes to thank the Woodrow Wilson International Center for Scholars for the opportunity to undertake much of the research on which this article is based during the 1978-79 academic year.

ENDNOTES

[1] For this theme see Samuel P. Hays, Conservation and the Gospel of Efficiency (Cambridge, 1958).

[2] A somewhat larger ecological context for analysis of the soil conservation movement is Donald Worster, Nature's Economy (San Francisco, 1977), pp. 189-253.

[3] For the Taylor Grazing Act and its implementation see Phillip O. Foss, Politics and Grass: The Administration of Grazing on the Public Domain (Seattle, 1960); Marian Clawson, The Bureau of Land Management (New York, 1971); William Voigt, Jr., Public Grazing Lands: Use and Misuse by Industry and Government (New Brunswick, N.J., 1976).

[4] See James B. Trefethen, An American Crusade for Wildlife (New York, 1975), esp. pp. 243-255.

[5] The University of Michigan School of Forestry, for example, became the School of Natural Resources when Samuel Dana succeeded Filibert Roth, a protege of Gifford Pinchot, as Dean. One of Dana's major innovations was to bring wildlife more fully into the curriculum. Interview with Carl Holcomb, student at the School in the early 1930s and editor of its student magazine, Michigan Forests, in 1934.

[6] Forests and Waters was one of the titles of the magazine published by the American Forestry Association (now American Forests) in the early 20th century. It was also the name of the administering agency for Pennsylvania resources, the Department of Forests and Waters until 1970 when it was changed to the Department of Environmental Resources.

[7] The National Parks Association added this new title to its publication in 1970. At the same time it revised its own name from National Parks Association to National Parks and Conservation Association.

[8] A brief statement of this competition between the Park Service and the Forest Service, and a detailed analysis of the Olympic case is Ben W. Twight, "The Tenacity of Value Commitment: The Forest Service and the Olympic National Park," Ph.D. thesis, University of Washington, Seattle, 1971.

[9] See, for example, Ralph Borsodi, Flight from the City: An Experiment in Creative Living on the Land (New York and London, 1933), and a publication, edited by Mildred Loomis, which grew out of Borsodi's inspiration, The Green Revolution, 1962-, published in the 1960s at the School of Living, Freeland, Maryland.

[10] For a brief description of this social context see Samuel P. Hays, "The Structure of Environmental Politics Since World War II," in Journal of Social History, 14-4 (Summer, 1981), 719-738.

[11] See William Ashworth, Hells Canyon, The Deepest Gorge on Earth (New York, 1977); interview with Brock Evans (May 1980) who at the time of the Hells Canyon decision was Pacific Northwest representative of the Sierra Club.

[12] These developments are worked out more fully in Samuel P. Hays, "The Role of Forests in American History," paper presented at a conference on the Future of the American Forests, sponsored by the Conservation Foundation, Seattle, Washington, April 1979. See also Hays, "Gifford Pinchot and the American Conservation Movement," in Carroll W. Purcell, Jr., ed, Technology in America: A History of Individuals and Ideas (Cambridge, 1981), 151-162.

[13] This analysis of the relationship between the U.S. Forest Service and the wilderness movement is drawn from a variety of sources, including Twight (fn. 8); James Gilligan, "The Development of Policy and Administration of Forest Service Primitive and Wilderness Areas in the Western United States"(2v), Ph.D. thesis, University of Michigan, 1953; articles in The Living Wilderness and the Sierra Bulletin from the mid-1930s onward; accounts of wilderness politics in state publications such as "Wild Oregon," "Wild Washington," "The Wilderness Record" (California); and the Sierra Club National News Report.

[14] For accounts of these divergent views see articles in Forest Planning, Forest Planning Cleaninghouse, Eugene, Oregon, which began publication in April 1980.

[15] For a continuing treatment of issues arising from this program see the annual Proceedings of the National Watershed Congress, first held in 1953 and annually thereafter.

[16] The issues in stream channelization can be followed in Committee on Government Operations, U.S. House of Representatives, Stream Channelization (4 parts), 92nd Congress, 1st Session (Washington, D.C., 1971).

[17] For a survey of non-game wildlife issues, see Wild life Management Institute, "Current Investments, Projected Needs & Potential New Sources of Income for Nongame Fish & Wildlife Programs in the United States," (Washington, D.C., 1975).

[18] Wildlife Management Institute, "The North American Wildlife Policy, 1973," which includes a copy of the "American Game Policy, 1930."

(Washington, D.C., nd).

[19] For two recent compilations of value changes over the past several decades see Joseph Veroff, Elizabeth Douvan and Richard A. Kulka, The Inner American: A Self-Portrait From 1957 to 1976 (New York, 1981); Daniel Yankelovich, New Rules: Searching For Self-Fulfillment in a World Turned Upside Down (New York, 1981).

[20] See Arnold Mitchell, "Social Change: Implications of Trends in Values and Lifestyles," VALS Report No. 3, Stanford Research International, Menlo Park, 1979; and John Naisbitt, "The New Economic and Political Order of the 1980s," speech given to The Foresight Group, Stockholm Sweden, Apr. 17, 1980, available from the Center for Policy Process, Washington, D.C. For periodic coverage of work on value changes consult Leading Edge Bulletin: Frontiers of Social Transformation, published by Interface Press, Los Angeles, Calif.

[21] See, for example, Mary Keys Watson, "Behaviorial and Environmental Aspects of Recreational Land Sales," Ph.D. thesis, Department of Geography, Pennsylvania State University, 1975.

[22] A considerable number of public opinion polls by the Gallup, Harris and Roper organizations indicate the range of expression of environmental values. There are also numerous polls on specialized environmental subjects which reflect environmental values. Among them are: Stephen R. Kellert, "American attitudes, knowledge and behaviors toward wildlife and natural habitats," study funded by the U.S. Fish and Wildlife Service, of which three of four phases were completed as of the end of 1980. The titles of each of phases I, II and III are: "Public Attitudes Toward Critical Wildlife and Natural Habitat Issues," "Activity of the American Public Relating to Animals," and "Knowledge, Affection and Basic Attitudes Toward Animals in American Society," See also The Gallup Organization, "National Opinions Concerning the California Desert Conservation Area," study conducted for the Bureau of Land Management (Princeton, 1978); and Opinion Research corporation, "The Public's Participation in Outdoor Activities and Attitudes Toward National Wilderness Areas," prepared for the American Forest Institute (Princeton, 1977).

[23] This sectional analysis is derived from tabulation of environmental votes in the U.S. House of Representatives, 1970-77, originally prepared by the League of Conservation Voters, Washington, D.C. for each Congressional session.

[24] One type of evidence which reflects these growing interests is the "field guide," which grew rapidly in extent and circulation in the 1960s and 1970s. The most traditional format was that represented by the Peterson guide series which identified birds, plants and animals. But there was an increasing number of hiking guides which included considerable information about the natural environment through which one hiked. Often each new site around which public natural environment interest arose led to a guide which enabled people to "find their way" and to appreciate what they saw. In 1980 the Sierra Club began to publish a new series of regional "naturalist guides" which provided similar assistance to seeking out a wide range of natural environmental areas.

[25] One of the major expressions of this interest was nature photography. This cannot be pinned down quantitatively, but not wholly irrelevant was the rise in photography as a whole in American society. The 1980 edition of the survey of American participation in the arts indicated that the number of Americans engaged in photographic pursuits rose from 19% in 1975 to 44% in 1980. Westerners tended to be more active (56% participation in 1980) than those in other parts of the country. See American Council for the Arts, Americans and the Arts (New York, 1981), p. 37.

[26] Two documents which reflect this emphasis at a governmental level are U.S. Senate, Select committee on Nutrition and Human Needs, Dietary Goals for the United States (Washington, GPO, 1977); and U.S. Department of Health, Education and Welfare, Public Health Service, Healthy People: the Surgeon General's Report on Health Promotion and Disease Prevention (Washington, GPO, 1979). See also, as a representative more popular statement, Environmental Science and Technology, Apr. 1970, 275-277, interview with Dr. Paul Kotin, director, National Institute for Environmental Health Sciences, including the statement, "Now people are interested

not merely in not being very sick but in being very well."

[27] The economic role of the health food industry can be followed in the trade publication, Whole Foods, published in Santa Ana, California, beginning in January 1978. For data on the level of business see "First Annual Report on the Industry," in Whole Foods: Natural Food Guide (And/Or Press, Berkeley, California, 1979), 268-274.

[28] In late 1981 a new magazine, American Health, was announced, subtitled "Fitness of Body and Mind." The initial direct-mail test to establish the existence of potential readers brought a 7.2% response when 5% is considered to be very good. The initial subscription offer will go to readers of a variety of publications, such as Runners' World, Psychology Today and other science, health, class, food and self-help magazines, which, taken as a whole, reflect the varied dimensions of the value changes associated with new attitudes toward health. New York Times, Nov. 23, 1981.

[29] Some of these issues have now become "classic," the subject of book-length writing. See, for example, Allan R. Talbot, Power Along the Hudson: The Storm King Case and the Birth of Environmentalism (New York, 1972); Barry M. Casper and Paul David Wellstone, Powerline: The First Battle of America's Energy War (Amherst, Mass., 1981); Joyce Egginton, The Poisoning of Michigan (New York, 1980); Paul Brodeur, Expendable Americans (New York, 1973).

[30] For an analysis in this vein see William E. Shands and Robert G. Healy, The Lands Nobody Wanted (The Conservation Foundation, Washington, D.C., 1977).

[31] A classic expression of the environmental view in this debate is Amory B. Lovins, Soft Energy Paths: Toward a Durable Peace (Cambridge, Mass., 1977). An analysis of the values implicit in these contrasting positions is included in Avarham Shama and Ken Jacobs, Social Values and Solar Energy Policy: The Policy Makers and the Advocates, Solar Energy Research Institute, Oct. 1979, SERI-RR-51-329.

[32] See, for example, Susan Jay Kleinberg,

"Technology's Step-Daughters: The Impact of Industrialization Upon Working Class Women, Pittsburgh, 1865-1890." University of Pittsburgh, Ph.D. thesis, 1973.

[33] The most celebrated book in this debate was Donella H. Meadows and Dennis L. Meadows, The Limits to Growth (New York, 1972). See also a reply by H.S.D. Cole, et al (eds), Models of Doom: A Critique of the Limits to Growth (New York, 1973). For one important item in the energy debate see Robert Stobaugh and Daniel Yergin, Energy Futures (New York, 1979).

[34] See Roger W. Sant, et al, Eight Great Energy Myths: the Least-Cost Energy Strategy - 1978-2000, Energy Productivity Report No. 4, The Energy Productivity Center, Mellon Institute, Arlington, Va., 1981.

[35] See items in fn 29; see also Hays, "The Structure of Environmental Politics Since World War II," fn 10.

[36] See, for example, Craig R. Humphrey and Frederick R. Buttell, Environment, Energy and Society (Belmont, Calif., 1982), which describes Rachel Carson as an "important catalyst for the environmental movement" and the Santa Barbara oil spill as a "pivotal event." (pp. 7 and 122). This book, the most comprehensive account yet from the perspective of "environmental sociology" gives heavy emphasis to the campus student movement of 1969-1970 as the source of environmental concern.

[37] The Sierra Club, for example, grew from 7000 in 1952 to 70,000 in 1969, and the Wilderness Society from 12,000 in 1960 to 54,063 in 1970.

[38] The relative significance of widely-shared social and economic changes on the one hand, and dramatic events on the other is a major set of alternatives in many historical analyses. The environmental scene is an especially striking case of the way in which preoccupation with the more publicized events has obscured the more fundamental changes.

[39] For hearings leading up to the appointment of the NORRRC see United States Senate, Committee on

Interior and Insular Affairs, 85th Congress, 1st Session, Hearing, "Outdoor Recreation Resources Commission," May 15, 1957 (Washington, GPO, 1957). See accounts of the outdoor recreation situation, which reflect varied responses to it, in American Forests, Dec. 1960, pp. 58-59, and Nov. 1961, pp. 40-41 and 55-56; and in Living Wilderness in issues through 1959 to 1962, for example, Winter-Spring, 1962, pp. 3-9.

[40] For the American Wilderness Alliance see its publications, Wild America (1979-present) and "On the Wild Side" (1979-present). See also Proceedings, 1980 Western Wilderness and Rivers Conference, Denver, Colorado, Nov. 21-22, 1980, distributed and apparently published by the Alliance.

[41] The work of the Nature Conservancy can best be followed in its quarterly publication, Nature Conservancy News (Arlington Va.), which began publication in 1951.

[42] For items on the air quality issue see John C. Esposito, Vanishing Air (New York, 1970) and Richard J. Tobin, The Social Gamble (Lexington, Mass., 1979). On water quality see David Zwick with Marcy Benstock, Water Wasteland (New York, 1971) and Harvey Lieber, Federalism and Clean Waters (Lexington, Mass., 1975).

[43] The pesticide controversy has produced several "tracts for the times", among them Frank Graham, Jr., Since Silent Spring (Boston 1970); Rita Gray Beatty, The DDT Myth: Triumph of the Amateurs (New York 1973); Georg Claus and Karen Bolander, Ecological Sanity (New York 1977); and Robert van den Bosch, The Pesticide Conspiracy (New York 1978).

[44] For the early stages of this issue see Committee on Merchant Marine and Fisheries, Subcommittee on Fisheries and Wildlife Conservation, 89th Congress, 2nd Session, Hearing, "Estuarine and Wetlands Legislation," June 16, 22-23, 1966. One can follow the issue as it developed leading up to the Coastal Zone Management Act of 1972. That Act was an important example of how a major environmental thrust, a proposal for a system of national estuarine areas to be managed by the National Park Service, much akin to the newly emerging concept of seashores

and lakeshores, was almost completely turned back. It appeared in the 1972 Act in the very limited form of "estuarine research areas."

[45] One of the most significant backgrounds to the 1969 National Environmental Policy Act lay in the concern of the Fish and Wildlife Service about the failure of federal agencies to consider the impacts of development on fish and wildlife habitat, and especially their failure to "consult" with the agency under the Fish and Wildlife Coordination Act. One such issue was the dredge and fill practices of the U.S. Army Corps of Engineers who refused to consider "impacts" other than those on the maintenance of navigation channels. To rectify this problem, Rep. John Dingell of Michigan included in a proposed estuarine area act a section which would require the Fish and Wildlife Service to approve each permit granted by the Corps. See Committee on Merchant Marine and Fisheries, Subcommittee on Fisheries and Wildlife Conservation, 90th Congress, 1st Session, Hearing, "Estuarine Areas," (Washington, GPO, 1967); see especially testimony of Alfred B. Fitt, U.S. Army Corps of Engineers, pp. 119-207.

[46] One of the major thrusts leading up to NEPA took place in the Subcommittee on Fisheries and Wildlife under the leadership of Rep. Dingell. See its hearing, "Environmental Quality," 91st Congress, 1st, Session, on HR 6750, a bill designed to amend the Fish and Wildlife Coordination Act (Washington, GPO, 1969).

[47] It should be emphasized that in its origins NEPA was an inter-agency review and not a public review process. It constituted a far more diluted response to the problem of inter-agency review than did the Dingell proposal for a "veto" or "dual permit" procedure, since it gave agencies the authority only to comment and not to veto the actions of other agencies. Only under modifications by the Nixon administration and the courts did NEPA become an instrument of public review.

[48] Toxic chemical cases were numerous and have generated a considerable amount of writing. See, for example, Ralph Nader, Ronald Brownstein and John Richard, eds., Who's Poisoning America: Corporate Polluters and Their Victims in the Chemical Age (San Francisco, 1981); Michael H. Brown, Laying Waste:

the Poisoning of America by Toxic Chemicals (New York, 1979).

[49] For some more recent events in these affairs see "Exposure," newsletter published by the Environmental Action Foundation (Washington, D.C.), Feb. 1980- ; and "The Waste Paper," published by the Sierra Club, Spring 1980- (Buffalo, New York).

[50] A brief, concise statement of environmental energy perspectives is in Gerald O. Barney, ed., The Unfinished Agenda (New York, 1977), pp. 50-68. The most eloquent speaker for the environmental energy view was Amory Lovins (fn. 31).

[51] A source which provides one of the most comprehensive views of this concern is the series of "whole earth" catalog publications. These include Stewart Brand (ed), The Whole Earth Catalog (Menlo Park, Calif., 1968); The Last Whole Earth Catalog (1971); The Whole Earth Epilog (1974), and The Next Whole Earth Catalog (1980). The spirit of personal autonomy is expressed by a statement introducing the 1980 edition: "So far remotely done power and glory--as via government, big business, formal education, church--has succeeded to the point where gross defects obscure actual gains. In response to this dilemma and to these gains a realm of intimate, personal power is developing--the power of individuals to conduct their own education, find their own inspiration, shape their own environment, and share the adventure with whoever is interested. Tools that aid this process are sought and promoted by the Next Whole Earth Catalog." (p. 2). See also Mother Earth News for a view of the range of facets in this perspective.

[52] On many and varied occasions there were expressions of cooperation and joint action. The most extensive occurred in 1981 when the Global Tomorrow Coalition was formed, by the end of the year comprising 53 environmental organizations, most of them formed during the environmental era. See its publication, Interaction (Washington, D.C.), the first issue of which appeared November/December 1981.

[53] See a varied set of newspaper clippings and articles, author file; also interviews with national leaders of the Sierra Club and the National Parks and

Conservation Association concerning their varied efforts to maintain working liaison with Secretary of the Interior James Watt.

[54] See report, "Protecting the Environment: A Statement of Philosophy," drawn up by the 14-member Task Force on the Environment, co-chaired by Dan. W. Lufkin and Henry L. Diamond; see also accounts of the Task Force, list of its members and a summary of its report in Environment Reporter, Oct. 17, 1980, p. 812, and Jan. 30, 1981, pp. 1855-1856. The Task Force report was rejected and its personnel replaced as lead administration advisers on environmental affairs by another group, quite divorced from earlier environmental activity, headed by Norman Livermore, a former administrator in California during the governorship of Ronald Reagan. See Environment Reporter, Jan. 12, 1980, p. 1226. For a brief account of this transition in advisers see Wilderness Report, Dec. 1980.

[55] See The Harris Survey, "Substantial Majorities Indicate Support for Clean Air and Clean Water Acts," June 11, 1981, in the form of a news release.

[56] From Oct. 1, 1980 to Oct. 1, 1981 Sierra Club membership increased by 35%, and in October 1981 went over the 250,000 mark. Organizations less politically oriented grew in both membership and financial contributions, but less rapidly.

[57] See Washington Post, Nov. 15, 1981, Section L-1 for a brief account of the "green vote" in the 1981 elections; see also clippings (author file) from New Jersey newspapers concerning participation in electoral politics there during the summer primaries.

[58] This conclusion differs markedly from the views of environmental sociologists; see, for example, Humphrey and Buttel, op. cit., 123-127, who speak of "rise and fall" rather than "persistent evolution" of environmental affairs. Their analysis seems to rest not on an examination of environmental values as social and political phenomena, but on their judgment as to the balance of political forces involved in a few selected "environmental problems."

[59] The following analysis is rarely made explicit in contemporary writings, but rests more on my own

judgment about tendencies and implications inherent in environmental activity.

[60] A recent non-ideological analysis which assumes this approach is Jerry A. Kurtzweg and Christina Nelson Griffin, "Economic Development and Air Quality: Complementary Goals for Local Governments," in Journal of the Air Pollution Control Association, 31-11, Nov. 1981, pp. 1155-1162.

[61] Perhaps it is not coincidental that the environmental movement was distinctively weak, compared with regional levels of education and urbanization, in the old "factory belt" of the North--as measured by votes in the U.S. House of Representatives on environmental issues, and as concluded from an analysis of environmental affairs within those states.

[62] Hence, support from the corporate business community for "natural areas" programs, for example on the part of the Nature Conservancy, but opposition to wilderness which involved larger tracts of land on which conflicts with development were far more likely to occur.

[63] The close relationship between production efficiency and environmental efficiency is described in Michael G. Royston, Pollution Prevention Pays (Pergamon Press, New York, 1979).

[64] This setting for innovation was defined especially in the water quality program in which "technology standards" were adopted in the 1972 Clean Water Act and in which as a result the Environmental Protection Agency was required to analyze existing technologies to decide which was "the average of the best."

[65] For a view on one aspect of this problem see Hyman G. Rickover, "Getting the Job Done Right," New York Times, Nov. 25, 1981, op. ed. page.

[66] Nicholas A. Ashford and George R. Heaton, "The Effects of Health and Environmental Regulation on Technological Change in the Chemical Industry: Theory and Evidence," in Christopher T. Hill (ed), Federal Regulation and Chemical Innovation (American Chemical Society, Washington, D.C., 1979), 45-66.

[67] The classic case with respect to TVA was the controversy over the construction of Tellico Dam in the Little Tennessee River. But this was only one of many such issues. These can be followed in the monthly newsletter of the Tennessee Citizens for Wilderness Planning.

[68] The "OSHA/Environment Network" organized to defend both occupational and community environmental protection programs during the early years of the Reagan administration extended earlier more informal cooperation into a more formal organization. See author clipping file, and miscellaneous documents on activities of the Network during 1981 (author file).

[69] This is reflected in party and ideological analyses of environmental support. See "The public speaks again: A new environmental survey," Resources, Resources for the Future, Washington, D.C., No. 60, Sept-Nov. 1978.

[70] This view seems to be implicit in a wide range of environmental issues, especially in the nation's countryside and wildlands.

[71] See the activities of the Environmental Policy Center, Washington, D.C., with respect to appropriations for the construction of dams; this was led throughout the 1970s by Brent Blackwelder of the Center. See also "Alternative Budget Proposals for the Environment, Fiscal Years 1981 & 1982," drawn up by 9 national environmental organizations to suggest ways in which the Reagan administration could reduce federal expenditures.

[72] A useful account of issues involving the Corps of Engineers is Daniel A. Mazmanian and Jeanne Ninaber, Can Organizations Change: Environmental Protection, Citizen Participation, and the Corps of Engineers (The Brookings Institution, Washington, D.C., 1979).

[73] For these value changes see items in fn. 19 and 20. Naisbitt, especially, provides a useful analysis by distinguishing between "leading sectors" and "lagging sectors" of value change; he sorts out states which are in the one or the other category. It may not be without significance that most of the "leading" states with respect to environmental value

change also seem to be states which have high percentages of women serving as state legislators. For this data see reports compiled since 1974 on women in state legislators by the National Women's Education Fund, Washington, D.C.

[74] For an expression of this "sense of place," see a view about the role of the watershed as a place: "...watershed consciousness focuses on place.... The journey of this perspective is right out your window--the immediate valleys and hills that surround you, that channel rain and snowmelt into your nearest creeks and rivers and lakes. It is a first excursion of thought into the place you live." See Stewart Brand (ed), The Next Whole Catalog (Menlo Park, Calif., 1980), "Streaming Wisdom," pp. 64-67.

ROUNDING OUT THE AMERICAN REVOLUTION: ETHICAL
EXTENSION AND THE NEW ENVIRONMENTALISM

Roderick Nash
University of California, Santa Barbara

"Land-use ethics are still governed wholly by economic self-interest, just as social ethics were a century ago. . . . The 'key-log' which must be moved to release the evolutionary process for [a land] ethic is simply this: quit thinking about decent land-use as solely an economic problem."

Aldo Leopold

(1949)

One of the most useful insights put forward in recent years by American environmental historians concerns the qualitative difference of post-World War II "environmentalism" from the earlier conservation movement. Climaxing in the late 1960s, the change partially replaced the utilitarian, anthropocentric, resource-oriented emphasis of Progressive and New Deal conservation. The integrity of the whole ecosystem, rather than the advantage of its most ambitious member, became the new focus. The science of ecology provided the philosophical guidelines of the new biocentrism. Indeed, the word "ecology" explains as much about the 1960s as "efficiency" does with regard to Theodore Roosevelt's and Gifford Pinchot's America. If, as Samuel Hays has explained, conservationists believed in a "gospel of efficiency", exponents of the Earth Day mentality professed a "gospel of ecology." [1] The quasi-religious characterization is deliberate; in both periods a movement of political reform acquired the intensity and dimensions of a crusade.

Efficiency had an ally in democracy to energize conservation in the Progressive era. [2] Again and again Progressive conservationists pointed out that the resources of the nation belonged to all the people and not just, in the vocabulary of the time, to the special interests. This kind of rhetoric, and the idealism behind it, made conservation more than a matter of economics. The wise use of resources for the greatest good of the greatest number was not just prudent but right. Ethics joined economics in making

the case to conserve.

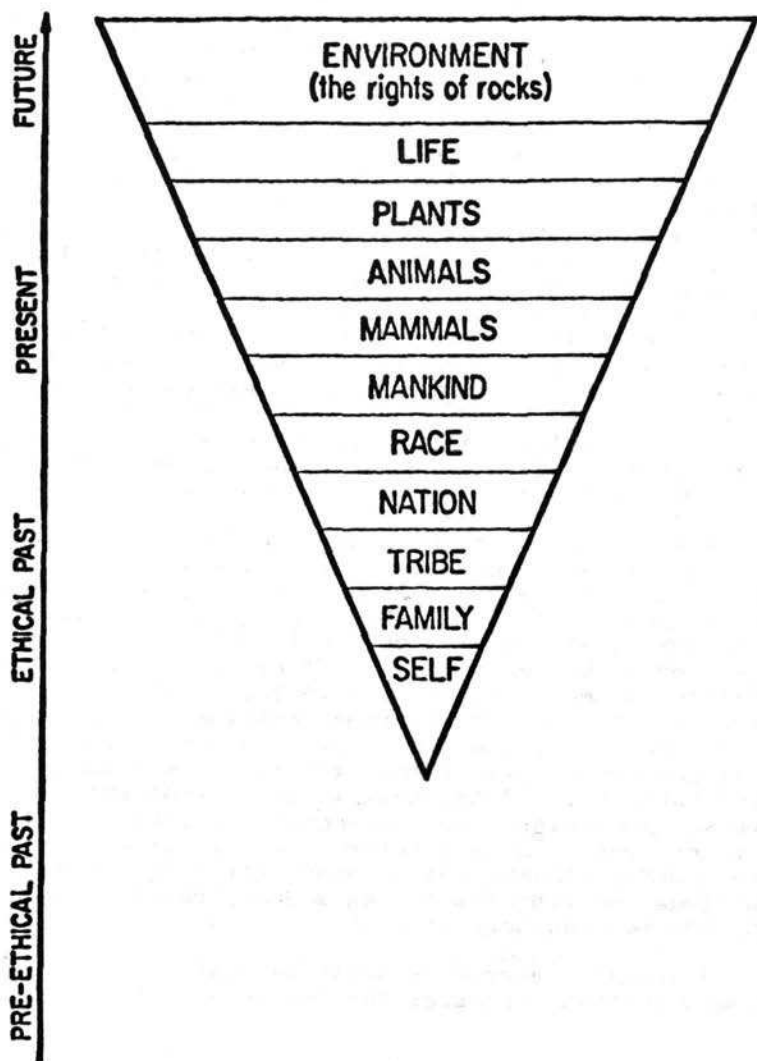
W J (he used no periods) McGee, the man Pinchot called the scientific brains of Progressive conservation, illustrates the approach. A follower of the democratic reform philosophies of Lester Frank Ward and Henry George, McGee left no doubt that for him conservation transcended economics. "On its face the Conservation Movement is material," he wrote in 1910, "yet in truth there has never been in all human history a popular movement more firmly grounded in ethics, in the eternal verities, in the divinity of human rights!" McGee went on to explain that the intellectual roots of conservation lay in the idealism of the American Revolution, namely "the new realization that all men are equally entitled to life, liberty, and the pursuit of happiness." It seemed clear to him that "Conservation" (he consistently, and significantly, capitalized the word) had as its most basic goal perfection of "the concept and the movement started among the Colonists one hundred and forty years ago--to round out the American Revolution." [3] Granted that in 1910 McGee was writing about the rights of people, not of nature, but his formulation suggests that ethics could be an integral and explosive part of conservation ideology. It is, in fact, arguable that what gave conservation its special hold on the Progressive mind was this injection of rights into what ordinarily involved only economics.

The thought of W J McGee offers a clue to the problem of what energized, even radicalized, a later generation of Americans concerned with environmental protection. For the 1960s the compelling idea was that not just people but nature itself has rights which must be respected. If natural rights theory impelled McGee and his colleagues, the idea that characterized modern environmentalism was the rights of nature. For the first time meaningful numbers of Americans could at least think of non-human life forms and even of the non-living environment (rocks, rivers, mountains) as defensible on ethical and not just on economic and anthropocentric grounds. From this perspective the 1960s witnessed the most ambitious attempt yet to, as McGee phrased it, "round out the American Revolution."

Although there were anticipations in the work of Jeremy Bentham, Charles Darwin, John Muir and Albert

Figure 2

THE EVOLUTION OF ETHICS



Schweitzer, an American wildlife ecologist, Aldo Leopold, did the most to call the attention to the possibility of extending ethics beyond person-to-person relations. As early as 1933 Leopold set forth the essentials of an ethical system that embraced nature as well as people.[4] What he called "the land ethic" received fuller expression in 1949 in Leopold's posthumously published book, A Sand County Almanac. At the core of his philosophy was the concept of sequential ethics. Figure 1 depicts and, to some extent, amplifies, what he had in mind. Society, Leopold believed, had evolved ethically over time. This meant including even broader categories in its concept of community. Ethics, which Leopold defined as self-imposed restraints on the freedom of individuals, could be thought of as beginning with the family and broadening to take in a nation, race, and finally, all mankind. What made Leopold's ideas so exciting to the 1960s and 1970s was the idea that ethical extension did not necessarily stop with people. Pets and useful animals, such as horses, were generally included in the community concept. What about other animals? Plants? The entire life community? What about ethical attitudes toward the earth itself--the rights of rocks?

There are, to be sure, many philosophical problems with Leopold's concept of an evolving ethic. Even as ideals his concepts are not always accurate descriptions of historical experience. And some would call him naive in assuming that human beings were moving inexorably in a linear fashion toward more ethical behavior. Perhaps Leopold underestimated the difficulties involved in having ethical relations with non-human life forms, not to mention non-living matter. But what counts for cultural history is that in the 1960s many were prepared to overlook these problems and use the land ethic as a springboard to new belief and to action. Whatever its shortcomings, A Sand County Almanac acquired near-biblical status among the new breed of environmentalists who professed a gospel of ecology. Its brisk sale, in several paperback editions, would have astonished its author who, in his last letters in 1948, expressed pessimism about the chances of his ideas ever finding acceptance in a culture which persisted in defining conservation in strictly economic terms.

What Leopold did not anticipate in the late

1940s was the emergence of a broad social questioning not only of economic criteria but of the entire fabric of traditional American value. The "counterculture", as it was called in the 1960s, also stressed the idea of community central to both the ecological sciences and to environmental ethics. Indicative of the new viewpoint was the headquarte an activist organization called Friends of the Earth used on the cover of its periodical. The words were Robinson Jeffers':

 ". . . the greatest beauty is organic
wholeness,
 the wholeness of life and things,
 the divine beauty of the universe. Love
that,
 not man apart from that . . . "

Friends of the Earth took the final phrase "Not Man Apart" for the title of its publication. It provided perfect expression of the concept of an extended ethical community that included "life and things" as well as people. Earth Day (April 22, 1970 was the first) and the environmentalists' omnipresent symbol of a circle were, obviously, other manifestations of these biocentric attitudes.

Evidence of interest in environmental ethics is widespread in the 1960s and, increasingly, in the 1970s. Professional conferences, a sure if sometimes tiresome sign of the maturation of a field, occurred. One of the first was convened in 1974 at Claremont, California by John Rodman under the title "Conference on Non-Human Rights". Historians and philosophers joined biologists and theologians in discussing the implications of the new ideas.[5] Rodman, a political scientist, had previously argued that liberalism would perish (become static and conservative) if it failed to find new ways to extend the sphere of rights. Furthering human rights represented one frontier, but Rodman was concerned with the possibility of going beyond to support the rights of non-human life forms.[6] In 1980, on the occasion of the tenth anniversary of Earth Day, the University of Denver sponsored a colloquium, "On the Humanities and Ecological Consciousness," concerning extended ethics.[7] The University of Georgia hosted "Theological Issues in Environmental Ethics" in 1982. A scholarly journal, Environmental Ethics, began publication in 1979, and it is possible to obtain a

Master's degree from Colorado State University in "Environmental Ethics and Animal Rights."

Books are well on their way to defining the emerging field. In 1971 Van Rensselaer Potter published Bioethics: Bridge to the Future. "What we must now face up to," Potter wrote in his preface, "is the fact that human ethics cannot be separated from a realistic understanding of ecology in the broadest sense." The book was dedicated to Aldo Leopold who, Potter noted, "anticipated the extension of ethics to Bioethics." One sign that this was in fact occurring in American culture was the almost unprecedented interest of theologians and students of religion in environmental responsibility. One of the earliest manifestations was Richard Baer's essay, "Land Misuse: A Theological Concern" which appeared in the October 12, 1966 edition of The Christian Century. Five years later the Faith-Man-Nature group of the National Council of Churches published A New Ethic for a New Earth. In 1972 two titles are representative of the growing interest: Ian G. Barbour's Earth Might Be Fair: Reflections on Ethics, Religion and Ecology and Bruce Allsopp's The Garden Earth: The Case for Ecological Morality. The next five years saw many additional popular and scholarly contributions to this inquiry. By the mid-1970s Dennis G. Kuby's "Ecology and Religion Newsletter" reached a nationwide network of individuals, churches and organizations organized in a "ministry of ecology." An interesting offshoot of the tendency to emphasize the religious nature of man-environment relations was, according to Linda Graber's Wilderness As Sacred Space (1976), something called "geopiety." Graber defined it as a quasi-religious zeal for particular environments, and she discussed its manifestation in the wilderness preservation movement. For Americans who understood wilderness to be "sacred," its protection had little to do with economics or with human recreation. They fought for the preservation of wilderness because, in the ultimate analysis, it was morally right. William O. Douglas' A Wilderness Bill of Rights (1965) anticipated some of Graber's ideas.

Books and articles concerning environmental ethics had, by 1980, increased to the point where George Sessions, a self-styled ecophilosopher, could publish a bibliographic review essay citing literally hundreds of titles.[8] A sociologist, Bill Devall,

concluded that these writings and the social action they inspired constituted a "deep ecology movement." [9] The "shallow" variety it was replacing was, Devall explained, the old economically-oriented conservation. Deep ecologists had revolutionary new attitudes toward the earth and its community of life based upon reverence for the non-human and upon ethical attitudes toward nature.

The penetration of these ideas into broader segments of American thought and action is what gave the new environmentalism its unprecedented political clout with the National Environmental Policy Act of 1970 being an obvious example. Robert Cahn was a member of the first council NEPA established, and in 1978 he published an investigation into the extent to which Americans had internalized environmental ethics in their day-to-day activities. Cahn's conclusions in Footprints on the Planet: A Search for an Environmental Ethic suggested while still far from dominant an ethical attitude toward the land was far more than just an ideal. The same conclusion can be drawn from recent efforts to save seals and whales from commercial exploitation and possible extinction. Ethics, in some instances, can transcend law as some environmental militants have proven at risk to their lives. After invading national waters to stop a Russian whaling operation, Paul Watson, skipper of the Sea Shepherd, explained that "it takes outlaws to stop outlaws." [10] Members of an organization called Greenpeace made sympathetic headlines throughout the nation by literally throwing their bodies between baby seals and the clubs of commercial pelt gatherers. No one had been around to do the same with buffalo calves in the 1870s. A century later the conservation movement not only existed but had changed perceptibly from its utilitarian origins.

Love seemed to be a major catalyst of this change. The new environmentalists loved the earth in ways Theodore Roosevelt's generation of conservationists would have found incomprehensible. On May 21, 1979, for example, a letter from Mark Dubois reached the California headquarters of the Corps of Engineers. Dubois, leader of the fight to save the Stanislaus River Canyon from being flooded by a new dam and reservoir, declared that by the time his letter was read he would be chained to a secret cliff on the river's bank. If the reservoir rose, he

would drown. Only one friend, sworn to let him die if need be, knew his location. After failing to locate Dubois the Corps opened the gates of its dam and stopped the reservoir's rise. Released by his friend, Dubois insisted that his action was not a power play but a personal expression of love for a river and a non-violent way of protesting a moral wrong. The same sense of moral outrage motivated the environmental guerrillas Edward Abbey described in The Monkey Wrench Gang (1975) as they sabotaged the technology that was, in their view, destroying the West. Although partly tongue-in-cheek, Abbey's celebration of radicalism and violence made considerable sense to Americans with ethical motives for protecting the earth.

Documenting historical change is sometimes easier than explaining it. But the historian of the new environmentalism must ask why this unprecedented perspective captured the imagination of many Americans in the 1960s and 1970s. Why, in particular, should environmental ethics spread from a small coterie of philosophers and scientists to blossom into a remarkably broad public concern? And why should the most recent surge of the American conservation movement be the most intense?

What is intriguing as an explanation is the possibility that an ethical attitude toward nature is the latest in a succession of American concerns for the rights of exploited or oppressed minorities. The new environmentalism simply transcended the limitations of species. This perspective interprets it as an extension of democracy--a rounding out of the American Revolution in ways that would have astonished W J McGee and other anthropocentric Progressive conservationists. They saw their cause as providing equal access to natural resources for all human members of the community. The new concepts made nature part of that community. The gospel of ecology, in other words, expanded natural rights into the rights of nature.

Continuing this pattern of explanation, it appears worth exploring the idea that what powered the new environmentalism was its link to revolutionary democratic theory so central to America's beginnings and subsequent history. The assumption is that oppressed and exploited minorities have always found a soft spot in the American heart.

"Freedom" and "liberation" have had explosive potential in this culture. When the emotion inherent in these concepts became associated not just with social groups but with nature, the new environmentalism resulted.

While admittedly oversimplified, figure 2 may help illustrate this explanation. It assumes that, rhetoric aside, the idea of rights was never universal. The Magna Carta of 1215 actually had a very limited constituency among English nobility. Later, American colonists were clearly regarded and treated as second class citizens of the British empire. This denial of rights became, of course, an important factor in bringing on the war for American independence.

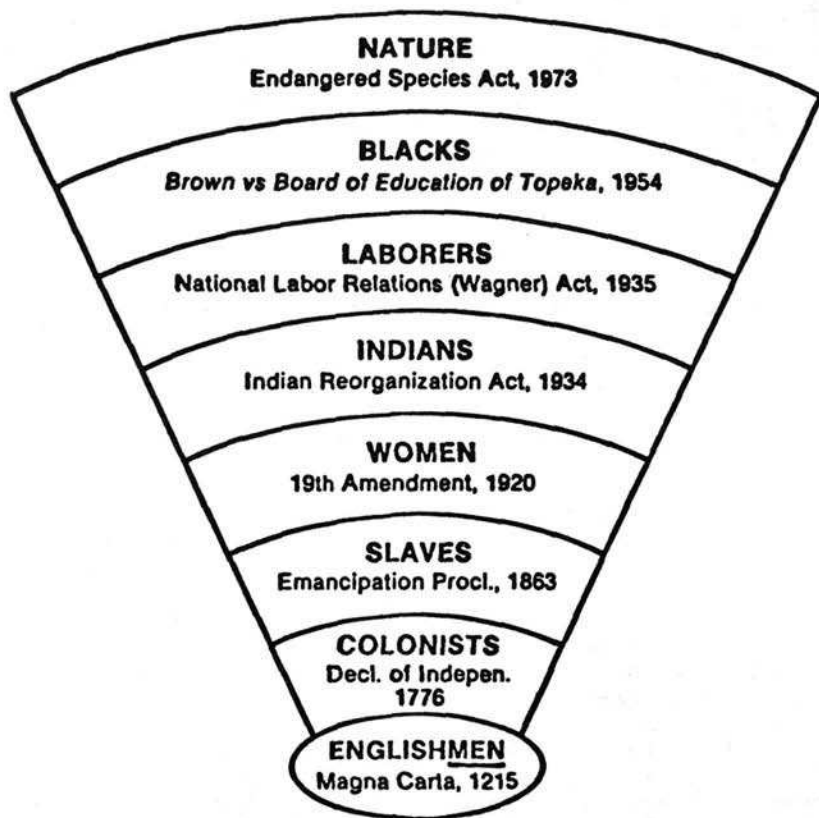
In the 1770s American democratic theory might have given "all men" equal rights on paper, but in practice some were a lot more equal than others. This comes as no surprise to professional historians who have long understood that the democratic theory underlying the American Revolution had severe limitations. Slaves, women, Indians and, to some extent, laborers without property, were in actuality not equal in rights with other members of early American society.

In time, as Figure 2 suggests, these groups caught up with the mainstream and became full members of the ethical and legal community. To some extent violence, or at least social tension, accompanied each expansion of rights. This seems to be explained by the fact that certain segments of society benefitted from the denial of rights to other segments. The practice facilitated exploitation. England, for example, was reluctant to give the American colonists equal rights and representation because doing so would have compromised the economic advantages of colonialism. That reluctance in time deepened into a determination to fight to preserve the empire.

The same pattern emerged in the case of America's slaves; and here the parallels with nature are revealing. Abolitionists objected to slavery because it involved ownership of something they considered as having rights and being oppressed. They saw slaves, in other words, as members of their ethical community. Slavery was not just uneconomic

Figure 2

The Expanding American Concept of Rights



or politically unsustainable; it was wrong. The new environmentalists held the same attitude toward the earth. Ownership and exploitation were again the issues. Nature, in a sense, was enslaved, and Mark Dubois, Paul Watson and Edward Abbey were, in a sense, abolitionists. Indeed it is tempting to see William Lloyd Garrison's newspaper, The Liberator, as having the same relation to abolitionism as Not Man Apart does to environmentalism. Harriet Beecher Stowe's Uncle Tom's Cabin (1852) and Rachel Carson's Silent Spring (1962) are similarly comparable. And the drawings of chained and mutilated slaves that so stirred the consciences of Americans in the 1850s anticipated the photographs of oil soaked birds, clearcut forests and dammed rivers that energized the new environmentalists a century later.

The similarities between abolitionism and environmentalism have not gone unnoticed. Albert Schweitzer noted early in the present century:[11]

"It was once considered stupid to think that colored men were really human and must be treated humanely. This stupidity has become a truth. Today it is thought an exaggeration to state that a reasonable ethic demands constant consideration for all living things down to the lowliest manifestations of life. The time is coming, however, when people will be amazed that it took so long for mankind to recognize that thoughtless injury to life was incompatible with ethics."

Aldo Leopold also used slavery--in Odysseus' Greece--as a way of explaining how ethical ideas could change. In Sand County Almanac he pointed out that Odysseus could hang a dozen slave girls on one rope because "the hanging involved no question of propriety. The girls were "property," and their treatment was "a matter of expediency, not of right and wrong." [12] This was still true, Leopold observed, about land, but he wrote in 1948 before an expanding ethical consciousness began to bring about changes. By 1978 Elizabeth Gray could ask, in the title of a book, Why the Green Nigger? Of course even in 1978 there were a great many Americans who

regarded a land ethic as totally crazy. But, it is well to recall, a great many in 1859 said the same of John Brown when he tried to start a slave insurrection at Harper's Ferry.

John Brown's act of violence against what he considered morally wrong, his subsequent hanging, and, of course, the Civil War, suggest that ethical expansion is often associated with violence. Granted that the gospel of ecology has not led to war, but the possibility is always present when an issue is defined in terms of right and wrong. Compromise becomes difficult. Part-time slavery is impossible and so is half a dam. Certainly more than previous conservation efforts, the recent environmentalism has the potential of engendering social conflict just as did the civil rights movement and opposition to the Vietnam war.

It is instructive to note that just as in the case of slavery and the movement for women's and Indian's rights, one of the most prominent goals of environmentalism is opening the American legal system to new definitions of oppression. In 1974 Christopher Stone, a lawyer, published Should Trees Have Standing?: Toward Legal Rights for Natural Objects. Stone's point was that Americans were beginning to think "the unthinkable" just as they once had in the case of blacks and females. The new cause was to give non-human life forms, and even places, "standing" in court. Of course humans had to speak for these litigants, but a Supreme Court Justice, William O. Douglas, ruled that this was entirely right and proper. In a minority (losing) opinion of 1972 concerning a ski development in California's Mineral King Valley, Douglas held that "inanimate objects" such as "valleys, alpine meadows, rivers, lakes . . . or even air" have a right to exist and should not be excluded from litigation to obtain that right. Douglas even cited Aldo Leopold to the effect that "the land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively, the land." [13]

Following this line of reasoning, the 1970s witnessed several well-publicized attempts to resist developments that would have destroyed the habitat of an endangered species. A tiny minnow, the snail darter, was the focus of an emotional, and ultimately

unsuccessful, attempt to stop a dam on the Little Tennessee River. Concern for a plant, the furbish losewort, held up approval of the Dickey-Lincoln Dam on Maine's St. John River. In Hawaii, a bird, the palila, sued for protection of its only habitat from the inroads of cattle and goats. The Audubon Society represented the bird, but the case was recorded as Palila vs. Hawaii, and the bird won. Significantly, all these species were lacking in utilitarian value to man. The movements for their protection appear to have been based on ethical grounds.

In 1973 Congress passed an extraordinary act that embodied the new ethical perspective and may be taken (see Figure 2) to represent a beginning of the institutional extension of rights to non-humans. The Endangered Species Act guaranteed the right to existence of any species threatened with extinction. Although highly, and expectedly, controversial, it has provided legal grounds for hundreds of decisions stopping or altering human plans. According to Joseph Petulla, the act embodies "the legal idea that a listed nonhuman resident of the United States is guaranteed . . . life and liberty." [14]

Returning to Figure 2, it is striking that the flowering of revolutionary environmentalism followed closely on the heels of action on behalf of oppressed human groups. The civil rights movement immediately preceded it, and women's liberation efforts (the Equal Rights Amendment, for example) occurred simultaneously. Several scholars have commented on the relationship of women's rights and environmental rights including Annette Kolodny in the significantly-entitled The Lay of the Land (1975). Kolodny feels that male exploitation of women and nature have similar roots and expressions in American culture.

We have, in sum, become accustomed to think of the environmental movement and the ecological perspective that lies behind it as hostile to traditional American values, as part of the counterculture. Paul Shepard called ecology a "subversive science", and Leo Marx pointed out the incompatibility of American ideals (like growth and individualism) and the ideals of the new environmentalism. [15] Left-wing environmentalists like Murray Bookchin have argued that meaningful protection of the environment depends on a wholesale

dismantling of American political and economic institutions. But if conservation is defined ethically, it fits quite squarely into the most traditional of all American ideals: the defense of minority rights and the liberation of exploited groups. Perhaps the gospel of ecology should not be seen so much as a revolt against American traditions as an extension and new application of them--as just another rounding out of the American revolution.

[An admittedly undeveloped analysis, this essay is merely a statement of needs and opportunities which the author intends to pursue in a book-length intellectual history of the American environmental movement since World War II. Samuel Hays is laying the political, social and economic foundation for such a study in his forthcoming book about the same period which has the working title "The Politics of Health, Beauty and Permanence." I have published preliminary statements as "environmental ethics" in Ronald Clarke and Peter List, eds., Environmental Spectrum (New York, 1974), pp. 142-150, "The Significance of the Arrangement of the Deck Chairs on the Titanic," Not Man Apart (Oct., 1975), pp. 7-9, and "Do Rocks Have Rights?," Center Magazine, 10 (Nov.-Dec., 1977), pp. 2-12.]

ENDNOTES

[1] I have sketched these changes in The American Environment (Reading, Ma., 1976), esp. p. 226 as well as in Wilderness and the American Mind (New Haven, Ct., 1972), pp. 251ff. Hays' book is Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920 (Cambridge, Ma., 1959).

[2] The standard reference is J. Leonard Bates, "Fulfilling American Democracy: The Conservation Movement, 1907-1921," Mississippi Valley Historical Review, 44 (1957), pp. 29 ff.

[3] W. J. McGee, "The conservation of Natural Resources," Proceedings of the Mississippi Valley Historical Association, 3 (1909-1910), pp. 365 ff. as quoted Nash, ed., American Environment, pp.

[4] For Leopold see two of my essays: Dictionary of American biography (New York, 1974), Supplement 4, pp. 482-84, and "Elder of the Tribe: Aldo Leopold," Backpacker, 27 (June-July, 1978), pp. 21 ff. and Wilderness and the American Mind, ch. 11 concerns Leopold. The best monographic treatment is Susan Flader's Thinking Like a Mountain: Aldo Leopold and the Evolution of an Ecological Attitude Toward Deer, Wolves, and Forests (Columbia, Mo., 1974).

[5] A related publication was Rodman's "The Dolphin Papers," North American Review, 259 (Spring, 1974).

[6] "Liberalism and the Ecological Crisis: Some Tentative Reflections" (unpublished paper presented to the Western Political Science Association, April 4, 1970).

[7] The papers were published as Robert C. Schultz and J. Donald Hughes, eds., Ecological Consciousness (Washington, D.C., 1981).

[8] "Shallow and Deep Ecology: A Review of the Philosophical Literature" in Schultz and Hughes, eds., Ecological Consciousness, pp. 391-462.

[9] "The Deep Ecology Movement," Natural Resources Journal, 20 (Spring, 1980), pp. 299-332.

[10] As reported in Animal Welfare Institute Quarterly, 30 (Fall, 1981), p. 5, and in Paul Dean, "Soldier With a Dangerous Task: Let There Be Whales," Los Angeles Times, Feb. 3, 1982, pt. V, pp. 1, 4.

[11] As quoted by Donald Worster in "The Intrinsic Value of Nature," Environmental Review, 4 (1980), p. 44.

[12] A Sand County Almanac (New York, 1949), p. 201.

[13] Douglas as quoted in Stone, Should Trees Have Standing? (Los Altos, Ca., 1974), pp. 73 ff. The quote from Leopold appears on pp. 83-84.

[14] Petulla, "American Institutions and Ecological Ideals," Science, 170 (Nov. 27, 1970), pp. 945-952.

[15] Marx. "American Institutions and Ecological Ideals," Science, 170 (Nov. 27, 1970), pp. 945-952.

CONSERVATION AND ENVIRONMENTALIST MOVEMENTS IN THE
U.S.: COMMENT ON HAYS AND NASH

Donald Worster
University of Hawaii

Every group seeking moral or political reform wants to have its cause vindicated by history. Marxists tell us that dialectical materialism is inexorably leading toward a classless future. Christians take their eschatology from God, while a Japanese businessman inspires his workers with grand extrapolations from past export charts. For the committed this can be an efficacious strategy; the will to believe that time is on your side has often been a powerful force in making history. For the new convert it can furnish a sense of purpose. But for the professional historian it is a suspect strategy to follow. One can always find directions and patterns in the past; it is far more difficult to make the case that those directions add up to general cosmic progress. That difficulty is encountered, it seems to me, in both of these papers. They are alike intelligent, well argued, and persuasive--but finally they are premised on the uncertain assumption that history is moving in the direction that contemporary environmentalists would like it to go.

Much is made by Professors Hays and Nash of recent legislative achievements, adding up to what they contend is a "massive" and "profound" shift in American environmental values. The Endangered Species Act, the Clean Air Act, the preservation of wild rivers and deserts are all cited as examples of a permanent change in consciousness--a greening of America that no amount of supply-side rhetoric can turn brown. I am almost convinced. It is of course true that most citizens stand somewhat to the left of President Reagan on environmental issues (and to the right of the Sierra Club). It is an indisputable fact that America's bourgeois culture has always sought, when and where they did not interfere with making money, the ideals of cleanliness and beauty; that such amenities, once considered the exclusive prerogatives of factory owners, are now becoming more widespread demands; that there has been some distaste generated over the past several decades for the spoils of progress. Up to a point American economic and social institutions have been capable of

accommodating those facts: thus junk cars have been screened from sight, palila birds have become wards of the court, solar systems have been marketed. But it is altogether premature to assume that such accommodation really implies deep cultural change. Consider for a moment the other side of the ledger. An age of scarcity has succeeded one of affluence, and we no longer are sure we can afford frills like snail darters. Consequently, the old patterns are reasserting themselves with vengeance: wilderness areas are threatened with mining, predator poisoning is being reintroduced on public lands, five new dams have been authorized for California's Stanislaus River to meet the energy crisis. And even back in the fresh green salad days of Earth Day euphoria in the United States was capable of putting far more land into shopping centers and highways than into wildlife sanctuaries, of spending more on cosmetics than on pollution control. With the same affluence that allowed us to buy a few amenities at home, we riddled the landscape of Southeast Asia with bombs, moved some of our worst polluters to South America, and left our detritus on the moon. It is, to say the least, highly problematical whether, on balance, there has been a radical change toward environmental protection in this society, or even whether what has been achieved will survive into the next century.

I make these points not to provoke a sense of gloom, but to sharpen our analysis. We will not make a convincing account of the recent environmental reform era until we do three things: first, reexamine closely our standard theories of historical progress; second, understand the complex role environmentalists play in defining the dilemmas of contemporary society; and third, realize what a genuinely radical challenge to this culture must entail--what it must confront and transform.

Professor Hays' paper is one of the best surveys of the recent period I have read. He suggests in clear, precise terms how public environmental values in the years after World War II added new, sometimes conflicting, emphases to prewar values. And he commendably tries to explain those value shifts by socio-economic factors. But his analysis of those factors is, in my opinion, too general and brief to be entirely satisfactory. It will not do simply to say that rising affluence and education were the main engines of change. There are too many wealthy

Americans opposed to toxic-waste regulation, too many Ivy League graduates who want to get rid of the EPA, for that explanation to get us very far. Something more detailed and precise is needed to explain what goes into the making of an environmentalist and what creates a receptive milieu. It is at least arguable, for instance, that a depression America did more for wildlife protection than the mass-consuming 1950s did. Certainly more wealth, more education do not yield an automatic or a proportionate return in ecological sensitivity.

The social theory behind Hays' analysis appears to be derived mainly from the modernization school, which was popular some years back but now is under devastating attack. That theory always contained within it, one suspects, a faith in progress and enlightenment that was thoroughly traditional American: the advance of industrial society would bring all men and women the world over to democracy, efficiency, and cooperation. In the process we would pay a psychic price, but it would finally be worth it. The novel twist in the Hays paper is to add environmental preservation to the outcome. In contrast, one of the leading proponents of the theory, Peter Berger (in The Homeless Mind), argues that environmentalism is a kind of neurosis, an "anti-modern" reaction to progress. And in truth the most ardent nature lovers have seldom seen themselves as beneficiaries or promoters of progress in the way Hays does. Why is there so much overt hostility to the consumer society and modernity among some environmentalists--the disciples of Thoreau and Muir in particular--if au fond they are as unequivocally "modern" as Hays's account has them?

To make his case more plausible, Professor Hays has to ignore all those environmentalists who don't quite fit into a modernization model. What he profiles for us is, say, the National Audubon Society, in whose magazine one can find exemplified much of what he describes; an environmentalism that is mildly reformist, nonideological, and largely compatible with the advanced consumer society (see all their glossy ads for foreign automobiles, perfumes, oil companies, luxury cruises). According to this group, nature too can be packaged and sold to discriminating buyers, and eventually that tastefulness will trickle down to the unredeemed masses. It is unfortunately a fragile, and

ultimately untenable, faith. At some point Americans and Audubon members have to ask, where do you put the oil wells to feed the Mercedes? More and more, they will be called upon to choose between oil and birds, and we will then see how far "modernity" (read consumer/marketplace culture) will take us toward ecological harmony.

Meanwhile a very different environmentalism has been emerging in the United States and abroad--and it has been generally underplayed in this paper. It is in fact ideological, contentious, sometimes radical, and much more critical of American institutions. It is not concerned with satisfying "wants" but with claiming or extending "rights," with raising moral challenges, with defining intrinsic and enduring values. For instance, there is no mention here of the worldwide Greenpeace campaign to stop the killing of seals and whales--can that concern really be meaningfully described as an "evolving consumer value?" What of the antinuclear movement, which since the fifties has become strongly opposed not only to nuclear power but to the American and Russian war machines? What of the socialist Barry Commoner and his critique of capitalist profit as ecologically destructive? How do we fit Rachel Carson's reverence for life into postwar patterns of affluence, or explain her devotion to the Albert Schweitzer of an earlier, poorer generation? Can "postindustrial society" explain Paul Ehrlich's and Garrett Hardin's alarm over immigration and overpopulation? Those names are of course instantly recognized everywhere as major environmental leaders. Granted Hays is talking about broad popular views, not leaders, but he can hardly leave such figures out of his reckoning of "environmental politics." What they collectively suggest to me is not a cohesive program, or even a set of ideas that has become commonly acceptable. Rather they stand for sharp disjunctions--for aggressive critiques of modern American culture that are potentially more truly revolutionary than those phenomena Hays discusses. I say potentially because it is unclear on this level whether environmentalism has the means or the following yet to redesign America. It is up against formidable, determined counterforces.

The second presentation, by Professor Nash, fills some of the ideological gaps in the Hays essay. Nash argues that recent environmentalism must be

understood, not as the expression of a new advanced consumer mentality replacing older production drives, but as an ethical break with the past--biocentrism replacing anthropocentrism. In contrast to Hays, he gives little attention to the socio-economic factors underlying that new gospel. Rather, he suggests an all-powerful religious or spiritual force evolving in history--a Hegelian unfolding of Idea, or perhaps more accurately, the growth of a democratic ideology that is reminiscent of the 19th-century historian George Bancroft's philosophy of history. The outcome predicted in that evolution is one I might wish for in the strongest terms; in fact, as moral philosophers Nash and I would have much to agree on. But is his approach, provocative as it surely is, convincing history? How far does it help us understand the recent past, or more pragmatically, how clearly does he indicate the means by which that new ethic can get implemented? On these questions there are doubts that must be entered.

The gist of Nash's argument is expressed in two charts, depicting in the first case the advance of ethics through all of history (inspired in part by Aldo Leopold) and in the second the expansion of natural rights thinking in the United States. Both of them, it seems to me, but especially the first one, may do more to distort than to clarify historical complexities. Both are based on a theory of moral enlightenment that seems rather outdated and perhaps invites complacency. We are told, for example, that primitive peoples put the self ahead of family and tribe, that a respect for life is an ethic unique to highly civilized cultures. One could just as plausibly reverse that progression, arguing that modern America is based on a narcissistic infatuation with self, that it was (and is) the native Americans who first granted rights to rocks. When one has trouble deciding whether a chart is upside down or not--as we do in this case--it is time to ask whether our historical models are very dependable.

But setting aside the grander tides of history, what of the 1960s and '70s? Did American conservation in those years move away from utilitarian economics and toward Leopold's "land ethic?" The evidence is clear, I think, that it did--but also that it didn't get very far. We have not yet had our ecological Lincoln or an Emancipation Proclamation (which would in any case be only a bare

beginning, if the example of black liberation can be applied here). Slaves were freed with the use of arms by those northerners who had no economic stake in the peculiar institution, while women have more recently been helped along the road to autonomy (so we are told) by contraceptives and the desire for larger family income. Nature, on the other hand, remains firmly under domination. Environmentalists have yet to discover how a world of four billion people can be supported at modern industrial standards of living without the total, absolute enslavement of nature. Not many environmentalists have really begun to consider the radical changes in our own society, let alone in others, needed to make that emancipation possible. What I am getting at is the fact that moral revolutions cannot occur only on the abstract plain of ideas and philosophy; they must be based on underlying concrete, structural changes or they will come to nothing. A shift to biocentric values will necessarily entail far-reaching alterations in such structures as social power, class, marketplace institutions (property, capitalist accumulation, advertising, multinational organization), and industrial technology. Is there evidence that any of those structures has in fact been altered of late? We may, as Nash says, have in the biocentric ethic "an idea whose time is coming," but we will only know for sure after we have examined those underlying material dynamics more closely.

The task of writing recent history, it must be admitted, is an exceptionally difficult one. What is gained by the advantage of firsthand observation is often offset by the overwhelming plethora of details and by an irresistible desire to predict the future. Henry Adams tried to do it earlier in this century. He ended by declaring that history is at last nothing more than a private thread we wind round a private bobbin--an ordering of chaos that has mainly its personal uses. He was probably right about it. If then these two fine scholars, Hays and Nash, have found a general law of progress in winding their threads, it may serve them very well. Many environmentalists too will be encouraged by their history. All of us must admire their craftsmanship--and some of us may go on winding our own threads in a less reassuring direction.

NAVAJO ECOLOGY AND GOVERNMENT POLICY

Donald A. Grinde, Jr.
University of Utah

Epistemological Introduction

The idea of ecology is a relative one. Like all concepts created by man it is culturally grounded, and it is issued from an experience of a culture's intellectual and environmental experiences. This study will delineate not only the differences between Navajo ecology and government policy but also the ecological assumptions and theories of both cultures.

The Euro-American culture asserts its dominance in many ways, even in a relatively "new" area such as environmental history. European intellectual dominance has been swift. The rationale for this intellectual assertiveness is usually found in three assertions:

1) The concept that Europe was, and is, the intellectually leading culture for the past 1,000 years. Non-Western cultures and ideas are less emphasized because they are "primitive" and/or less interesting than true European history.

2) Contemporary power relations give the "conqueror" the right to impose the "winning" or "successful" mode of ideas upon the "losing" or "unsuccessful" cultures (latent Social Darwinism).

3) The concept that all people/cultures behave and conceive in the same way so that the ideas of the dominant culture need only minor refocusing in order to cover the "new facts or contents of any culture.[1]

These conceptualizations reflect not only the cultural arrogance of Europe but its way of perceiving reality. The Euro-American approach to knowledge in the academy is through abstraction. That is, reality is perceived through science and/or religion. Speculative philosophy has developed out of the conflict of "scientific" and "religious" reality. Thus, speculative philosophy creates an

abstract reality through which science and religion can communicate. Such an approach

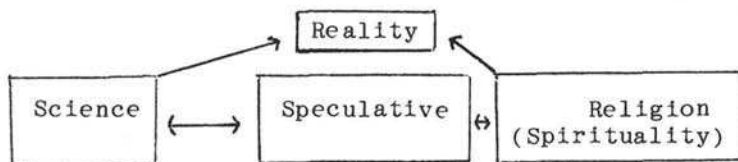


Diagram I: Western Civilization Approach to Reality[2]

to reality is clearly repeated in the departmentalization of the Western University. Departments like history, biology, and literature are separate and discrete areas of inquiry. Society is thus perceived in fragmented fashion: church, state, business, education and now ecology.

Given this philosophical and cultural bias, it follows that the dominant society, even when it "discovers" a new area of inquiry, will be unable to embrace the conceptual modes of a different culture.

Traditional American Indians and Navajo ways of perceiving the world are in contrast to the abstract world of Western thought. For Navajos and most tribal people, reality is based on experience. Knowledge is not "compartmentalized." All ways of looking at the world (science and religion) are mutually and perpetually informative. Visions, production of goods, concrete observation, and ritual constantly concretize human existence with nature (reality). Basically, all things, experiences and ideas simultaneously reinforce that reality. This view is the characteristic "sacred hoop" or "circle" within the traditions of many Native American people. In essence, reality is not something "above" but an integral part of the experimental process itself.

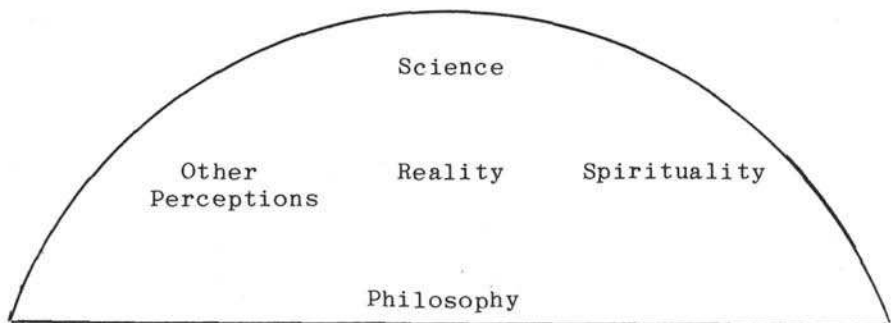


Diagram II: American Indian Approach to Reality[3]

To sum up, "ecology" is a "new" abstract slice of reality in the Western mind. To Native Americans and the "Navajo" it was, and is, an integral part of the living/knowing process. If we juxtapose the two cultures, we find the patterning of the Western culture is based on planning, manipulation, predictability, competition and power while the Navajo way is based on reciprocation, response to situation and cooperation.[4]

Navajo Ecology

The differing ways that cultures define their relationship to nature is a complex subject. The Navajo conception of nature and the Euro-American viewpoints on ecology have little in common. Such differences have produced conflict and confusion between the Navajos and the United States government. The basic value orientations of Navajo ecology are holistic and participative while the theoretical underpinnings of Euro-American ecology are empirical, abstract and narrowly defined. These differences, in a broad sense, have created a tension between the two societies since the U.S. government's ecology has often been forced upon the Navajos with little sensitivity.[5]

A full explanation of Navajo ecology in linear and rational terms is virtually impossible since the Navajo view of the environment is one of

participation and reciprocation. For instance, a moviemaker and an anthropologist recently gave some young Navajos cameras and asked them to make movies. One girl made a movie on Navajo weaving, supposedly a "technical" subject. But the forty-five minute movie had only a few pictures of rugs and the weaving process. Most of the film was about people herding sheep, riding horseback, shearing, digging roots for dyes and just shots of the desert. The entire film was a statement of the important factors to Navajos in making rugs, that is, human interaction with nature. This process was far more important than the mere "technique" of weaving. For the Navajo, weaving is an extension of the reciprocations embodied in his world view. Needless to say reciprocity and balance are important factors in Navajo rug and fabric design as well.[6]

Reciprocity is central to the production of many other Navajo items. For instance, deer killed for food may be shot. But in the traditional Navajo way, a deer killed for clothing must not have a punctured hide. To obtain such a hide, a Navajo gathers pollen in a pouch, maneuvers the deer into open country and jogs along behind it until it is exhausted. When the deer is exhausted, it is thrown to the ground as gently as possible and then smothered by the hunter with a handful of pollen so that it will die breathing a sacred substance. A ritual of apology is also done to explain the reason for taking the deer's life. The animal is then skinned in a ritual manner and the carcass is also disposed of in a ritual manner.

The deerhide is then tanned and dyed from herbs and from parts of the deer. Moccasins are then made by sewing the deerhide uppers to cowhide soles. Often, the moccasins are buried in wet sand until the person for whom they are intended comes by and puts them on. The person wears them until they are dry. This creates a footprint in the sole so that these are unmistakably their own shoes. In fact, shi ke', "my shoes" is also "my foot" in Navajo. The implication is that the deerskin becomes a part of you. Thus, the moccasin, like the rug, is more than something to facilitate your feet. It is symbolic of the sacred human interaction with plant, animal, and the earth that is so central to Navajo "reality" and thus ecology.[7]

Government Policy

American contact with Navajos began at the outbreak of the Mexican War. When General Stephen Watts Kearny arrived in New Mexico with his Army of the West in May of 1846 he encountered a situation in which the Pueblos were surrounded by Navajos, Apaches and Comanches. The Navajos and other tribes raided the Pueblos continuously and had also kept their Mexican rulers at bay. Tension between Mexicans and Navajos was constant. Thus, one of Kearny's first official acts in New Mexico was to pledge protection for the white inhabitants from Apaches and Navajos. Kearny noted that the Mexican government had failed to provide this protection. The Mexican government offered no opposition to this assertion. The Mexican settlers, and Pueblo villagers offered no resistance and so New Mexico quickly passed into American hands. But Kearny was not successful in pacifying the Navajos before he moved on to California. Consequently, he ordered Colonel Alexander W. Doniphan, who had been left in New Mexico with a regiment, to make war on the Navajo and exact reprisals. Kearny also authorized the people of the Rio Abajo area (Mexican and Pueblo) to raid the Navajos. The Navajos found it difficult to understand why they should be criticized for making war upon the same people that the United States was fighting. Colonel Doniphan stated to the Navajos that it was an American custom to treat those that had surrendered as friends.[8]

From the start, American policy was unconsciously biased in favor of the sedentary Pueblos versus the pastoral way of life of the Navajos. Of course, the policy was also biased in favor of white over red race. By late 1846, temporary treaties were made with the Navajo and other Athabascan speaking tribes. However, American overconfidence, Mexican intrigue and Indian persistence led to the Taos Revolt of January, 1847 in which the U.S. territorial Governor and other U.S. officials were killed. As a result New Mexico remained insecure to American hands until the summer of 1849 when James S. Calhoun, New Mexico's first Indian agent, arrived on the scene. Calhoun worked closely with Lieutenant Colonel John MacCrae Washington, the military commander and Governor of New Mexico.[9]

In the autumn of 1849, Washington and Calhoun tried to impress upon the Navajos the power of the U.S. government and military, the right of the U.S. to assume jurisdiction over the area, and the right to build military garrisons in Navajoland, if necessary. But the council broke up, when Washington tried to take a Navajo horse which a Mexican volunteer claimed was stolen. Subsequently, Washington did sign a treaty with a few minor Navajo chiefs that

- 1) recognized U.S. jurisdiction
- 2) promised peace
- 3) sought to return captives
- 4) asserted the U.S. government's right to determine the boundaries of Navajo lands.

But the treaty was meaningless to the major portion of the Navajo tribe and warfare continued.

Calhoun believed that only brute force and separation of Navajos, Apaches, Comanches, and Utes into controlled reservations could stop conflict between the Athabascan speaking tribes and the sedentary whites and Pueblo Indians. Thus, differences in land use and the accompanying ecological perceptions was one of the first problems between Navajos and the U.S. government.

Given this perception, it is not surprising that Calhoun's approach to the resolution of conflict would be ecological. Calhoun stated that Navajos and other Athabascan speaking tribes in the area should be made more pastoral and agricultural once settled upon a reservation. The alternative to such a program, Calhoun reasoned, was extermination. Agent Calhoun felt that the Pueblos should be citizens because of their land use characteristics, and indeed, he felt that the Pueblos could be used effectively to quell Navajo raids. Thus, government Indian policy was being made on the land use practices of various Indian groups in New Mexico.[10]

In 1851, Colonel Edward V. Sumner arrived in New Mexico as the new military commander. Calhoun was made Territorial Governor in 1850 when New Mexico became a territory by virtue of the Compromise of 1850. After some debate, Sumner withdrew his troops

from the towns and established two forts, Fort Union and Fort Defiance in 1851. Fort Union was built on the Santa Fe Trail near Moro, and Fort Defiance was built in the heart of Navajo country as the name connotes. Fort Defiance was an attempt to assert U.S. military authority in Navajoland and confine the Navajos and the other tribes. Seeds and farm implements were brought to these and additional forts created to pursue this policy. Thus the remedy to Navajo-American conflict was to change the Navajo economy, land use, and in part, the ecological perceptions of the Navajo.

This policy was pursued with varying success for about a decade when the Civil War broke out, and chaos broke out in New Mexico territory. It was not until 1864 when Kit Carson helped to round up the Navajo and take them on the Long Walk to Fort Sumner that government attempts to fundamentally alter Navajo land use would be more effective.[11]

In 1868, the government stepped up its policy of encouraging sheep herding among the Navajos. The Navajos had agreed by treaty to settle peacefully on the 3.5 million acres surrounding Fort Defiance, Arizona. At the time, they probably numbered about 15,000 people. After returning from incarceration at Fort Sumner, the government issued 34,000 sheep and goats to the Navajos. The idea was to make the Navajos self-sufficient sheep herders, and thus pacify them. The program was a success. Subsequently the reservation land base was expanded from 3.5 million acres to 11.5 million acres by the 1920s. By 1933, the population of the Navajo Nation expanded to about 50,000 people.[12]

Outward appearances seemed to indicate that the Navajos had strengthened their pastoral economy and coupled it with a sound agricultural subsistence economy. They had altered their land use in order to "survive." However, government encouragement of pastoral pursuits had been overemphasized. Reservation traders also encouraged Navajo to bring in fleeces and rugs to obtain cash for hardware, coffee and other foodstuffs.

The Navajo New Deal: Government Policy Versus Navajo Ecology in the Stock Reduction Program

From 1910 to 1933, various governmental surveys

analyzed the conditions of soil erosion that was occurring over most of the Navajo Reservation in Arizona, Utah and New Mexico. By 1933, at least 2,000,000 acres of grazing land was denuded and eroding. Various calculations indicated that between 37.5 and 60 per cent of the silt in Lake Meade above Boulder Dam was from the Navajo Reservation. To non-Indian environmentalists Navajo range capital and the water supply of neighboring whites appeared threatened. The interests of the Navajos and the government conflicted. Moreover, the perceptions of the problem and its solutions were different for both the Navajo and the government.[13] However, the government policies triumphed almost unchallenged (except for opposition on the reservation) over Navajo perceptions. This governmental paternalism and arrogance of power produced a social and economic disaster for the Navajo people.

The governmental facts were quite clear. In 1933, Secretary of the Interior, Harold Ickes, established a Soil Erosion Service that was to cooperate with the Public Works Administration to use federal funds earmarked for erosion control on the Navajo reservation. The recommendations of the Soil Conservation Service in 1934 called for the reduction of Navajo livestock to about 50% of the amount carried in 1933. Additionally, the Navajo Tribal Council set aside 50,000 acres for soil conservation experimentation in 1934. Using Public Works Administration funds, the Bureau of Indian Affairs began to purchase and slaughter livestock in 1934. To offset the economic impact of stock reduction, the B.I.A. started a number of Work Progress Administration and Civilian Conservation Corps projects on the Reservation. These projects were to provide wages to Navajos impoverished by stock reduction. The programs generally focused on soil conservation (dams and reseeding) and construction of roads and buildings. The result was that for several years about \$2,000,000 per year was spent on soil projects. Many traders encouraged this wage system since they could sell goods for cash instead of credit. In 1935, the B.I.A. centralized its administration of the Navajos at Window Rock replacing the six agencies that previously existed. Subsequently, the Navajo Reservation was divided into eighteen land management districts. From 1935-1937, the Soil Conservation Service with the Navajo Service conducted surveys of the entire Navajo reservation.

The surveys encompassed the economy, climate, soil, vegetation, hydrology, population and livestock problems of the Navajos.[14]

By 1937, the Navajo Service required that every stock owner on the Reservation register the total amount of stock owned at the time of the summer sheep-dipping. This registration was the basis for the issuance of grazing permits in accordance with the estimates of the Soil Service. In 1937, the Navajo Tribal Council drafted a set of grazing regulations that theoretically met the needs of the Navajos. After the Secretary of the Interior reviewed these regulations, the Council approved them in 1938. At the same time, the Council passed a resolution favoring the elimination of nonproductive stock.[15]

In 1939, the Arizona Courts upheld the right of the Interior Department to regulate the Navajo rangeland. In 1939, the tribal council also approved a program to reduce the horse population and it met with opposition.[16] This is the U.S. and Navajo governmental scenario. However, "grass roots" opposition to the stock reduction program was organized, widespread, and critical.

According to traditional Navajo, sheep, rain and land are related directly under an interesting set of natural laws. The anthropologist David Aberle describes the Navajo view of range management clearly:

Supernaturals gave sheep to the Navajos for their livelihood. When Navajos increase their flocks, the supernaturals see that the Navajos care for their gifts and bring rain. But when they use them improvidently or give them away the supernaturals respond by failing to bring rain. Hence reduction brings drought and damages the range.[17]

This attitude is reinforced by Navajo statements about stock reduction. Ernest Nelson, a Navajo who lived through stock reduction states:

The reason why there is no grass is because of little rain. Before stock reduction it rained all the time... Then, when John Collier put a blockade

on livestock, the rain ceased altogether.[18]

Another Navajo, Curly Mustache observed that:

During the period before stock reduction you could see the big size of sheep and horses, and during that time, the rainfalls were never shy.[19]

Thus, the two perceptions of the environment (Navajos and government) were still based on totally different views of the world.

Conclusion

By the 1940s, livestock reduction had reduced the Navajo to poverty and more dependence. Grazing stock had been reduced to one-half their 1933 levels. World War II provided some job outlets for young males. But overpopulation due to livestock reduction helped to justify the Navajo Indian relocation program of the 1950s. This program tore families apart and created further hardships. Stock reduction had broken the economic self-sufficiency of the Navajos and made them more dependent upon "government" solutions to problems.[20]

Even the sale of resources of the Navajos today is fraught with differing views. Peter MacDonald, a past chairman of the Navajo Tribe, asserts that Navajos cannot receive fair market value for their resources because:

1) the U.S. has no understanding of Navajo values which are essential in the calculation and selling of Navajo resources,

2) Navajo resources are never put on the open market,

3) in Indian dealings, the government exerts compulsion or duress in sales, and

4) Indians must deal through the U.S. government and therefore never know the needs of the buyers.[21]

MacDonald also talks of Navajoland in terms of balance, sacredness of land, and the Navajos special sense of place. MacDonald thinks that the Navajos can work with the U.S. government to restore

self-sufficiency to the Navajos and yet provide resources to the dominant society. At the same time, he asks the U.S. government to seek realistic alternatives to America's resource needs that do not put undue pressure on the Navajo people.[22]

So, the Navajo view of the environment has been attacked by government policy but it still persists. The basic problem is that U.S. government policy with regard to the Navajo environment has been manipulative, overly theoretical, and geared to solving "specific problems" (overgrazing, etc.). By manipulating the Navajo environment, the government has produced a great deal of cultural and economic strife among the Navajos that goes untabulated in the government's theoretical equations. However, it still appears that the Navajos and their leadership still strive for balance with nature and mediation with the creative force to insure a harmonious relationship with nature. Whether the two cultures can coexist and understand each other is problematical.

ENDNOTES

[1] Vine Deloria, Jr. God is Red (New York, 1973).

[2] See Walter H. Capps, ed., Seeing with a Native Eye (New York, 1976), pp. 1-8; Calvin Martin, Keepers of the Game (Berkeley, 1978), pp. 8-13; Ward Churchill, "White Studies or Isolation: An Alternative Model for Native American Studies Programs," unpublished paper at UCLA American Indian Studies Conference, May, 1980.

[3] Benjamin Lee Whorf, "An American Indian Model of the Universe," in John M. Carroll, ed., Language, Thought, and Reality, Selected Writings of Benjamin Lee Whorf (Cambridge, Massachusetts, 1956), Wilbur P. Jacobs, "Indians as Ecologists....," in Christopher Vecsey and Robert W. Venables, eds., American Indian Environments (Syracuse, 1980), pp. 46-64), and Barre Toelken "Seeing with a Native Eye: How Many Sheep will it Hold?" in Capps, ed., Native Eye, Ethelou Yazzie, ed., Navajo History (Chinle, Arizona, 1971), and Churchill, "White Studies or", UCLA Conference Paper.

- [4] Ibid., and Vecsey and Venables, eds., American Indian environments, pp. 1-37.
- [5] Ibid.
- [6] Toelken, "Seeing..." in Native Eye.
- [7] Ibid.
- [8] Roy A. Billington, The Far Western Frontier, 1830-1860 (New York, 1956), pp. 179-180.
- [9] Wilcomb Washburn, The Indian in America (New York, 1975), pp. 181-182.
- [10] For a fuller treatment of this policy see Robert Anthony Trennert, "The Far Western Indian Frontier and the Beginnings of the Reservation System, 1846-1851," (Ph.D. dissertation, University of California, Santa Barbara, 1969) which has subsequently been published.
- [11] Jerry Kammer, The Second Long Walk (Albuquerque, N.M., 1980), pp. 20-22.
- [12] U.S. Congress, House, Executive Document 263, 49th Congress, 1st session, p. 15.
- [13] Edward Spicer, ed., Human Problems in Technological Change (New York, 1952), pp. 185-207.
- [14] Graham D. Taylor, The New Deal and American Indian Tribalism (Lincoln, 1980), pp. 126-129, and Spicer, ed., Human Problems, pp. 185-207.
- [15] Ruth Roessel, ed., Navajo Livestock Reduction (Chinle, Arizona, 1975), Appendix.
- [16] Spicer, ed., Human Problems, pp. 185-207.
- [17] David Aberle, The Peyote Religion Among the Navaho (Chicago, 1966), p. 87.
- [18] Roessel, ed., Livestock Reduction, p. 159.
- [19] Ibid., p. 172.
- [20] Spicer, ed., Human Problems, pp. 185-207, and Peter Iverson, "The Evolving Navajo Nation: Dine

Continuity Within Change," (Ph.D. dissertation, University of Wisconsin, 1975) which has subsequently been published by Greenwood Press.

[21] Vecsey and Venables, eds., American Indian Environments, p. 168.

[22] Ibid., pp. 168-170.

SCIENCE AND ETHNOSCIENCE: NATIVE AMERICAN WORLD
VIEWS AS A FACTOR IN THE DEVELOPMENT OF NATIVE
TECHNOLOGIES

Clara Sue Kidwell
University of California, Berkeley

For thousands of years before European contact, Native Americans adapted to a wide range of environmental conditions throughout North America. In the Chaco Canyon region of western New Mexico, for example, a great Pueblo culture flourished from approximately 1100 A.D. to approximately 1300 A.D. Pueblo Bonito contained at least 800 rooms, and the total population of the canyon region may have been as many as 7,000 people at the height of the culture. The development of this culture was made possible by floodwater irrigation of corn with the river that flowed through the base of the canyon.[1] On the Northwest Coast, Makah whalers, using canoes hollowed out of single cedar logs, harpoons of yew wood, and lines of cedar fiber strung with inflated sealskin floats, hunted and killed whales weighing up to forty tons.[2] The Haida on the coast were expert canoe makers. The even thickness of the canoe shell was determined by smoothing the outside first then driving pegs of uniform length into the wood at intervals. The hollowing of the inside proceeded until the tips of the pegs appeared.

The stereotype of Native American cultural adaptation that has become popular in American society is that of the Indian living in balance with nature, taking from the environment only those things necessary for basic survival. The stereotype contains some truth. Native American societies have been classified by Bennett as "equilibrrious."[3] They were subsistence based, depending ultimately upon the sun as a source of plant and animal resources whose collection depended upon human energy. They used few forms of mechanical energy. The wheel was unknown in North America. Native people did not domesticate animals for food (unless one considers reports of semi-domesticate flocks of birds around native villages).[4] They did not domesticate major beasts of burden (although the dog was used to carry small loads, and the horse was readily adapted after its introduction into North

America). The energy that Native Americans used to supply their needs was human energy.

Leslie White considered that "It becomes the primary function of culture ... to harness and control energy so that it may be put to work in man's service. Culture thus confronts us as an elaborate thermodynamic, mechanical system." [5] By this criterion, Native American cultures have been considered primitive. Arnold Toynbee, in his famous Study of History classed the Eskimo as an "arrested civilization," which emerged to a certain level of social and religious organization by coping with its environment in order to survive, but which remained then at a minimal level of culture because so much effort was necessary for the people to wrest a living from their environment. [6]

And yet native cultures not only adapted to environmental conditions; they adapted those conditions to their own needs as well. Through the use of fire, native tribes on the east coast created the park-like aspect of the eastern forests upon which early travelers commented. [7] In California, the chaparral was fire adapted both by lightning and deliberate Indian burning practices. The Indians set fires to burn off the chaparral and encourage new growth that would provide better browse for deer. [8] The extent of the grassland areas of the Great Plains was partly a result of the Indian practices of burning the grass either in the course of buffalo hunting or to promote new grass that would be attractive to grazing buffalo. [9] Archaeological remains of great irrigation systems associated with remains of the Hohokam culture in the Southwest indicate the control of water resources not for mechanical energy but for greater control over crops. [10]

Leslie White's statement about energy and culture continues:

By means of technological instruments energy is harnessed and put to work. Social and philosophic systems are both adjuncts and expressions of this technologic process. The functioning of culture as a whole therefore rests upon and is determined by the amount of energy harnessed and by the way in which it is put to work. [11]

The social and philosophical systems of Native American cultures are a function of a certain kind of world view, a set of assumptions about the relationship between human beings and the forces evident in their environments. Using those assumptions, Native Americans interacted with and manipulated those forces. Their technologies were based in the use of exclusively human energy. That energy was expended both in providing for material needs through subsistence activities of hunting, gathering, and agriculture, and in influencing or controlling the forces of nature through their ceremonial activities. The interaction between the human world and the physical world represented mutual influence, within the context of a world view.

For example Waldo R. Wedel speculated that the herd behavior of the buffalo on the Plains demanded group activity on the part of buffalo hunters.[12] Ruth Landes surmised that the so-called "atomistic" personality structure of the Chippewa was related to the fact that they hunted large and solitary game animals such as the caribou, moose, deer, and bear.[13] Symmes Oliver documented the importance of the Plains environment on the cultures of tribes that moved onto the Plains to become mounted buffalo hunters after the introduction of the horse. Those tribes that had been originally farmers, some of whom remained partially farmers (Crow, Gros Ventres, Omaha, Mandan, Iowa, and Oto) retained a clan system, while those that had been hunter-gatherers in other environments (Northern Shoshone, Kutenai, Blackfoot, Comanche, Sarsi, Cree and Assiniboine), lacked clans. Even for those tribes that retained clans, however, the clan system weakened as the demands of the buffalo hunt called for greater flexibility in social organization.[14]

Human influence over the environment came in ceremonial activities such as the ritual cycles of the San Juan Pueblo people. The yearly cycle of ceremonial activities performed by the Made People, members of certain religious societies, was necessary to assure the turning of the seasons. In other words, the expenditure of human energy in ceremony was essential to the proper progression of the seasons, which was of course essential to the agricultural activities and subsistence of the group.[15] On the Northwest Coast, proper performance of the First Salmon Ceremony was

necessary to assure that the salmon would return in abundance the following year. The first salmon caught was ceremonially brought to the village, cooked, sliced and eaten. The head and tail had to be kept intact with the backbone and thrown back into the water.[16]

The assumptions concerning the relationship of human beings and the forces of their environments can be expressed in terms of a world view. Every culture can be said to have a world view within which it structures its social and philosophical principles and establishes its relationship with the external world. As A. Irving Hallowell remarked:

Human beings in whatever culture are provided with cognitive orientation in a cosmos: there is "order" and "reason" rather than chaos. There are basic premises and principles implied, even if these do not happen to be consciously formulated and articulated by the people themselves.[17]

His classic example of world view is his statement that when the Sauleaux flees in terror from the Windigo monster (the giant cannibal with a heart of ice), he is fleeing from a real threat, and to do otherwise would be an example of either extreme foolishness or phenomenal intellectual emancipation.[18]

American culture operates principally with a scientific world view, assuming a certain kind of order and certain kinds of cause-and-effect relationships. Native American cultures operated within a different set of assumptions which provided an internal logic and postulated certain kinds of cause-and-effect relationships. I shall define this set of assumptions as an ethnoscientific world view.

I do not propose to speculate on the origins of cultural assumptions about the nature of the world, but rather to take the concept of world view and examine the premises that are characteristic of a Native American world view. This method constitutes an emic approach to culture, looking at culture from the inside, as it were. The essence of a Native American world view is comprised of the most basic premises that can be extracted upon close examination of a broad range of Native American cultures. These

generalized assumptions should not override the extraordinary diversity of Native American groups, which adapted in many ways to many different environmental conditions, spoke hundreds of different languages, structured their societies in many different ways. The concept of world view is offered as a framework for interpretation of cultural adaptation.

The most basic premise of this general world view is that the environment--the forces of the natural world, are manifestations of spiritual beings. Hallowell commented on the Ojibwa concept of "owners" or "bosses" of the animal world--the spirits who controlled the movements of game animals.[19] These "owners" are the underlying reality of the physical world. Dorothy Lee commented on the Wintu notion that matter always has been. She noted:

The Wintu speak of these characters in English as Coyote, Loon, not a coyote. We have assumed that by this they mean a proper name. But it is probable that they refer to something unlimited, as we, for example, distinguish between fire and a fire. These characters die and reappear in another myth without explanation. They become eventually the coyotes and grizzly bears we know, but not through a process of generation. They are a prototype, a genus, a quality which, however, is not rigidly differentiated from other qualities.[20]

In native oral traditions generally, figures such as Coyote, Raven, and Bear appear, die, and reappear, or change form, as wenebojo, the trickster figure among the Chippewa changed himself into a snake to get at a particularly choice piece of meat on a moose skull.[21] Changeableness of form is a sign of spiritual power; it attests to the immutability of essence despite mutability of form.

The spirits of the world are not subject to unvarying laws of behavior. Their essence is will, volition, motion, speech. When Hallowell asked an Ojibwa man whether all stones were alive (in the linguistic category "animate") the man replied "No, but some are." [22] Flint is a living person in Ojibwa traditions.[23] In the Navajo tradition of the origins of the world, the hero twins who rid the world of monsters who were threatening human beings were protected by flint armor. Flint has life and

power in its ability to strike sparks.[24] In the Navajo world view, the concept of inner forms is of primary importance in the universe. Natural phenomena are lifeless, but an inner human-like form within each functions as their life principle, and it vitalizes and personalizes each phenomenon. In the origin tradition of the Blessingway chant, the inner forms of the sun, the moon, water woman, Mountain Woman, the four directions, and various other deities were contained in the sacred bundle of First Man, and in the first ceremonial at the place of emergence from the world below, he revealed these forms and placed them in the phenomena.[25] The spiritual nature of the world is manifest in movement and speech. It is manifest in the actions of spiritual beings to control the behavior of animals, and in the power of flint to protect and to give off sparks.

This sense of spirituality in the world, of the will and volition of natural phenomena, is evident in hunting rituals, where the body of an animal must be treated with proper respect. It may explain why native peoples did not domesticate animals. Although Elsie Clews Parsons attributed the fact that the Pueblo did not domesticate animals to a "conceptual block" on their part,[26] their attitude toward animals was one of respect, and animals gave themselves to human beings in the hunt, rather than being subject to domination by human beings. An interesting aspect of this attitude toward animals appears in origin story of the Night Chant, a Navajo ceremony recorded by Washington Matthews. In the story, the hero has a pet turkey who mourns his absence when he is away from the camp and who rejoices when he returns.[27] The turkey was not used as a food source but was a pet, a companion. The hunter who wanted to utilize animals did so through a combination of careful attention to their habits and a sense of relationship to the spirits who controlled the animal's behavior. Domestication was not necessary when such influences prevailed.

The second premise of a general Native American world view is that there are hierarchies of power, and that human beings are generally dependent upon the spirit world. Although human beings have the power to speak and to move (the major criteria for spiritual power), they have less power than do the spirits. Here the linguistic concept of ethnoscience has been a tool of study. Mary Black's study of

Ojibwa language structure showed that native categorizations of beings placed spiritual beings above human beings in ranked lists, and Hope Isaacs' study of the Iroquois, using a similar method of eliciting rankings, indicated similar categories.[28] Spirits, sun, moon, winds, stars, shells (certain shells called megis were sources of power in the Midewiwin, or grand Medicine Society, of the Ojibwa), thunders were among the things considered more powerful than humans by Black's Ojibwa teachers. Large animals and spirits were equally respected by several. The spirit world among the Iroquois was highly ranked in relation to humans. The physical manifestations--plants, animals--were ranked lower.[29]

The third premise of a Native American world view, and perhaps the most difficult to summarize, is that human beings can have access to power from the spiritual world. This power comes through the mystical experience--a direct, profoundly personal experience of the nature of the spiritual world. Ruth Benedict, in her study, "The Concept of the Guardian Spirit in North America," stated that the visionary experience was the essential feature of Native American religions.[30] Throughout North America, the visionary experience, the dream, or the initiation rite marked the emergence of the individual as a full participant in the life of the community. These experiences were ways of acquiring knowledge that transcended the social training of day-to-day experience. Individuals could establish personal, on-going relationships with guardian spirits, as was customary on the Plateau, in the Northeast Woodlands, and on the Plains, and on the Plains men continued to quest throughout their lives for knowledge concerning the outcome of events, as Sitting Bull did to determine the outcome of the Battle of the Little Big Horn.

Native American attitudes toward the natural environment can be seen as based in a world view that defines a personalized relationship between human beings and the forces of nature. Spiritual forces can be placated, and they can be controlled. The personal relationships that individuals may achieve with spirits through vision quests and dreams are reflected in the group relationships that are maintained in ceremonial activity. Human energy supplies the basic material needs of culture, both by

direct intervention in the environment through hunting, gathering and agricultural practices, and in the expenditure of energy in ceremonial activities whose purpose is to assure success in hunting or the growth of crops. Technology, the ways of utilizing energy, is manifest in simple tools which make the use of human energy more efficient. The atlatl extended the throwing range of the spear. The horn or shell bladed hoe made agriculture more efficient. The travois acted as a sled to carry larger burdens. But the important aspect of control over other sources of energy in the environment--animals, plants, rivers, storms--was found in the world view that posited the spiritual nature of those forces, attributed to them will and volition and spiritual motivation, and established personalized relationships with them through dreams, visions, and mystical ways of knowing.

ENDNOTES

[1] Kirk Bryan, "PreColumbian Agriculture in the Southwest, as Conditioned by Periods of Alluviation," Annals of the Association of American Geographers, XXXI, no. 4 (1941), 219-42; R. Gwinn Vivian, "An Inquiry into Prehistoric Social Organization in Chaco Canyon, New Mexico, in Reconstructing Prehistoric Pueblo Societies, edited by William Longacre (Albuquerque: University of New Mexico Press, 1970, pp. 75-76.

[2] Philip Drucker, Cultures of the North Pacific Coast (New York: Chandler Publishing Company, 1965), p. 136.

[3] John W. Bennett, The Ecological Transition: Cultural Anthropology and Human Adaptation (New York: Pergamon Press Inc., 1976), p 138.

[4] John R. Swanton, "Aboriginal Culture of the Southeast," Forty-Second Annual Report of the Bureau of American Ethnology, 1924-25 (Washington: Government Printing Office, 1928), p. 694.

[5] Leslie A. White, The Science of Culture: A Study of Man and Civilization (New York: Farrar, Straus and Giroux, 1969), pp. 367-68.

[6] Arnold J. Toynbee, A Study of History (12 Vols.; London: Oxford University Press, 1935-62), III, 4-7.

[7] Gordon Day, "The Indian as an Ecological Factor in the Northeastern Forest," Ecology, XXXIV (April, 1953), 334.

[8] Henry T. Lewis, "Patterns of Indian Burning in California: Ecology and Ethnohistory," Ballena Press Anthropological Papers, No. 1 (1973), pp. 48-49.

[9] Carl O. Sauer, "Grassland, Climax, Fire and Man," Journal of Range Management, III (1950), p. 20.

[10] Emil W. Haury, The Hohokam, Desert Farmers and Craftsmen: Excavations at Snaketown, 1964-65. (Tucson: University of Arizona Press, 1976).

[11] White, p. 368.

[12] Waldo R. Wedel, "Some Aspects of Human Ecology in the Central Plains," American Anthropologist, IV (1953), 501.

[13] Ruth Landes, "The Personality of the Ojibwa," Character and Personality, VI (1937), 4-5.

[14] Symmes C. Oliver, Ecology and Cultural Continuity as Contributing Factors in the Social Organization of the Plains Indians (Berkeley: University of California Press, 1962), pp. 2-3.

[15] Alfonso Ortiz, The Tewa World: Space, Time, Being and Becoming in a Pueblo Society (Chicago: The University of Chicago Press, 1969), pp. 206-107.

[16] Erna Gunther, "Analysis of the First Salmon Ceremony," American Anthropologist, n.s. XXXVIII (1926), 605-17.

[17] A. I. Hallowell, "Ojibwa Ontology, Behavior, and World View," in Contributions to Anthropology: Selected Papers of A. Irving Hallowell (Chicago: University of Chicago Press, 1976), p. 358.

- [18] A. I. Hallowell, Culture and Experience (Philadelphia: University of Pennsylvania Press, 1955), pp. 58-59.
- [19] A. I. Hallowell, "Some Empirical Aspects of Northern Saulteaux Religion," American Anthropologist, n.s., XXXVI (1934), 391.
- [20] Dorothy Lee, "Linguistic Reflection of Wintu Thought," in Freedom and Culture (New York: Prentice-Hall, Inc., 1959), p. 124.
- [21] Victor Barnouw, Wisconsin Chippewa Myths & Tales: And Their Relation to Chippewa Life (Madison: University of Wisconsin Press, 1977), p. 25.
- [22] A. I. Hallowell, "Ojibwa Metaphysics of Being and the Perception of Persons," in Person Perception and Interpersonal Behavior, edited by Renato Taquiri and Luigi Petrullo (Stanford: Stanford University Press, 1958), pp. 65-66.
- [23] Ibid.
- [24] Gladys A. Reichard, Navajo Religion: A Study of Symbolism 2nd edition, Princeton: Princeton University Press, 1950), p. 556.
- [25] Leland C. Wyman, Blessingway (Tucson: The University of Arizona Press, 1970), pp. 109-110.
- [26] Elsie Clews Persons, Pueblo Indian Religion (2 vols., Chicago: University of Chicago Press, 1939), I, 22.
- [27] Washington Matthews, "The Night Chant, A Navajo Ceremony," Memoirs of the American Museum of Natural History, VI (1902), pp. 174-75.
- [28] Mary Bartholomew Black, "An Ethnoscience Investigation of Ojibwa Ontology and World View," Unpublished Ph.D. dissertation, Department of Anthropology, Stanford University, 1967, p. 131.
- [29] Hope L. Isaacs, "Orenda: An Ethnographic Cognitive Study of Seneca Medicine and Politics," Unpublished Ph.D. dissertation, State University of New York at Buffalo, 1973), p. 122.

[30] Ruth Fulton Benedict, "The Concept of the Guardian Spirit in North America," Memoirs of the American Anthropological Association 29 (Menasha, Wisconsin: The American Anthropological Association, 1923), p. 29.

COMMENT

Peter Iverson
University of Wyoming

I am happy to have the opportunity to provide a comment at this session. Let me say a few things about the papers together and proceed to discuss them separately in the order they were presented. It seems to me that it is not accidental that both authors are members of Native American Studies departments. At a time when such programs are under administrative attack and financial duress, these papers mirror the promise of interdisciplinary enterprise. Those of us who reside in the West and who teach Native American history have an obligation to do more than wish Native American Studies well. I hope we will support their efforts and help to make sure they survive.

The papers represent the efforts of two scholars who for the past decade have been working in the field and who are now in a position to have a significant influence on how we see some basic questions. Clearly the answers we obtain about Native Americans and their history depend on the questions we ask. In reminding us about Indian world views they assist us in removing ethnocentric blinders; they allow us to ask more appropriate questions about the ways in which Indians interacted and interact with their environment.

Donald Grinde's paper on Navajo ecology and government policy begins with what he terms an epistemological introduction, in which he contrasts Western and Indian thought. As he cites Wilbur Jacobs, among others, I have left it to my colleague to comment here. My one quibble is which his categorizing university departments as separate and discrete areas of inquiry. They can be but they need not be and surely those of us who do Indian history from history departments can, should, and often in fact do utilize the other disciplines; I, for one, define history as everything that happened up to this sentence and any way of finding out about a part of the past is a means that ought to be used.

Following a brief discussion of Navajo ecology, Grinde turns to more lengthy considerations of

government policy and the conflict of government policy and Navajo ecology in the livestock reduction program during the commissionership of John Collier. In the first section Grinde focuses on the period from the Mexican War to the Treaty of 1868 when the Americans moved with startling rapidity and impressive determination to bring the Navajos under Anglo jurisdiction. The main question I would raise for this section deals with the portrait of the Navajo economy.

According to such noted observers as William Y. Adams and David M. Brugge, by the time of the Anglo campaign livestock had been established as economically important and culturally significant. The basic sedentary economic pursuits of the Navajo--W. W. Hill argued that the Navajos had been since historic times primarily sedentary agriculturalists--strongly influenced the kind of livestock raising they practiced. Seasonal movements of animals took place within a prescribed narrow radius which in no way could be considered nomadic.

This picture does not emerge very fully from this part of the paper. In addition, the era from 1868 to the early 20th century is covered in two fleeting paragraphs. It was an important time and merits more detailed analysis. I would make a couple of additional points here. One would be to note that overgrazing was reported as early as 1883. A second would be to add traders to the monolithic "government" as a central factor in the Navajo economy. Thomas Keam, Lorenzo Hubbell, Richard and John Wetherill, Sam Day, John B. Moore, David and William Babbitt, and the scattered sons of Joseph Lehi Foutz all helped shape government policies.

For the final section, several additions or clarifications seems in order. The idea for livestock reduction preceded Collier's administration and serious consideration of the program began in 1928 at a meeting in Leupp, Arizona, and continued in 1931 with a special February meeting of top administrators. So Collier in a real sense built upon previous discussions. Moreover, other considerations affected the thinking of government personnel. The Depression meant lower and lower prices for wool, goat meat, and mutton; Indian Service employees felt the Navajos should depend less upon livestock in these troubled times. They also

saw soil erosion in larger terms. If the tide could be turned here it could be anywhere: the first U.S. Soil Conservation Service demonstration project was initiated at Mexican Springs on the Navajo reservation.

Grinde uses Ruth Roessel and Broderick Johnson's book on stock reduction effectively to chronicle some Navajo responses. As he well knows, the imposed program had its adherents and was influenced in its composition by some of the ricos who did not want a percentage reduction of all herds. As he knows as well, Navajos objected to the tremendous impact stock reduction had upon their social environment. Sheep paid for a singer's services at a ceremony and mutton fed the assembled guests. For the average Navajo family which possessed few sheep the loss of any was a social disaster.

Donald Grinde is right: the legacy of stock reduction endures in difficulties and disagreements over how the land is seen and how the land is used. For most Navajos the raising of livestock can no longer be a central part of one's economic life, but the stock remains important to people in reaches of the Navajo Nations and almost everyone is related to someone for whom sheep matter. A different view of the land is part of an ethnic boundary that continues.

Clara Sue Kidwell's paper represents to me an interesting beginning. She has sampled from a variety of sources and marshalled some useful evidence to support her argument about Native American world views. In the end, I am troubled by some assertions that seem unnecessary rehearsals of what one hears in an introductory anthropology course and by a tendency to adhere to the cookbook approach in advancing a thesis. One wishes for a little more Kidwell and a little less anthropological stew.

I have two main questions to raise about this paper. Is there evidence that does not support her main points? And 2) do the Native cultures used as examples change through time? In other words, to what extent does Kidwell view Native Americans through the looking glass of an ethnographic present that denies change? Does the Native American world view presented here allow sufficiently for adaptation and alteration. Or to put the matter in a more

extreme way, given the great variation with Indian cultures, can we indeed talk properly about a generalizable Native American world view? I am not sure. I do know that tradition can be of recent vintage and we all know that cultures evolve through time.

That time for Indians often may be seen as circular rather than linear and how we relate to our environment may be more circular than progressive. For Native American views perhaps we need, too, to look not only to anthropologists and historians and not only to the collective wisdom of the old people. I believe we must also look to the poets, who may capture the spirit of a perspective that is old and new, changing and everlasting. Let me close with the words of one such young Native American poet:

Prayer to the Pacific

- (1) I traveled to the ocean
distant
from my southwest land of sandrock
to the moving blue water
Big as the myth of origin
- (2) Pale
pale water in the yellow-light of
sun floating west
to China
where ocean herself was born.
Clouds that blow across the sand are wet.
- (3) Squat in the wet sand and speak to Ocean:
I return to you turquoise the red
coral you sent us
sister spirit of Earth.
4 round stones in my pocket I carry
back the ocean
to suck and to taste.
- (4) 30000 years ago
Indians came riding across the ocean
carried by giant sea turtles
Waves were high that day
great sea turtles wades slowly out
from the gray sun down sea

Grandfather Turtle rolled in the sand
4 times
and disappeared
swimming into the sun

(5) And so from that time
immemorial,
as the old people say,
rainclouds drift from the west
gift from the ocean.

(6) Green leaves in the wind
Wet earth on my feet
swallowing raindrops
clear from China.

--Leslie Marmom Silko, in
Voices of the Rainbow,
ed. by Kenneth Rosen

PLANNED ECONOMY AND ENVIRONMENTAL PROBLEMS: EASTERN EUROPE FROM A COMPARATIVE PERSPECTIVE

Ingmar Oldberg
University of Lund, Sweden

1. INTRODUCTION

This paper will analyze the reasons for and solutions to the environmental problems in the East European countries pointing out similarities between the East and West European states and differences between the latter and the Soviet Union. Differences between the East European states themselves will also be indicated. Most attention will be given to Czechoslovakia and Hungary, the one emphasizing central planning, the other market mechanisms. By Eastern Europe I mean the Soviet Union's Warsaw Pact partners.

My main objective is to show why the environmental problems and the prospects for them in the future probably are worse in Eastern Europe, in particular the northernmost states, than in the Soviet Union and most of Western Europe. Admittedly, it is difficult to compare the actual extent of environmental disruption in the socialist countries because of their secretiveness with data in this field and differences in data measurement. Therefore, the main attention will be focused on the reasons for environmental disruption and the different solutions to the problem, especially the institutional management of it, in other words the "environmental efficiency" of the economic systems.[1]

2. NATURAL CONDITIONS

The East European states are all small in comparison with the Soviet Union. The East Europeans have less agricultural and forest area per capita than Soviet citizens. The GDR and Czechoslovakia are especially short in the former. The share of forest out of total area is highest in Czechoslovakia and Bulgaria, lowest in Hungary.

Some East European countries are, in contrast to most of the Soviet Union, hilly or mountainous.

Therefore they more often have air inversions, especially in the winter, which, in case of air pollution, cause high concentrations of pollutants and damage to the environment. Some of the countries are landlocked. There are several rivers flowing north or south with Czechoslovakia as water shed, but no big, unexploited rivers as in the Eastern Soviet Union, and few lakes. The GDR is shorter in water per capita than its neighbors and most of Europe.[2]

In view of the higher population density in Eastern Europe, the natural conditions appear to be worse there than in the USSR and more similar to the conditions in small states in Western Europe. However, the crucial question of course is how man has adapted to the given circumstances.

3. PRODUCTION STRUCTURE

3.1 Industrial development

Ever since socialism of the Soviet model was introduced in Eastern Europe, its countries have striven for economic autarky and devoted a greater share of their resources than the capitalist states to the development of heavy industry: the production of machines, appliances, metals, fuels, building materials, and chemicals. The military armaments also contribute to the development of the heavy industry. Correspondingly, a greater share of the population is occupied in these branches. Impressive figures of growth have been attained. This development has taken place at the expense of the production of consumer goods, services, and trade, which are important for the population's living standard.[3] Industrial development has to a greater extent than in the West followed an extensive pattern, raising production by enlarging existing plants and building new ones, rather than an intensive pattern, characterized by production increase through modernization and improved productivity. Another explicit aim of the socialist states has been to industrialize underdeveloped areas in order to achieve regional equality. Thus Czechoslovakia has boosted industrial production especially in Slovakia.[4] Strong concern for the territorial distribution of industry has been shown in Romania, where industry was to dominate production in every county by 1980.[5] This structure of

extensive production with emphasis on heavy industry, however, requires much raw material and energy. Thus the socialist states consume more steel and energy than the West European states. In these respects Czechoslovakia is worse than the others, including the USSR.[6]

3.2 Energy structure and environment

The energy structure of the East European states is distinguished from that of most West European states and the Soviet Union by the extensive use of solid fuels. Coal plays a dominant role in the three northernmost countries, the GDR, Czechoslovakia, and Poland, but it is also widely used in the other states. The GDR is the world's biggest producer of brown coal, and the CSSR is number two. Poland is the world's fourth-largest producer of hard coal, and this is the country's most important export product.[7] The problem is, however, that most of the coal contains many waste products such as sulphur and has low caloric value. This has several consequences. More of it has to be burnt to achieve the desired effect. It cannot be used in production processes, but has to be refined, which means to be transformed to electricity. This is one of the reasons why the GDR is second only to Norway in the world for the share of electricity out of the total energy consumption.[8] What most interests us here is the fact that all this--the preparation and combustion of coal--has disastrous effects on the environment. The combustion of coal in huge electricity and heat-producing plants is the major source of air pollution in Eastern Europe ahead of the chemical and metal industries.[9] The area from Polish Silesia across Bohemia to Saxony and Thuringia is the most polluted in Europe.[10]

In order to reduce the harmful local concentrations, very high stacks, capable of reaching through inversions, began to be built in the 1960s after the Soviet pattern. Abatement equipment to prevent pollution was also installed which succeeded in halting the growth of or reducing emissions, especially of solid particles from the metal and chemical industries. But the equipment has not been as efficient as expected, and it is in short supply. No solution to the urgent problem of intercepting sulphur dioxide seems to have been found.[11]

The use of coal has other adverse effects on the environment as well. The brown coal of the GDR and Czechoslovakia is quarried in open-cast mines, thereby disrupting vast areas of farmland. Huge masses of soil have to be moved away and heaped elsewhere. The disrupted area in the North Bohemian Brown Coal Region, which in this way is being transformed from landscape to "moonscape", is said to be the largest in Europe. Most has been moved.[12] The preparation and combustion of the coal also leave enormous quantities of waste products, which are difficult to handle. This devastation of the landscape is, of course, countered by subsequent recultivation measures, but these are very difficult and costly, and they do not seem to make up for the losses.[13]

The energy industry also causes water problems. Open-cast mining and the waste heaps disturb the hydrological balance. The deep hard-coal mines, as in the Czechoslovak Ostrava region and Polish Silesia, discharge vast quantities of salt water into the surface waters.[14] The preparation of the coal demands much water, and the combustion of it in the power and heat plants need even more for the cooling processes. The energy industry, in short, is a major consumer and polluter of water, together with chemical and metal industries often located in the vicinity.[15]

As the water supply directly affects production, it is a most urgent environmental problem in the most industrialized East European states. The water-poor GDR already utilizes about half its water resources, and most of the surface waters are classified as polluted. The situation is similar in Poland and Czechoslovakia. Czechoslovakia's water pollution affects the countries downstream, and it has agreed to pay indemnities to Poland and the GDR.[16] The situation is more favorable in the Balkans, but even in Romania prevention of water pollution has been declared a national problem.[17] To solve this problem, waste water treatment plants are built. However, this proceeds slowly, so that for example in Hungary, the GDR and Poland, only half of the waste water was treated in the middle of the 1970s. The treatment is most often only mechanical, and disturbances are common, just as with the air protection devices. Industries are also encouraged to recycle the water they use, and this seems from

necessity to have become practice in at least some East German industrial districts.[18]

The rising costs of coal production, including damages to the environment, the growing demands of the industry for more refined fuels and the expansion of automobilism in the 1960s prepared the way for a belated transition to oil, natural gas, and electricity. Except for Romania, which has oil of its own (and even exported most of it to the USSR until 1955), the East European states met almost all their demand for oil and natural gas by imports from the Soviet Union, and pipelines were built for transport.[19] Soviet oil came to play a prominent role in the energy balances, especially in Hungary and Bulgaria, which are short of coal. In spite of the fact that Soviet oil is relatively sulphurous, the introduction of oil and gas into some industries and into the house-heating systems in the main cities reduced the level of air pollution from these sources. The increased use of oil, however, has become a growing threat to the surface and ground waters.

However, in the 1970s Soviet oil production started to decline in relation to consumption and export, and the production and transport costs rose, as the sources in the European parts became depleted and new ones had to be used farther East. In 1973 the world market prices quadrupled confronting the Soviet Union with rising opportunity costs in its oil export to Eastern Europe. In 1975 the USSR followed OPEC's example. Its oil export prices for its allies are now adjusted annually to the past five-year average world market prices. The East Europeans also have to pay in hard currency for extra deliveries, and have been asked to cover part of their oil demand on the world market, where prices are still higher.

Soviet gas flows more freely through the newly built pipeline from Orenburg, but the East Europeans have had to contribute to the building of this in return for fixed amounts of deliveries. All this has become a heavy burden on the trade balance of most of the countries and led to a general shortage of energy with frequent rationing. This is also the case with Romania, where domestic oil production declined in the second half of 1975 and the supplementing oil imports from the Arab states became even more expensive than Soviet oil to the other East

Thus, even though East European oil consumption continues to grow, the rising prices and threats of shortages have driven the states back to cover as much of their energy needs as possible from domestic sources. The countries with coal assets are now exploiting these more than ever, even if the quality of the coal is more and more inferior. This will inevitably lead to more environmental problems as described on the preceding pages. Even the countries, which so far have relied more on oil, now follow the same path. Hungary is opening new mines for brown coal. Romania plans to raise its coal production threefold 1975-1985 so that coal will be its most important form of energy.[22] The East European states also exploit all the hydrological resources they have for electricity production. In this respect Romania and Bulgaria have more potential than the others.[23] This kind of energy does not entail pollution, but sometimes dams have to be built, which flood vast areas. A controversial project here is a Czechoslovak-Hungarian dam on the Danube.[24]

Nuclear power is considered the long-term solution to the many energy and environmental problems. Since the 1960s the East European states have cooperated with the Soviet Union in an ambitious expansion program. The GDR and Bulgaria seem to be the most successful states. Bulgaria covers 20 per cent of its electricity need with nuclear power, and the GDR 10 per cent (1979).[25] However, the nuclear program has had difficulties, and there are environmental and other risks judging from reports of accidents in Czechoslovakia resulting in deaths and radioactive pollution.[26]

As the East European States thus rely to a greater extent than the West European ones on their own resources, which means low quality coal, they get corresponding environmental problems. They are as dependent as the West Europeans on import from abroad when it comes to oil and natural gas, which are better for the environment. They, too, are approaching the end of the oil spree period. Unlike most of the West, the East Europeans pin high hopes on nuclear power, the environmental damages of which mainly are a matter of risk. The Soviet Union uses more oil and needs less nuclear energy than Eastern

Europe, and its environmental problems are less concentrated to the populated areas.

3.3 Transport and environment

The emphasis on heavy industry and concomitant need for fuel is also reflected in the transport systems of Eastern Europe. Railway transport in the first decades contributed significantly to air pollution, because locomotives used coal for fuel, but the situation has improved greatly as a result of the transition, albeit belated in comparison with the West, to diesel and electric traction.[27]

As for passenger transport, the socialist states of Eastern Europe, like the Soviet Union, have an ideological preference for collective means of transport--trains, buses, trolley-buses, and trams. These also happen to be more energy efficient and harmless to environment than a great number of automobiles. However, with the rising living standard, the number of private cars has grown at a dazzling rate, particularly in the more developed states. In the CSSR the number tripled in ten years from 1965, and in Hungary it quadrupled 1970-1979. In 1975, every tenth Czechoslovak and every eighth East German had a private car.[28]

In comparison with Western cars, those of socialist makes have inferior exhaust and noise abatement technology. Road and street construction has not kept pace with the increased traffic. Consequently traffic stands for an increasing share of air pollution and noise in the urban areas. Already in 1971 Budapest recorded pollution levels on a par with those in Western capitals.[29] Nevertheless, even though the problems are worse than in the Soviet Union, the relative importance of traffic is still less than in the West due to the lower number of cars.

In the face of these traffic and pollution problems, the East European authorities are now making efforts to improve collective transport.[30] A metro is being built in Prague and Bucharest and the existing one in Budapest expanded. The steeply rising gasoline prices are likely to affect the East European car owners more than their Western counterparts.

3.4 Agriculture, forestry and environment

The agricultural sector is the one most afflicted by environmental damages. Air pollution damages crops, the expansion of industry, settlements and roads demands land. In all the East European states the cultivated agricultural area is diminishing. Czechoslovakia is said to have lost most crop land in Europe since 1937.[31] But agriculture also contributes to environmental problems on its own. In order to compensate for the losses of land, the state farms and cooperatives have to increase their productivity, which they do by mechanization and large-scale farming. This typically leads to cultivation of very large fields, clearance of protective vegetation in and between fields, deep ploughing, and monocultures, all of which in turn contribute to the erosion problem. Bulgaria is one of the foremost countries in Europe for soil erosion. More than half the soil in the Czech part of the CSSR is exposed to wind and water erosion, and the situation is not much better in the other states.[32]

The environment is affected by other aspects of the industrialization of agriculture as well. As a result of large scale irrigation projects, the demand for water increases rapidly. The application of fertilizers and pesticides, which in the more industrialized states compare well with that in Western Europe, increasingly contributes to water pollution. In Czechoslovakia it has become the main source of water pollution.[33] Also large scale husbandry causes growing problems of water pollution and stench.[34] The modernization of agriculture in Eastern Europe thus causes similar problems as in the West. Poland, however, is an exception, as its agriculture is still dominated by private farms with small plots and relatively little use of modern agricultural techniques.[35]

The forests in Eastern Europe, which have important ecological functions, are, as mentioned, damaged by industrial and other activities. But forest management also produces problems of its own. One such problem, well-known in the Soviet Union, is the extensive felling of trees. Complaints have been made in the Bulgarian press to the effect that if the current trends continue, soon all ancient forests will disappear and only planted areas remain.

Overexploitation in Romania has led to decreased wood production, the shrinking of the forest area, and flood problems downstream in Hungary.[36]

The combination of the Soviet model of development emphasizing heavy industry and extensive growth with an energy structure heavily dependent on coal of low quality in small, densely populated countries thus seems to expose Eastern Europe to worse environmental problems than the Soviet Union and most of Western Europe. Air pollution still seems to be on the increase, while water pollution has already reached such a level that it hampers economic development. There are, however, differences within Eastern Europe according to the level of economic development, so that the industrial disruption of the environment has reached higher levels in the Central European states, whereas the Balkan states still worry more about the problems caused by the agricultural sector.

Like the Soviets, the East Europeans travel collectively more than people in the West, but during the last two decades there has been a tendency, more pronounced than in the Soviet Union, toward individual transport, which has a worse environmental impact. So from an environmental point of view, Eastern Europe appears to have chosen the worst factors of development of both worlds. The question then is whether these problems are countered by more effective institutional solutions, whether the East European states have special structural features which enable them to solve environmental problems better than their neighbors to the East and West.

4. POLITICAL SOLUTIONS

Following the Soviet bid, the Communist parties in the East European states have a monopoly on political activities. All organizations are under party control. The mass media, research, and all forms of information have to follow and support the current party line. Typically, citizens participate in the solution of the environmental problems by being mobilized by the authorized organs and organizations for already settled goals. Thus they are engaged in regular campaigns on a local or nation-wide level, for example, the cleaning up or beautification of communities, and the planting of trees. To solve the problems, the authorities call

on different, more or less voluntary, interest organizations to help in protecting and forming the living environment--nature conservation societies, trade unions, youth organizations, and the like.[37] Appeals of this sort can be seen as an admission that the responsible professional organs are not enough for solving the tasks.[38] This means that there is little scope for any independent, spontaneous environmental movement without authorization from above as we are used to in the West--there are no demonstrations, no occupations, no referendums. The authorities are normally secretive about their doings, and public hearings or unrestricted debates are anomalies.

However, there are some positive signs. Under Western influence, the environment has in the 1970s come to play a prominent role in the mass media, in schools, and at the universities and research institutes of Eastern Europe. The official propaganda stresses that society does everything in its power to solve the problems, but that the protection of the environment is a responsibility for everybody. There is, in fact, scope for some criticism as long as it is considered "constructive" and not offending to the party. Especially in scientific publications, printed in small editions and designed for researchers and decision makers, there is a good deal of debate, factual criticism and presentation of uncomfortable data on the situation. This is the main source of this paper. During the Prague Spring in 1968, scientists called for a democratization of political life and the establishment of an environmental organization, solely devoted to its purpose. From that time and the Charta 77 movement, the persecuted reformist communists have later criticized the official attitude to the citizens on environmental issues, and even demanded a referendum on the delicate energy policy question in view of the risks of nuclear power.[39]

The democratization process in Poland from August 1980 was also reflected in the environmental field. Following the rise of Solidarity, the independent trade union movement, a Polish Ecology Club was formed, which in one year gathered some 20,000 members. The Club published a letter to the mayor of Krakow demanding the closedown of the country's largest aluminum smelter which heavily

polluted the air of the city. Citizens brought a suit against the plant to get compensation for health damages. As a result the mayor first overrode a decision by the Mining Minister and closed down half the production, then the Minister decided for a complete shut-down. Other plants in the country were closed in the same way--despite the deepening economic crisis.[40] Solidarity devoted a special chapter to environment in its program of 1980.[41] However, Solidarity was crushed by the military laws of December, 1981. This shows that the margins for democratic pressure from below in Eastern Europe remain very narrow in comparison to Western societies.

5. ADMINISTRATIVE SOLUTIONS

5.1 Organization of environmental protection

The solution to environmental problems in socialist countries is institutional and administrative by character, and the organizational system is more centralized than in the West. This fact has potential advantages in the gathering and evaluation of comprehensive data on the environment, and in the implementation and control of decisions. But the data gathering tends in practice to become routinized and biased for various reasons.[42] To these belong the general secretiveness and the absence of public pressure. The countries which most openly publish "negative" data such as the extent of pollution seem to Poland and Hungary.[43]

Environmental problems are complex and interlocking--changes in one area affect others. As in the West, environmental protection is therefore a concern for many organizations and authorities. The ministries have divided among themselves the responsibility for the environment according to their general focus. This has resulted in problems of coordination and competence, and complaints of ministerial narrow-mindedness are frequent. In Czechoslovakia, for instance, the Ministry of Forestry and Water Management besides the tasks indicated by its name handles air pollution problems, while land problems fall under the Ministry of Agriculture and Nourishment and nature reserves under

the Ministry of Culture.[44] In addition, environmental research is scattered among institutes belonging to different ministries and the academy of sciences in each country.[45]

Another problem in Czechoslovakia is the federative structure, as a consequence of which there is one set of ministries and one academy of sciences in each republic and one set of federal ministries.[46] But this is a far cry from the problems of coordination which may occur in the complex structure of the Soviet Union.

However, as the environmental problems have increased, the socialist states in Eastern Europe have found it necessary to establish special organs to secure coordination and control in the field. The GDR and Bulgaria have vested this responsibility in a special ministry, but in Poland the ministry for environment also deals with local administration and economy, which may distract its attention.[47] Czechoslovakia, Hungary, and Romania have established a special council for the environment on the government level with representatives from different ministries and other concerned organs, but these councils only advise, coordinate and suggest, having little actual power.[48]

These organizational problems, however, are further complicated by the fundamental fact that in socialist societies all large-scale production is nationalized and divided among different ministries. Some ministries such as those for mining or forestry therefore have to promote production, which may harm the environment, and protect the environment simultaneously. The same double concern obtains with the central planning agencies, which allocate the financial resources to the different sectors in their plans, the five- and one-year plans. Also the local administrative bodies, which are obliged to strive for a balanced economic development within their regions, and the regional planning organs, which are charged with the responsibility of placing industries, settlements and roads, have to reconcile the interests of production and environmental protection within themselves. The question of priorities becomes crucial.[49]

Environmental policy is also affected by conflicts between regions and between center and

regions over the allocation of resources. Thus environmental policy has combined with the conflicts between the Czechs and the poorer Slovaks. Also in multiethnic Romania (and Yugoslavia) the problem can acquire ethnic overtones. But, again, this is a much worse problem in the vast Soviet Union.[50]

Another distinctive feature of the socialist states in Eastern Europe, entailing some advantages over conditions in the West from an environmental point of view, is the abolition of private ownership of land and natural resources. Public ownership makes city and regional planning a relatively easy and speedy procedure, facilitating the creation of green belts, water-protection zones, nature reserves, and central-heating systems.[51] Despite its population density, Czechoslovakia allegedly belongs to the foremost countries in the world with regard to the area and number of protected nature reserves, and together with other East European states it even ranks ahead of the Soviet Union.[52] It has also been claimed that only public ownership of land in a socialist society gives the citizens free access to the forests, [53] but this is also the case in Sweden and Finland. There are, however, serious economic problems with public ownership. We will discuss them in another context.

5.2 Environmental legislation

Legislation is the main weapon of the socialist state to safeguard the protection of the environment. All the East European countries have the pledge of the state to protect nature inscribed into their constitutions. Yet, environmental legislation reflects the organizational setup. As in the West, the laws have been issued, as the problems have arisen, by all kinds of organs of different authority, from the central government to local administrative organs. In Hungary there are about 500 legal rules on the environment, in Czechoslovakia over 350.[54] In order to overcome legal confusion, a comprehensive law, the Landeskulturgesetz containing general principles, regulations for the different sectors of environment, and followed by executive rulings on sanctions, was enacted in the GDR in 1970. Similar laws have since been issued in Hungary and Romania, and are under preparation in the other countries.[55]

Josef Klapáč at the Law Research Institute in Bratislava has pointed out that once industry was nationalized, environmental degradation was seen as an unavoidable correlate to industrial development. This view allowed many flaws in the legislation, such as exceptions from liability.[56] Klapáč's point can be illustrated by the Czechoslovak water protection law of 1973, which exempts factories temporarily from the obligation to purify their waste water in exceptional cases, justified by the special interests affecting the entire community".[57] Similar regard to the production interest is to be found in the other countries. Hungary established maximum permissible levels of air pollution only in 1973 and then allowed fairly generous emissions in industrial areas.[58]

Another problem is that damage often has to be proven for responsibility and the causal link established. This is difficult, when--as frequently is the case--there are many polluters and many victims. According to Czechoslovak and Hungarian law, the perpetrators have to pay indemnities collectively. In Hungarian practice, a factory is sentenced even if others have contributed. To solve this problem the researchers have demanded shifting the burden of proof to the polluter and applying risk rather than damage as evidence.[59]

Under the pressure of criticism and continuing pollution problems, there is a general tendency toward strict objective risk responsibility and enforcement, as in the West.[60] But according to the Hungarian Sólyom objective liability has in some cases been limited, because "risk" has been defined as being above the norms and the question is whether it applies, when there are no norms or the pollution is below the norms.[61]

Most East European states recognize the right to compensation for the full social damage of pollution, but there are problems here, too. Damage is, as a rule, defined as the material damage or loss. In Hungary, an investigation showed that only a third of the damages were compensated for in 1976-1977, and compensation for non-material damages was not codified until the latter year.[62] In Czechoslovakia such compensation is only an exception and, according to Klapáč, too low when it comes to damages to people's health.[63] Scientists in

general demand that in order to dissuade the factories from polluting they should be obliged to pay the full damage or loss inflicted on society. Klimkova, however, suggests that if the costs are forbidding, the state should help.[64]

Another problem obtains in extreme cases, when pollution cannot be eliminated and the polluting production cannot be stopped for economic reasons. In Czechoslovakia, agricultural cooperatives were earlier obliged to grow species resistant to pollution, thereby adapting to the existing pollution.[65] In Hungary a lively discussion was evoked in 1975 by the case of a miner, who started gardening in a polluted area, sued the polluting factory for losses and was turned down. Solyom recommended for these problems the solution found by a factory which took the initiative of financing crop experiments and subsidized the suffering cooperatives. The court also played an active part to bring this solution about--a form of contribution Solyom saw as an example.[66] Another solution to the liability problem is already practiced in the GDR. There enterprises enter pollution abatement contracts between themselves and with cooperatives and local authorities. Liability is based on breach of contract so that proof of damage is not required, and economic sanctions can be imposed and compensation paid according to the contract.[67]

A second consequence of thinking that pollution was an inevitable correlate of production was that environmental legislation in Eastern Europe earlier relied on the principles of reparation and compensation rather than on prevention.[68] A law for the compensation of air pollution damages was enacted in Poland as late as 1970.[69] However, under the pressure of criticism and continued pollution, the trend is toward prevention. Factories are now generally obliged to protect the environment and install necessary protective equipment, otherwise production may be stopped. Judging from Czechoslovakia, however, this sanction seems not to be used in practice. In this country, environmental standards are to be taken into account already when factories are projected and constructed, but the final permit for starting production is given by the minister responsible for the factory, and he may well let the fulfillment of the norms come later.[70]

In order to secure compliance with the law, the penalties for violations have been raised in Eastern Europe, as recommended by experts. Following the Soviet and Western example, environmental crimes are referred to the criminal law in most countries, and this is advocated also in the CSSR. There are also suggestions to penalize organs and workers responsible for environmental protection in case of negligence.[71] The control of the compliance with the norms is also a problem. A network of inspection bases with modern equipment has been called for in Hungary, and in Czechoslovakia a network of measuring stations for air and water will be built only in 1980-1990.[72] In this respect the East European states seem to lag behind those in the West.

The laws and the authorities administering them thus do not stand free from the productive interests in socialist Eastern Europe as far as environmental protection is concerned. However, Solyom noted a positive tendency in Hungary toward a more active role for the courts in the formation and application of laws, as the courts have started indirectly to revise administrative rulings. Furthermore, the procurator's methods of politization have changed, so environmental protection could become a new task for his general right of intervention, Solyom advised.[73] In sum, despite or because of the fact that the state owns all enterprises and there should be no contradiction between the two interests, there are many problems in the East European environmental law systems. The laws are unstable and imprecise, containing loopholes. Even if the laws were more stringent than those in the West, the lack of control and enforcement is not likely to make the system work much better than that of capitalist states.

6. ECONOMIC SOLUTIONS

6.1 Central planning

Environmental protection is very much a question of investments. In the planned economies of Eastern Europe, these are typically taken care of by allocations from the central budget according to the development plans for the five- or one-year periods. This is especially the case for investments of a structural character, such as in water management. In Romania the central plan pays for water treatment

plants, if there is a risk of coastal pollution.[74]

In the 1970s, the environment has become a separate planning concern, and the central investments in the field have grown rapidly. However, according to a Hungarian estimate, the share in 1975 as a percentage of the GNP was lower in Hungary than in some countries in the West.[75] There have been complaints in Czechoslovakia and Romania, even in the daily press, that the relevant chapter in the central plan is not considered so important as other parts, and that the production of pollution-preventing equipment is lagging so that the recipients cannot meet the environmental standards. Instead some equipment has to be imported from the West for scarce hard currency.[76] The Prague economists Jana Klacková, Aléna Černá and Eva Tošovská have in a series of articles analyzed environmental planning problems. According to them, environmental planning is not synchronized with other planning, and it enters into central planning only at a late stage. Instead, environment should be included already in the plan proposals of the central investors.

In Czechoslovakia (and the GDR) the environmental plans since 1976 are regionalized, and they contain aggregate indicators of environmental quality, for example the development of some kinds of pollution. Klacková, however, complained that these indicators were used only for orientation and suggested that they be used as targets, to which the size of investments is adapted. Environmental standards ought to be seen as analogous to socio-economic standards in, for example, housing and food. The standards could be fixed with upper limits, and variants of the plan exceeding these could be discarded.[77] In Hungary, for example, there are similar problems and similar proposals.[78] There now seems to be a tendency toward the desired optimalization. The new Czechoslovak planning measures of 1980 contains a conception of water protection in the form of a target program, and in Hungary a government decision has been taken not to improve them in the most threatened areas.[79] This is an interesting development. The question is, of course, how far it is allowed to go in the face of scarce financial resources.[80]

As in the West, the charges and fines from the factories for pollution in some East European countries go to special central funds and to local authorities to be used for environmental investments. In the CSSR, 70 per cent of the costs for the water treatment plants are covered by the Water Protection Fund. But critics have found that the fund and the local authorities have used the money also for purposes not directly related to environmental protection and have demanded a stricter policy.[81] The problems of central planning are specific to the socialist states, and have few parallels in the West. The dual concern for economic development and protection of environment is of special importance as it affects the whole economy. The production interest, so far, seems to have been stronger.

6.2 Problems of directing the enterprises

The problems of central planning are closely connected with those of directing the enterprises and factories on the lower levels. In the beginning of the socialist period, the East European states relied heavily on administrative means to make the enterprises protect the environment--obligations to install equipment, prohibitions to pollute and punishments of violations of the law as shown above. This, however, proved insufficient, so when economic reforms introducing market mechanisms were instituted, economic stimuli were also created in order to increase the responsibility of the enterprises and enhance their interest in protecting the environment. In all the countries there are now different systems of charges, fines and indemnities, applicable to the factories and responsible individuals. However, in reality, when the factories have not used the loopholes of the laws to avoid the penalties, they have often paid their penalties but at the same time continued to pollute in the same way as has been observed in the West. In Hungary, 55 per cent of factories obliged to pay penalties for water pollution have taken no measure to reduce pollution. The factories have been able to turn the penalty costs over to society by including them in their economic plans.[82] To solve the problem scientists suggest raising the penalties and have them levied on sensitive parts of the factory budget.[83]

If the main reason for capitalist enterprises to pollute and violate environmental norms is the need

to increase production for profit, a corresponding role in socialist societies is played by the obligation to fulfill the plans. The primary goal of these plans is to increase production, which as a rule is expressed in quantitative terms. The remuneration of the factory directors and employees is tied to the fulfillment and overfulfillment of the plans. In Czechoslovakia, this has been mentioned as the reason for such diverse problems as overexploitation in forest management, workers' overexposure to radiation in nuclear plants, and the switching off of air protection equipment at night to save energy.[84] The same incentive also seems to distort the information system, judging from the fact that enterprises are blamed for furnishing data in fields which yield most profit, whereas their data on the environmental effect of their activity are deficient.[85]

To remedy this incentive problem, several economists in Czechoslovakia have suggested that analogous to the central level environmental indicators be included into the enterprise plans just like those of production and material consumption so that the material interest of the employees is the same as society's interest in protecting the environment. If the environmental targets were reached, the workers would be remunerated, in the opposite case they would lose.[86] In Slovakia, wages in some branches are now linked to the implementation of environmental measures. Ratislav Lacko at the Living Standard Institute in Bratislava recommends this to be extended to the whole economy. Observing that new funds were created in 1980 materially to stimulate worker efficiency, Lacko proposed similar funds for protecting nature.[87]

Even though there is a tendency for increasing the responsibility of enterprises, some environmental investments are beyond the resources of the individual enterprises, so the state has to help them. This situation is familiar in the West, and interest is therefore shown in Western methods of supporting the enterprises.[88] Thus, the Bulgarian state subsidizes the building of purification plants at factories, and in Czechoslovakia such plants are exempted from property tax.[89] Even in the more market-oriented Hungary, the state gives assistance for investments of great importance to society. For example, in the late 1960s, it encouraged the

resettlement of industries from Budapest to less developed regions by paying 20-50 percent of the investment costs. Nevertheless, it proved difficult to move the biggest enterprises--often the worst polluters.[90]

An important role in the state's direction of enterprises is played by the price system. The prices in socialist states are set by the state for political and social ends. Among these, production rather than environment seems to have preference. An investigation in the CSSR in the 1960s showed that the damage caused by the production of electricity was higher than the production price and double the actual price. In general, capital-intensive products have low prices, and precisely this production tends to have the worst environmental impact.[91] The prices of private cars were long very high, but this was hardly motivated by concern for environment. Now that air pollution has become a problem, private cars are still affordable causing many problems. But, of course, car prices are still higher in relation to private income than in the West and lower than in the USSR.

Many East European economists now favor the inclusion of the environmental damage costs into the production costs of enterprises. The Czechs Černá and Tošovská argue, with a reference to the leading Soviet economist K. G. Gofman that this would stimulate waste-free technology and recycling, and lead to a reassessment of which production is most useful. High prices on ecologically demanding products could also destimulate the consumption of them.[92] A great problem here, however, is how cost-sensitive the enterprises are.

In capitalist states, a major problem in including environmental costs into production prices is that it may lead to price hikes and, eventually, to inflation, close-downs of factories and unemployment. But in practice many enterprises have been able to compensate for the environmental costs by increased productivity and technical progress.[93] However, this is one of the central problems for the planned economies. The East European state authorities will therefore doubtless be hard pressed to support the enterprises and subsidize prices, which will weaken the responsibility principle. Still, the ideal of an inflationless economy has been

tarnished in the last few years by the price hikes following the rising raw materials prices, and Hungary, for example, openly admits it has inflation. The Soviet Union has been less affected, and is less likely to allow environmental costs to influence prices.

Consequently, there is a tendency to direct the enterprises by more indirect means, to stimulate them and increase their economic responsibility in the field of environmental protection. More than in the West but less than in the Soviet Union this is counteracted by the ever-present centralist tendency of direct intervention and support from above to maintain stable prices and raise production.

6.3 Evaluation of natural resources

A major reason for the squandering of natural resources and the pollution of the environment in Eastern Europe is to be found in the system of evaluation. The planned socialist economies build on collective ownership of the means of production and natural resources and the Marxian labor theory of value. According to this theory, commodities are not valued by supply and demand as in capitalist economies but by the amount of human labor invested in them.

As a result, natural resources have been given even less value than in the West, as land, minerals, water and forests are not created by human labor, and are considered in principle free for state-owned enterprises. Natural reproduction, growth and self-purification processes are not valued either. Waste products should have a value, but this has not happened in practice.[94] However, the theory allows for some charges in practice. All the East European states except Bulgaria have introduced water consumption prices partly based on the costs of labor for bringing the water to the consumers. In Hungary the price is also differentiated by regions. The charges for air and water pollution are partly set with regard to the costs of purification. A problem here is that polluted and then purified water gets a value but not naturally clean water. A solution can then be to calculate potential costs for the clean water.[95]

The labor theory of value is now fitted into the

theory of optimal planning, which has been elaborated in the Soviet Union. According to this theory, the central plan determines the prices in society's best interests according to the utility effects of the different products compared among themselves. In the theory, the natural resources are evaluated by a differential rent approximating their economic contribution for different purposes.[96] Thus, water consumption prices vary depending on quality and use, being higher for ground and drinking water and for industrial use. In the CSSR, for example, industries pay ten times more than households for surface water, but, on the other hand, the thermal plants are favored by only paying one-tenth of the ordinary price for their cooling processes.[97] Nevertheless, the Czechoslovak charges for restricting the consumption of water have been mentioned as a paragon by Soviet experts.[98] Scientists think that the charges have had positive effects but regard them as insufficient and recommend that they be raised. When land is taken from agriculture, it is given a price in relation to its location and quality, representing the value of its productivity, the loss of which has to be compensated for by increased production elsewhere.

For the use of the land, the agricultural collectives pay a differential rent according to its fertility beside the investments in it. When land is taken away from agriculture, it is given a higher price which shall compensate for the loss of production. But the prices have not been able to halt the steady withdrawal of land, so the scientists recommend higher prices.[99] The Hungarian G. Szabó has argued that sensitivity analyses should be completed to discover whether the branches using the land "feel" the prices.[100] Poland seems to be different from the other East European states, because a major share of the land is still owned by private peasants, and a radical price hike on land was brought about there in 1977.[101]

Obviously, the central problem in evaluating natural resources is the existence of shortages. This problem has been addressed by Jaroslav Stoklasa at the Institute of Landscape Ecology in Prague. Referring to the Soviet optimal plan theorist N. P. Fedorenko, who had pleaded for the evaluation of water according to supply, Stoklasa suggested that, in the interests of society, environmental factors

like water, air and land should be valued on the basis of the law of marginal value.[102] In 1976 Stoklasa criticized Soviet economists, who had claimed that natural resources such as minerals can be said to be reproduced by the discovery of new sites and by the scientific technological revolution, introducing new resources, for example nuclear power. Stoklasa argued that science cannot replace all types of natural processes and that the total supply of resources is definitely limited. As a reply to the ideological objection that accepting shortage as a criterion of value would mean abandoning the Marxian theory of value, Stoklasa pointed to the practical consequences of the theory. In defense of Marx, Stoklasa stressed that Marx had worked out his theory when the exhaustion of the resources was not topical. To Marx, nature had too high a value to be a commodity even at the highest price. Therefore society should give the natural resources so high a monopoly price that the consumption of them was controlled, Stoklasa suggested.[103]

The East European economists thus make various scientific suggestions for evaluating natural resources in order to restrict the use of them. But the problem can--at least as raw materials are concerned--also be solved with the help of an external criterion, namely the world market price, based on supply and demand. As of 1980, Hungary has taken the bold step of applying the world market prices of raw materials and fuels as well as of Hungarian processing industrial products to the domestic market. One aim of this is to enforce savings of fuels and raw materials, which will mean less pollution. The price reform will lead to significant price hikes.[104]

Such a price reform is unthinkable in Czechoslovakia, where the centralism of the planned economy is much stronger as can be gleaned from the attitude to inflation above. Another reason is that it uses more raw materials and a price rise would affect the economy more. Nevertheless, raw material and fuel prices have risen in Czechoslovakia, too, as a result of the Soviet price hikes, and there are cautious voices advocating more regard for international prices and less price subsidization.[105] The same is to a varying extent also true for the other East European states.[106] Thus, the socialist economies of Eastern Europe have

greater difficulties than capitalist states in restricting the use of natural resources by pricing, as this has to be combined with central planning and fitted into the Procrustean bed of Marxist ideology. There is a strong dependency on Soviet theory and practice, but the East Europeans have, nevertheless, ventured to make more radical price reforms accounting for the problems of shortages and pollution than the Soviets.

6.4 Evaluation of damages and the setting of charges

Related to the evaluation of (undamaged) natural resources is the problem of evaluating damages to the environment. The Czech economists Černá and Tošovská, following Klacková, note that not only in capitalist firms but also in socialist enterprises, investments to reduce pollution impair the economic results, as the positive effects of them for other enterprises and entire regions are not accounted for. The investments only reduce the costs for penalties. Instead Černá and Tošovská held, in the interests of the whole society, the damages should be included into the costs of production in the form of payments, whereas the effects of investments to protect or improve the environment should be registered as positive contributions and entail a reduction of payments. Different from a suggestion from Fedorenko, this would presuppose a change of the existing prices and payments. The suggestion also differs from the existing penalty system, since the payment for every degradation of environment must equal the net social losses--something which guaranteed a factual evaluation of the effects of the investments and eliminated the disparity between enterprise and social efficiency.[107]

This scheme resembles the so-called Pigou tax on emissions, which sets the taxes in a Pareto optimal way so they will always equal the level of marginal damage. The two economists recognized, however, some practical difficulties in applying their scheme. It is hard to get information on the origin and extent of the damages because of the high number of perpetrators and victims. Many damages are of a non-material character and difficult to measure, for example, damages to people's health and scenic beauty.[108] In the face of these problems, the Czech economists turned to what they called the

"second best" solution of choosing an external criterion for the setting of the charges, namely to start from the desired environmental quality, as defined by the health norms. This is in line with Klackova's earlier mentioned recommendation of goal orientation in environmental planning on the central and enterprise level. According to the proposal, uniform charges should be linked to the desired environmental standards. The charges could then be raised until the enterprises achieved the desired level, for example a reduction of sulphur dioxide in the air by 50 per cent. Cerna and Tosovska realized that the method requires technological adaptability and an interest in the economic results on the part of the enterprises. If they have this interest, they will reduce their pollution until their charges are reduced.[109]

This interest is indeed a problem, because the enterprises as mentioned have so far found ways of being subsidized. Some other preconditions for the proposal have been indicated by the West German Josef Fullenbach in his book on Environmental Protection in East and West (1977): The enterprises have to know the costs of environmental investments. They must be allowed to react flexibly without interference from higher authorities, and there must be protective equipment available--a problem noted before. In sum, Fullenbach questions whether the simulation of the market mechanism and the decentralization of decision making, inherent in the proposal, can be combined with the centralism of the planned economy.[110]

Thus, it is obvious that both the planned economies and the market economies have problems in evaluating environmental damages and quality. On balance, the institutional solutions to the environmental problems in Eastern Europe do not appear to be superior to those of the West European capitalist states or the Soviet Union, making up for the disadvantages of a "dirty" energy and production structure in small, densely populated states.

7. ECONOMIC GROWTH OR BETTER ENVIRONMENT

The fundamental reason for the environmental problems in Eastern Europe and a common denominator for many of the problems analyzed here is the preference given to economic growth. This preference

is rooted in Marxism-Leninism and the Soviet pattern of development. In Marxist ideology, communism is to be built on the affluent industrial society, which doomed capitalism leaves behind. Yet, the first socialist state in the world, the Soviet Union, was at the time of the revolution less developed than many capitalist countries and had to create the foundations for Communist society by itself. For this purpose, Lenin and his successors chose to develop the industrial assets already existing in the country and to some extent also to use technology obtainable from the West, instead of taking a completely new route of development. Emphasis was placed on extensive industrialization and the expansion of heavy industry to the detriment of consumers.

Instead of a spontaneous capitalist development with supply and demand and with individual profit as the recurring motive, the driving force in socialist development became fulfillment and overfulfillment of centrally made plans in order to achieve maximal growth in quantitative terms. This preference for growth was reinforced by the fact that the development became a competition with the more developed capitalist countries in the West. These had to be caught up with and overtaken so as to prove the superiority of the socialist system. The countries in the Third World soon became a target for this propaganda.

In the wake of the Red Army's victory over Nazi Germany in the Second World War, the Soviet model of extensive development was soon imposed on Eastern Europe. As some of the countries, notably the GDR and CSSR, then were more developed than the Soviet Union, they sooner came to a stage where more emphasis had to be placed on intensive growth--that is increased productivity and more effective use of the given natural labor and capital resources. This should lead to relatively less environmental degradation, but the main goal--increased production--remains the same.

The emphasis on intensive growth also meant more concern for consumer goods and people's living standards. The raising of the latter has now become one of the main aims of the Communist parties. Romania, the least developed country, gives lesser weight to private consumption than the others.

Raising the living standard is an especially strong desire with the East Europeans, as they have always compared themselves with the wealthier West Europeans, rather than with the poorer Russians, because of the traditionally strong cultural and economic ties with the West. This is, for obvious reasons, particularly pertinent to the East Germans. These ties have been reinforced since the 1960s by the intensification of trade, tourism and the flow of information across the Iron Curtain. The stagnation of economic growth in the last years, mainly due to the energy crisis, natural adversities, and problems in East-West trade, have restricted the scope for giving more resources to the environment, but have hardly diminished people's desire for a higher standard of consumption.

Against this background, how is the question of economic growth versus better environment treated in the official debate in Eastern Europe? As a result of growing environmental problems, these issues have become recognized as social concerns, too, but the official reasoning is that the solution of them must not infringe on economic growth and living standards. The Western advocacy of zero-growth is rejected. Under the socialist system, the development of science and technology is said to be able to correct the negative effects on nature and even to be a precondition for the solution of the problems.

However, under the influence of Western debate, the growth paradigm has come under criticism in Eastern Europe as well. The already cited Slovak Lacko regarded zero-growth as a luxury and at odds with the natural trend of growing needs, but at least he found the questions posed by the report to the Club of Rome, Limits to Growth, and other Western words of warning appropriate. He attacked snobbish mass consumption and advocated limited or qualified growth, like several other Czechoslovak economists.[111]

Lacko and others further noted the problem that the more expensive environmental investments tend to become, the higher the quality of environment is, but criticized the conclusion that therefore there is no reason to improve the environment beyond the optimal point, where costs for environment equal benefits. They stressed the importance of non-economic criteria

as human health and environmental balance as criteria of efficiency.[112] The Czech ecologist Stoklasa is even more critical. In his view, the economic thinking that more growth will give more money to environment and that science will solve the problems seems advantageous to decision makers, since the results of economic growth materialize rapidly in contrast to environmental damages. He called for preventive investments in environment, which would become savings in the future, and for an emphasis on environment similar to the one on heavy industry in the 1950s. A break with ecological "anthropocentrism" and a revolution in common thinking like the Copernican revolution in the 16th century was necessary, Stoklasa argued.[113]

Similar criticism can be found in Hungary. According to Josef Bognar, growth theories and indicators reflect a quantitative approach, unacceptable in the new world economic situation. He demanded greater creativity from the leadership, since supplementing earlier decisions would not suffice. The role of the state had to increase.[114] A step further was taken by the East German philosopher Wolfgang Harich (1975). He as a goal adopted outright zero-growth, also for populations, criticized some Soviet "growth fetishists" by name and rejected the hope of an affluent Communist future, considering for example private cars as alien to nature and society. Realizing that people would not accept this voluntarily, he advocated a strong political power, which should suppress "unnatural" needs and distribute resources on the principle of strict equality. This Communist policy he saw as an example for a future world government.[115]

Harich noted, however, that the "growth fetishism" in the world Communist movement is extraordinarily strong. As argued above, the international demonstration effect of Western Europe is more powerful in Eastern Europe than in the Soviet Union, so the ruling parties there are more likely to buy complacency from their subjects by raising the living standard at the expense of the environment.

The East Europeans may perhaps be willing to comply with suppression of their material standard, if they are allowed to take part in the political decision making, that is under a more democratic system. But the limits for a development in that

direction are, in the final analysis, set by Moscow, and these limits are indeed narrow as lately illustrated by the fate of Solidarity in Poland.

ENDNOTES

[1] Robert J. McIntyre, James R. Thornton, "On the Environmental Efficiency of Economic Systems", Soviet Studies, Vol. XXX, No. 2, April 1978, pp. 173 ff.; Charles E. Ziegler, "Soviet Environmental Policy and Soviet Central Planning: A Reply to McIntyre and Thornton", Soviet Studies, Vol. XXXII, No. 1, January 1980, p. 124.

[2] Stefan Zawodziński, "Ochrona gruntów rolnych", Gospodarka planowa, No. 3, 1980, p. 128; István Lang, "Resource Endowment and Hungarian Agriculture", New Hungarian Quarterly, Vol. XXI, No. 80, Winter 1980, p. 35; Josef Pytel, Jiří Šafař, "The Natural Resources of Czechoslovakia and Their Exploitation", Czechoslovak Economic Digest (henceforth CED), No. 5, 1976, p. 32; Leslie Dienes, Nikos Ekonomou, "COMECON Energy Demand in the 1980s: A Structural Analysis", NATO Economics Directorate: Brussels 7-10 April 1980, pp. 2 f.; G. Preissler, "Aufgaben and Probleme im Zusammenhang mit der rationellen und effektiven Nutzung des Wassers in der Deutschen Demokratischen Republik"; Autorenkollektiv, Wasser und Umweltschutz, Vorträge zum Berg und Huttenmännischen Tag 1975 in Freiberg, Freiberger Forschungshefte, (Leipzig 1976) p. 11; K. F. Busch, K. Strzodka, "Beeinflussung des Grund und Oberflächenwassers durch den Bergbau und die Energieversorgung", op. cit., pp. 38 ff.

[3] Statistisches Jahrbuch der Deutschen Demokratischen Republik 1980, (henceforth Statistisches Jahrbuch, Berlin 1980, Anhang 2, Tab. 9,10, Rocznik Statystyczny 1978, Warszawa 1978, Tab. 759, 775.

[4] Statistická ročenka 1980, Praha 1980, Tab. 1, Gerhard Brlhovič, "Dlhodobé ulohy vo využívaní prírodného bohatstva Slovenska", Ekonomický časopis, (Bratislava) No. 10, 1980, pp. 937 ff.

[5] Leonte Tismăneanu, Rolică Zaharia, Present and

Prospect in Romania's Social and Economic Development, Bucharest 1977, pp. 110 ff, Nicolas Ceausescu, The Development and Modernisation of the Techno-Material Basis of Socialism in Romania, Bucharest 1979, pp. 129 ff., Ibid., Report at the Twelfth Congress of the Romanian Communist Party, Bucharest 1979, p. 40.

[6] Ružena Vintrová, "Raw materials, energy and economic growth", CED, No. 6, 1976, pp. 45-47, Rudé právo, Sept. 6, 1976, M. Virius, J. Bálek, "Cooperation between CMEA countries in securing supplies of fuels and energy", CED, No. 3, 1976, p. 26; J. Demek, V. Voráček, "Životní prostředí v ČSR - Současný stav, problémy a perspektivy", Studia Geografica, (Brno) No. 35, 1974, p. 24.

[7] Statistisches Jahrbuch 1980, Anhang 1, Tab. 8, Anhang 2, Tab. 15, Marshal I. Goldman, The Enigma of Soviet Petroleum. Half-Empty or Half-Full? London 1980, p. 108. Rocznik Statystyczny 1978, Tab. 778, 779.

[8] Dienes, Economou., op. cit., pp. 9 ff., Statistisches Jahrbuch 1980, Anhang 2, Tab. 11.

[9] P. Raab, in I. Novak, ed. Ochrana čistoty ovzduší, Praha 1972, pp. 14 ff, Rocznik Statystyczny 1978, Tab. 26, Bogdan Poplawski, "Ochrana i kształtowanie środowiska naturalnego Polski w latach siedemdziesiątych", Gospodarka Planowa, No. 3, 1980, pp. 134 f.

[10] Brynjulf Ottar, "International Agreement Needed to Reduce Long-Range Transport of Air Pollution in Europe", Ambio (Stockholm), No. 5, 1977, pp. 264-265.

[11] Raab, op. cit., pp. 21 ff, Jaroslav Muranský, "Vyvoj znečištění ovzduší v ČSSR", Sborník československé společnosti zeměpisné (henceforth SCSZ) (Brno), No. 1, 1972, pp. 57 ff., Poplawski, op. cit., 133 ff, Tíbor Seman, Kornélia Rišová, "Řešení ochrany životního prostředí v SSR", Plánované hospodářství, No. 1, 1979, p. 29 Rudé právo, Nov. 13, 1975.

[12] Busch, Strzodka, op. cit., pp. 37 ff. Boleslav Pospíšil, "the legal aspects of exploitation of mineral wealth in Czechoslovakia", Bulletin of

Czechoslovak Law, No. 18, 1979, pp. 92 ff, Frank W. Carter, "Pollution problems in Czechoslovakia with special reference to the Prague region", Second World Congress for Soviet and East European Studies, Garmisch-Partenkirchen, Oct. 30-Nov. 4, 1980, (mimeo), pp. 6-8.

[13] Rocznik Statystyczny 1978, Tab. 27, Poplawski, op. cit., pp. 137ff, Carter, pp. 11 f. K. Šamořil, Ochrana a tvorba životní---prosfedť, Praha 1980, p. 40.

[14] Busch, Strzodka, op. cit., 41 ff, J. Mareš, "Vliv člověka na životní prostředí Ostravska", Studia Geografica, No. 43, 1975, pp. 19 f, 36 ff.

[15] Die Wirtschaft, (Berlin), No. 1, 1979, p. 19 (Soviet and East European Abstracts Series, henceforth ABSEES, (Glasgow) No. 58), Preissler, op. cit., 11, Busch, Strzodka, op. cit., pp. 39, 41, Poplawski, op. cit., p. 136, Rocznik Statystyczny 1978, tab. 15.

[16] Preissler, op. cit., pp. 11 ff, Tribuna Ludu, June 19, 1979, Dušan Kokavec, "Vplyvy viededko-technického pokroku na pôdny fond a polnohospodarskú výrobu a ich súvislosti s tvorbou s ochranou životného prostredia", Právnické štúdie, 1979, p. 132.

[17] Thomas Vajna, "Ungarn", H. H. Höhmann, G. Seidenstecher, T. Vajna, Omweltschutz und ökonomisches System in Osteuropa, Stuttgart 1973, pp. 141 ff, Ceausescu; Development, p. 40.

[18] Statistisches Jahrbuch 1980, Tab. VII:28, Rocznik Statystyczny 1978, Tab. 17, 20, Poplawski, op. cit., pp. 136 f, Statistická ročenka 1976, Tab. 15 - 1, Sloboda, (Bratislava) Jan. 31, 1975, Seman, Rišová, op. cit., pp. 26 ff, Preissler, op. cit., pp. 11 ff.

[19] Pytel, Šafař, op. cit., p. 6, Virius, Bálek, op. cit., pp. 30, 34, Goldman, The Enigma, p. 60.

[20] Vajna, op. cit., pp. 158 ff, Demek; Voráček, op. cit., pp. 38, 45, Karel Houdek, "Energetická náročnosť československé ekonomiky", Plánované hospodárství, No. 1, 1979, p. 3, Preissler, op.

cit., p. 15, Dienes, ekonomou, op. cit., 6 ff.

[21] Revista Economică, (Bucharest) No. 2, 1980, p. 1, (ABSEES No. 61), Polityka (Warszawa), Dec. 8, 1979, pp. 1, 5 (ABSEES No. 61), Virius, Bálek, op. cit., pp. 31, 38, Goldman, The Enigma, pp. 61, 101, 104.

[22] "Energin i Ungern: Satsning pá kärnkraft, kol och jordvärme", Ungern idag (Published by the Hungarian embassy in Stockholm), 1980, p. 8, F. Martos, "On the 'Eocene' programme", Magyar Tudomány, No. 3, 1978 (Abstracts of Hungarian Economic Literature (henceforth AHEL) 1978: 399), Scinteia (Bucharest), Jan. 24, 1980 (ABSEES No. 60), Revista Economica, No. 2, 1980 (ABSEES No. 61).

[23] Scinteia, Jan. 24, 1980 (ABSEES No. 60), Dienes, Ekonomou, op. cit., p. 12.

[24] Vladimír Plecháč, "Approaches and Methods of Long-term Planning of Water Management in the CSSR", Long-Term Planning of Water Management, Proceedings of the Seminar at Zlatní Piasatzi, Bulgaria, United Nations Economic Commission for Europe, New York 1976, Vol. 2, p. 39, Demek, Voráček, op. cit., p. 31, F. Pícha, in Bedřich Moldan, red. Geologie a životní prostředí, Praha 1974, pp. 35 f.

[25] Statistisches Jahrbuch 1980, Tab. VII:25, The 15th congress of the Communist Party of Czechoslovakia, Prague 1976, pp. 36 f, Goldman, The Enigma, p. 107.

[26] Listy, (Rome) (Organ of the Czechoslovak socialist opposition), No. 1, 1979, pp. 57 ff.

[27] Raab, op. cit., 17 ff, Dienes, Ekonomou, op. cit., p. 5.

[28] Statistická ročenka 1976, Tab. 3-2, 13-16, Statistisk årsbok for Sverige 1978, (Stockholm), Tab. 5, Statistisches Jahrbuch 1980, Anhang 2, Tab. 42, Statistical Pocketbook of Hungary 1980, p. 134.

[29] Márton Pécsi, Ferenc Probáld, eds., Man and Environment, (Selected papers submitted at the

International Geographical Union, European Regional Conference, Budapest 1971), Budapest 1974, p. 192, Raab, op. cit., pp. 17, 28, Demek, Voráček, op. cit., p. 33, Gy, Gerle, "Protection of the environment in Hungary", Budapest 1974 (AHEL 1974:447).

[30] The 15th congress, p. 188, B. Szabadi, "Motorization in Hungary", Sztatisztikai Szemle, No. 5, 1980 (AHEL 1980:293)

[31] I. Gríger, "Učinnost ekonomických nástrojov v peči o životné prostredie, Životné prostredie, No. 2, 1976, p. 71, Pytel, Šafář, op. cit., pp. 21-29, Zawodziński, op. cit., pp. 178 ff, B. Litov, Kooperativno selo, Dec. 25, 1977 (ABSEES No. 54).

[32] Kazandiev, Otechestven Front (Sofia), Jan. 20, 1978 (ABSEES No. 56), B. Tsvetkov, Ikonomicheski zhivot, July 25, 1979 (ABSEES No. 60), P. Ignat, M. Enache, Revista economica, No. 15, 1978, pp. 12ff (ABSEES No. 56), Demek, Voráček, op. cit., p. 23, Wladislaw Misiuna, "Ochrana zemědělské pudy v Polsku", Politická ekonomie, No. 11, 1979, p. 1225, Kokavec, op. cit., p. 125.

[33]. Pytel, Šafář, op. cit., pp. 37 ff, Statistisk Arsbok, 1980, Tab. 529, Kaczmarek, Tribuna Ludu, June 19, 1978, (ABSEES No. 56) Kokavec, op. cit., p. 130-133.

[34] Demek, Voráček, op. cit., pp. 24f, 46.

[35] Misiuna, op. cit. p. 1225.

[36] Kazandiev, op. cit., Zelev, Trud (Sofia), Jan. 21, 1978 (ABSEES No. 56), Stanescu, Revista Ekonomică, No. 34, 1978, p. 13 (ABSEES No. 57), Vajna, op. cit., p. 141.

[37] Problems Relating to Environment, Proceedings and Documentation of the Symposium, held 2-15 May 1971 in Prague, United Nations Economic Commission for Europe, New York 1971, pp. 231 ff.

[38] Ziegler, op. cit., pp. 128 ff (on the USSR).

[39] Karel Fink, "Společenská problematika znečištění ovzduší," Sociologický časopis, No. 1,

1969, pp. 33-34, Listy, No. 3-4, 1978, p. 23, No. 1, 1979, pp. 58 ff.; see also Rudolf Měkota, "Zdokoalit' administratívno-právne predpisy o výstavbe vo vzťahu k ochrane životného prostredia", Právny obzor (Bratislava), No. 9, 1975, p. 794, Rastislav Lacko, Ekonomické problémy životného prostredia, Bratislava 1975, p. 194, J. Durovčík, "K novému zákonu územného plánování a stavebnom poriadku", Právny obzor, No. 3, 1976, pp. 229-230.

[40] Radio Free Europe Research, Poland Situation Report, 30 January 1981, pp. 26 ff.; David Brand. "Polish Ecology Club Risks Government Ire by Battling Pollution", Wall Street Journal, July 24, 1981.

[41] Dokument från Solidaritets kongress. Översättning och redigering: Maria Borowska, Stockholm 1981.

[42] J. Mikolaš, L. Pittermann "Klasifikace systémy řízení životního prostředí", Životné prostredie, No. 5, pp. 317f, Zawodziński, op. cit., p. 128.

[43] Rocznik Statystyczny, tab. 1-16, Poplawski, op. cit., 131, "Data collection of environmental statistics", Statisztikai Időszaki Közlemény, Vol. 438, 1978 (AHEL 1979:150).

[44] Zdeněk Madar, Antonín Sum, "Právní řešení životního prostředí v Československu", Rada pro životní prostředí při vládě ČSR (Informační publikace) (henceforth Rada) (Praha), No. 5, 1972, pp. 16-17, Josef Klapáč, "Problémy a úlohy právnej upravy starostlivosti o životnej prostredia", Právnické štúdie, 1978, p. 133, Leonard Bianchi, "Viedeckotechnická revoluce a úloha práva životného prostredia", Právnické štúdie, 1979, p. 96.

[45] Madar, Sum, op. cit., M. Macka, P. Mareš, "Životní prostředí člověka v ČSSR a úlohy geografie", SCSZ, No. 1, 1975, p. 26, Géza Kilényi, "On the Hungarian Environment Protection Act", Acta Juridica Academiae Scientiarum Hungaricae, (henceforth Acta Juridica), (Budapest), No. 1-2, 1977, p. 205.

[46] Madar, Sum, op. cit., pp. 16 ff.

[47] Idem, Mikolaš, Pittermann, op. cit., 256

ff.; Antonin Sum, "Environmental Protection in Member Countries of the CMEA: A Survey", Environmental Policy and Law, No. 1, 1976, pp. 11 ff, Josef Füllenbach, Umweltschutz zwischen Ost und West, Bonn 1977, p. 46.

[48] Madar, Sum, op. cit., pp. 16 ff, Mikoláš, Pittermann, op. cit., pp. 256f, Bianchi, op. cit., pp. 103, 110, Lacko, op. cit., 208.

[49] Madar, Sum, op. cit., pp. 13-18.

[50] V. Kasalický, "Jak řídit oblastí životního prostředí v ČSSR", Rada, No. 8, 1972, p. 31, Kristian Gerner, Lars Lundgren, Planhushällning och miljöproblem. Sovietisk debatt om natur och samhälle 1960-1976, Lund 1978, pp. 58-59, 179 ff, 257.

[51] Marshall I. Goldman, "Umweltzerstörung und Umweltvergiftung in der Sowjet-union", Manfred Glagow, Hrsg., Umweltgefährdung und Gesellschaftsystem, München 1972, p. 93.

[52] J. Demek; "Geografie a formování životního prostředí", Studie Geografica, No. 24, 1972, p. 9, Branibor Fabijanič, "Protection of Yugoslavia's Natural Heritage", Yugoslav Survey, 1980, p. 24, Demek, Voráček, op. cit., pp. 10, 14, 34, 43, Gerner, Lundgren, op. cit., p. 158.

[53] Šilar, op. cit., p. 118.

[54] Kilényi, op. cit., p. 158, Madar, Sum, op. cit., pp. 11 ff, 71 ff.

[55] Josef Klapáč, "Kodifikačné ciele práva životného prostredia", Právnické štúdie, 1979, pp. 177-190.

[56] Klapáč, "Všeobecné teoretické a pravoadministratívne otázky ochrany životného prostredia", Právny obzor, No. 4, 1974, pp. 305 ff.

[57] S. Ercman, European Environmental Law. Legal and Economic Appraisal, Bern 1977, p. 45, see also Klapáč, "Funkcia a úlohy práva životného prostredia pri využívaní a likvidácii odpadov", Právnické štúdie, 1980, p. 240, Hana Klimková, "K

otázke zásad právnej úpravy zodpovednosti za ohrozenie a poškodenie životného prostredia", Právnické štúdie, 1980, p. 259, J. durovčík, "K legislatívnemu zabezpečeniu ochrany ovzdušia", Právny obzor, No. 1, 1978, p. 22.

[58] Füllenbach, op. cit., pp. 23, 28, 48, Klimková, op. cit., 258, Ercman, op. cit., 93ff, 163 ff.

[59] L. Sólyom, "Der zivilrechtliche Umweltschutz und die Möglichkeit einer Bürgerklage im ungarischen Recht", Acta Juridica, pp. 27-28, Klapáč, "Problémy", p. 154, Klimková, op. cit., pp. 265-266, Ercman, op. cit., 92, 163.

[60] Klimková, op. cit., 259ff, Sólyom, op. cit., p. 22, Kilényi, op. cit., p. 203.

[61] Sólyom, op. cit., pp. 23-24.

[62] Klimková, op. cit., p. 266, Sólyom, op. cit., pp. 28, 50.

[63] Klapáč, "Problémy", pp. 153-155.

[64] Klapáč, "Všeobecné", pp. 305 ff, ibid., "Kodifikačné", p. 190, Klimková, op. cit., p. 266.

[65] Klapáč, "Všeobecné", pp. 307f.

[66] Sólyom, op. cit., pp. 31-37.

[67] Ercman, op. cit., p. 488.

[68] Klapáč, "Všeobecné", pp. 305 ff, Klimková, op. cit., p. 255.

[69] Füllenbach, op. cit., p. 48.

[70] Měkota, op. cit., p. 795 ff, Klapáč, "Problémy", pp. 150-151, 159.

[71] Poplawski, op. cit., p. 132, Klimková, op. cit., pp. 264ff, Klapáč, "Všeobecné", pp. 311-312.

[72] Mikolas, Pittermann, op. cit., p. 318, Kilényi, op. cit., p. 204, Ercman, op. cit., p. 163.

- [73] Sóllyom, op. cit., p. 24-25, 45, 50.
- [74] Ercman, op. cit., 97, T. K. Forgács, "On Some Issues of Environmental Economics", Közgazdasági Szemle, No. 6, 1980 (AHEL 1980:232).
- [75] Poplawski, op. cit., pp. 131-132, Rocznik Statystyczny, 1980, tab. 40 (shows a decline of investments for 1979), Forgács, "Environmental Protection", Figyelő, No. 45, 1979 (AHEL 1979:554).
- [76] Poplawski, op. cit., p. 133, Sloboda, Jan. 31, 1975, Füllenbach, p. 36, Seman, Rišová, op. cit., p. 319. According to Rastislav Lacko, "Nástroje hmotnej stimulácie starostlivosti o životné prostredie", Plánované hospodárství, No. 12, 1980, p. 47, the demand for air filtering equipment is three times the capacity of the producing plants.
- [77] Jana Klacková, "Životní prostředí a struktura společenských cílů", Politická ekonomie, No. 8, 1974, pp. 699 ff.; Ibid., "Ke zdokonalvání péče o životní prostředí v národohospodarském plánování", Politická ekonomie, No. 7, 1980, pp. 684-693; Aléna Černá, Eva Tošovská, "Ekonomické problémy životního prostředí", Politická ekonomie, No. 11, 1979, p. 1197.
- [78] A. Madas, "Some topical issues on environmental protection", Valóság, No. 5, 1974 (AHEL 1974:330), "National economy accounts, national welfare, and environmental factors", Statisztikai Szemle, No. 8-9, 1976 (AHEL 1976:387).
- [79] Karel Nutil, "Ekonomický rozvoj společnosti a jeho vliv na tvorbu a ochrany životního prostředí", Plánované hospodárství, No. 4, 1980, p. 37, Gy. Gonda, "Environmental protection. Domestic conception". Figyelő, No. 34, 1979 (AHEL 1980:368).
- [80] Nutil, deputy federal minister of construction and investment in the CSSR, expresses this caveat, op. cit., p. 39.
- [81] Gríger, op. cit., p. 71, Klapáč, "Prevenencia a zodpovednosť pri starostlivosti o tvorbu a ochranu životného prostredia", No. 5, 1976, p. 429, Klimková, op. cit., pp. 262-263, Ercman, op. cit., pp. 484 ff.

[82] Sóllyom, op. cit., p. 36, Klapáč, "Problémy", pp. 163 f.

[83] Klapáč, "Všeobecné", pp. 308-309, Lacko, Ekonomické, p. 189, ibid., "Nástroje", p. 53, Forgács, "On some issues", M. Petschnig, "Some economic problems of environmental protection", Pénzügyi Szemle, No. 3, (24) (AHEL 1980:210).

[84] R. Rapant, M. Běláček, "Ochrana lesního fondu v podmienkach socialistického Československa", Právny obzor, No. 1, 1979, p. 12, Listy, No. 1, 1979, p. 58, S. Muranský, "Oblasti s největším znečištěním vody a ovzduší v ČSSR", SCSZ, No. 4, 1964, p. 297. Cp. Tribuna Ludu, Oct. 20, 1970, and Wall Street Journal, July 24, 1981.

[85] Mikoláš, Pittermann, op. cit., pp. 317f.

[86] Gríger, op. cit., p. 72; Černá, Tošovská, op. cit., p. 1198; Lacko, "Nástroje", pp. 51-52.

[87] Lacko, "Nástroje", pp. 52-55.

[88] Lacko, Ekonomické, pp. 203 ff, Černá, Tošovská, op. cit., pp. 1193 ff.

[89] Ercman, op. cit., p. 41, Lacko, "Nástroje", p. 54.

[90] B. Tóth, L. Pühr, "Financing Tasks Related to the Protection of the Human Environment", Pénzügyi Szemle, No. 12, 1975 (AHEL 1975:624), Vajna, op. cit., pp. 158 ff.

[91] P. Synek, "Negative Wirkunge der Wirtschaftstätigkeit im nordböhmischem Kohlenrevier", Studia Geografica, No. 7, 1969, pp. 127 ff, Füllenbach, op. cit., p. 96 f.

[92] Černá, Tošovská, op. cit., p. 1203; Jana Klacková, "K některým problémům vyhodnocování efektivity opatření na ochranu životního prostředí", Ekonomický časopis, No. 4, 1980, p. 380; Jaroslav Stoklasa, "Některé ekonomické aspekty tvorby životního prostředí", Životné prostredie, No. 6, 1971, pp. 299-300.

[93] Lacko, Ekonomické, pp. 80 ff, 203 ff.

- [94] Jaroslav Stoklasa, "The Role of Natural Resources in Economic Theory". Background paper. International Geographic Union Congress, Moscow 1976, pp. 2 ff, Goldman, The Enigma, pp. 43 ff.
- [95] Stoklasa, "The Role", pp. 2 ff, Long-Term Planning of Water Management, pp. 205 f, 385.
- [96] Černá, Tošovská, op. cit., part 1 in Politická ekonomie, No. 11, 1979, pp. 992-993; Jana Klacková, "Principy racionálního využívání přírodních zdrojů v teorii optimalního plánování", Politická ekonomie, No. 7, 1976.
- [97] Plecháč, op. cit., p. 35ff., Ercman, op. cit., p. 48.
- [98] Gerner, Lundgren, op. cit., pp. 58, 171.
- [99] Valér Fábry, "Protection of Agricultural Land", Bulletin of Czechoslovak Law, 1979, pp. 83-88, Misiuna, op. cit., p. 1226, Z. Hun'áček, E. Schinke, "Bodennutzungsrechte und Schutz des landwirtschaftlichen Bodenfonds in der CSSR", Osteuropa-Recht, No. 3, 1979, pp. 138 ff.; G. Szabó, "The Problems of the Economic Evaluation of Land Withdrawn from Agriculture in the Works of Hungarian Economists" Acta Oeconomica Academiae Scientiarum Hungaricae (henceforth Acta Oeconomica) No. 3-4, 1971, pp. 399 ff.
- [100] Szabó, op. cit., pp. 400ff.
- [101] Füllenbach, op. cit., p. 102, Misiuna, op. cit., 1226.
- [102] Stoklasa, "Nekteré", pp. 299-300.
- [103] Ibid., "The Role", pp. 11 ff.
- [104] B. Czikós-Nagy, Hungarian Price Policy, Budapest 1980, (AHEL 1980:115). L. Rács, "The New Price System", Közgazdasági Szemle, No. 3, 1980 (AHEL 1980:60).
- [105] Hospodářské Noviny (Praha), June 8, 1979, Jiřina Sládková, "K funkcím zahraničné obchodních cen v československém národním hospodarství", Politická ekonomie, No. 1, 1981, pp. 42-46, Jiří Šafař; Arnošt Sýkora, "Nerostné surovinové zdroje v čs.

ekonomice", Plánované hospodářství, No. 9, 1980, pp. 52-57.

[106] V. Pehlivanov, "The Problem of Raw Materials and Power and the Wholesale Prices in the Extraction Industries", Abstracts of Bulgarian Scientific Literature : Economy and Law. (Sofia), No. 1, 1979.

[107] Černá, Tošovská, op. cit., part 1, Politická ekonomie, No. 9, 1979, pp. 987-994, Klacková, "Životní", pp. 699-700.

[108] Černá, Tošovská, op. cit., part 1, Politická ekonomie, No. 9, 1979, pp. 993-994, Klacková, "Životní", p. 697.

[109] Černá, Tošovská, op. cit., pp. 994-995, Klacková, "Životní", pp. 697 ff.

[110] Füllenbach, op. cit., pp. 128-129.

[111] Lacko, Ekonomické, pp. 20 ff, 58-59, 117 ff, Klacková, "Životní", p. 699, J. Havelec, "Ekonomické aspekty tvorby a ochrany životního prostředí", Politická ekonomie, No. 9, 1974, 796-797, Vintrová, Klacek, Kupka, op. cit., pp. 29-37.

[112] Lacko, "Kritéria efektivnosti vkladov do tvorby a ochrany životného prostredia", Plánované hospodárství, No. 11, 1978, pp. 81-87; Černá, Tošovská, op. cit., pp. 987-992; Jaroslav Stoklasa, "Ke vztahu životního urovné a životního prostředí", Planované hospodárství, No. 10, 1974, pp. 66-67.

[113] B. Blažek, J. Petz, J. Stoklasa, "Anthropo-ecological Decision-making of Implicit Assumptions Intervening between Biological and Economic Approaches", Lund Studies in Geography, Series B. Human Geography, No. 40, 1974, pp. 8-9, 25-26; Ibid., "Vliv prognóz potřeb životního prostředí na společenské-ekonomický proces", Životné prostredie, No. 6, 1973, pp. 396 ff.; Ibid., "Koperník a bioekonomie", Životné prostredie, No. 4, 1976, pp. 216-217.

[114] József Bognár, "Economic Growth in Coexistence with Nature", New Hungarian Quarterly, No. 74, Summer 1979, pp. 17-23.

[115] Wolfgang Harich, Kommunismus ohne Wachstum ?

Babeuf und der Club of Rome. Sechs Interviews mit
Freimut Duve und Briefe an ihn, Hamburg, 1975, pp.
37-48, 62-75, 140-176.

THE JAPANESE EXPERIENCE WITH SCARCITY: MANAGEMENT OF TRADITIONAL COMMON LANDS

Margaret A. McKean
Duke University

Preventing the Tragedy of the Commons

One of the first things we all learn in studying environmental problems is that environmental quality is a public or collective good and, conversely, that environmental degradation is a public or collective bad. For this reason action by isolated individuals, however well-intentioned, cannot yield overall improvements in environmental quality and cannot prevent environmental degradation. This "public goods" or "free-rider" problem has been eloquently described in Garrett Hardin's famous essay, "The Tragedy of the Commons" and carefully analyzed in Mancur Olson's The Logic of Collective Action. [1] In essence, rational individuals acting in their own interest in the absence of any mechanism for cooperation will gradually but inexorably withhold their contributions to the maintenance of, or use up more than their fair share of, commonly held assets, eventually threatening the very existence of those collective goods. Some sort of collective decision to cooperate and exercise mutual restraint (what Hardin calls "mutual coercion mutually agreed upon") is obviously necessary. Thus environmental problems are by their very nature political. The challenge for society is to figure out how to eliminate circumstances in which rational individuals will make decisions that lead inexorably to tragedies of the commons, essentially to create greater overlap and synchrony between private good and public good. To date, economists have paid the most careful attention to free-rider problems, analyzed their characteristics, and even devised some potential theoretical solutions.[2]

One such solution, popular among economists interested in property rights, is to privatize the commons: to divide it into little pieces and assign ownership and responsibility to each co-owner on the easily verified theory that individuals take better care of their own property than of someone else's or even property in which they have only a partial

share. This method solves the tragedy of the commons by eradicating the commons itself. It can be done sometimes but there are many commons or collective goods which we cannot subdivide or for social or ideological reasons we choose not to divide into private parcels. Moreover, we have also learned the hard way that too often individuals do not take adequate environmental care of their own property (even if they do better than if they shared the property with others). In fact, it can be mathematically demonstrated that in certain circumstances a resource may yield greater net material value to the owners or exploiters if they proceed to deplete the resource rapidly than if they attempt to maintain its productive output at some maximum sustainable yield.[3] So privatizing the commons is not much of a solution--it may not work even when it is physically possible; and much of the time it is not physically or politically possible anyway. We still have to find other solutions.

A second solution would be a community ethic of behavior or a sense of community identity so that individuals perceive their own interests to be very similar to those of the community. The environmental equivalent would, of course, be a greater and conscious value placed on the environment and the widespread understanding that without mutual restraint in the use of the environment, a tragedy of the commons will occur. This is undoubtedly important--crucial in fact--but we do not know how to make it happen. A very valuable research project for anthropologists and historians would be to study communities where public and private good are perceived to be virtually identical, with emphasis on the circumstances in which such community ethics arise and disappear. In the meantime, all we can do is to continue to educate our peers, recycle our own garbage to salve our own consciences, and hope that the environmental crisis that finally produces an environmental ethic in others (if that is indeed what it takes) does not itself take us beyond the point of no return.

A third solution is to have small communities of co-owners for each commons, so that an individual's contribution to the commons yields a significant benefit--not an infinitesimal one--to the contributing individual and conversely so that an individual suffers significantly himself when he

withholds his expected contributions to the commons. This method would function by tampering with the mathematics of the tragedy of the commons so that the fate of the individual and the fate of the commons are closely linked, regardless of the individual's ethical values or identification with the community. Some observers conclude that, in spite of the mathematical verity of this principle in theory, it does not always hold up in practice: some large groups have been known to manage well and some smaller groups fail.[4] Nonetheless, they would agree that reducing group size can reduce transaction and information costs among co-owners of the commons, thus reducing uncertainty (or providing assurance) about the actions of other co-owners, and in turn perhaps stimulate a community ethic and voluntary cooperation to protect the commons among the community of co-owners.[5] Reduction of group size is undoubtedly a valuable solution, and is perhaps the strongest argument underlying the environmental common sense of "small is beautiful" even though it is not an argument E. F. Schumacher made on behalf of his proposal of decentralization and smallness.[6,7] Unfortunately, reduction in group size is limited in its potential application, because for the foreseeable future we are stuck with nation-states and population clusters of many thousands and millions of people apiece. Although we should undoubtedly keep "small is beautiful" and "decentralization works" in mind at all times, we will still need to deal with potential tragedies of very large commons.

What solutions remain when we cannot or will not convert the commons to private parcels, when we cannot fabricate a community ethic, and when we cannot shrink the community of co-owners to some "magic" size at which free-riding ceases to be rational? A tragedy of the commons occurs because the individuals sharing in it have no way or incentive to cooperate, and thus to exercise mutual restraint. Another solution, then, would be to institute cooperative agreements among co-owners of commons that include regulations to restrict access to the commons to prevent overuse (sometimes called "stinting"), and sanctions or penalties to create an incentive to obey these regulations. The environmental equivalent in the nation-state is the decision to make the environment an object of public policy and to devise rules to govern citizens'

behavior toward the environment.

Such a system would presumably work well (i.e., prevent tragedy of the commons) to the extent that the prohibited behaviors really constituted abuse of the commons or free-riding.[8] Often it is physically or technically difficult to identify authentic free-riders--to decide whose sins of commission or omission are the real problem--so uniform rules applied to all co-owners are needed. In effect, the community defines violating the rules as free-riding. If the regulations are carefully designed, then there should be close overlap between rule-violators and true free-riders who exploit their position and thus damage the commons.

Once rule-violators or authentic free-riders have been identified and pursued, they have to be penalized. Scholars interested in public goods argue at the abstract level over whether regulations of common property can incorporate incentives to obey the rules and thus be self-enforcing, or must be coercively imposed from outside of the community of co-owners.[9] But everyone agrees that no matter where the incentives come from, these regulations can only be enforced if there are rewards for compliance and penalties for non-compliance. Economists who have explored collective goods problems at the theoretical level suggest penalties that can be roughly classified into three categories. First, the community can charge a "toll" so that the "ride" simply is not "free" any more; there is general agreement that in order to deter abuse of the commons, the toll or user charge should vary in proportion to the abuse committed rather than being a flat fee.[10] Alternatively, the community might suspend the free-rider's right to purchase certain private (marketable) goods that it also produces.[11] Finally, the community might withhold certain collective goods--right to the commons itself--from convicted free-riders: from minor rights for minor offenses all the way to exclusion from the community and the commons itself for extremely serious offenses.[12]

What we need to understand, then, is how to devise regulations and sanctions. It is not enough simply to propose regulation of the behavior of co-owners in a commons and exclusion of violators from certain rights. There are presumably regulations

that work and regulations that do not, and there are presumably levels of harshness in excluding violators that work better than others. We must go beyond mathematical and theoretical exercises in public goods theory to collect additional information before we can design workable or effective or efficient regulations. One enormous task for research that's been left almost untouched is to comb the historical record for near-tragedies of the commons to collect examples of success (i.e., prevention of the tragedy of the commons or solutions to free-rider problems), and then to analyze these examples to determine the ingredients of success.[13] Actual successes, after all, are more convincing testimony than paper solutions as to the actual range of human and social capacities. Properly speaking, we need to collect examples of failures too, both to strengthen our analysis of successes and to serve as a stern reminder of the limitations of human and social capacities.

I have therefore decided to start a collection of relatively or apparently successful encounters with collective goods or free-rider problems under conditions of scarcity. I consider myself a Japan specialist and derive my interest in environmental problems from Japan's horrendous recent experience. It is natural then for me to start my collection with examples from Japan, though it is my intention to branch out later.

The Development of Common Lands in Japan

Thus far I have selected three case studies of the Japanese experience with solving free-rider problems (during periods of low, zero, or negative economic growth, which exacerbates the political challenge of allocating any resource, including rights to the commons). Two cases are energy conservation in the 1970s and rationing of food and fuel during wartime. In both of these cases the commons or public good is not the stuff being conserved or rationed--these commodities are intrinsically private goods--but the security and survival of society, and conservation and rationing are public policies designed to make do with a limited present supply in the interest of enhancing future supplies and thus society's security and survival. In both of these cases the free-rider is the person or institution who benefits from society's

overall security without making an appropriate contribution--who does not conserve "his share" or who evades the rationing system.

The third case, the one I will concentrate on here, concerns real, tangible common property rather than abstract public goods: the management of common village lands (iriai or "common access" lands) in rural Japan. Here the free-rider is the person who abuses the natural environment in the commons, much like Hardin's farmer. These centuries-old common lands are particularly worthy of study for several reasons. First, because these are common lands with identifiable communities of co-owners--as opposed to being vast public areas used by all and in essence owned by no one, a very different circumstance posing different problems--they are very similar to the theoretical examples from which theories of public goods and free-rider problems are built, and they thus provide excellent empirical tests for that body of theory. Second, villages developed elaborate regulations, even written codes, for the commons, and the information available from even a fraction of the 70,000 traditional villages ("classical" or "true" villages, before the amalgamations of the 19th century) offers a rich variety on most variables of interest. Second, Japanese villages employed threats of ostracism and banishment to control social behavior and as ultimate penalties for abusing the commons; thus there is a fascinating resemblance between the sanctions they employed and those recommended by scholars extrapolating their conclusions strictly from theoretical assumptions. Finally, and most importantly, these thousands of villages managed their common lands for several centuries without experiencing, as far as anyone seems to know, a single tragedy of the commons. Since the political change that is known as the Meiji Restoration in 1868, there has been steady attrition of common lands.[14] Either the newly modernizing Japanese government managed to declare inadequately documented common land to be government property (to be converted into military bases or national forests) or, more recently, villages sold their common land off at high prices (to be converted into golf courses, tourist hotels, shopping centers and other 20th century abominations), but I have not yet turned up an example of a commons that suffered ecological destruction while it was still a commons. Obviously the techniques by which these common lands were so

carefully managed for centuries, and abuse and overuse prevented, deserve a very close look.

Though it may be news, it really need not be surprising that Japanese villages, like European ones, possessed expanses of land that gradually came to be viewed as commonly owned or in which all the villagers had rights. After all, wet-rice agriculture requires collective effort by large numbers of people, and collectively-managed irrigation systems too. Common lands came into being gradually during the breakdown of the estate (shōen) system and the civil wars that followed--essentially, between the 14th and 16th centuries.[15]

All land was officially nationalized--made part of the imperial and public domain--in the 7th century, but as the imperial court at Kyoto began to decline in the 11th century it awarded vast estates (shōen), along with immunity from taxation and the intrusion of police powers, to individual court nobles and Buddhist temples. By the 13th century very little imperial or public land remained, and even though nobles and temples retained titular possession of the estates, real possession was in the hands of estate managers or land stewards (jitō) appointed to manage the estates. With the decline of the Kamakura shogunate (Japan's first military or feudal government to arise out of the emergence of the warrior class) in the 14th century, the same process that had allowed imperial land to devolve into estates recurred within the estates, as estate managers and land stewards began appropriating land rights for themselves and encroaching upon the proprietary rights of the absentee estate holders. With each outbreak of civil war and each decline in central control over the provinces, political power slipped into the hands of local warlords (often former estate managers) who "owned" their land by physically occupying it, who acquired additional land in battle and awarded it to their vassals as fiefs. Thus over a period of three centuries, the imperial land-grant estates evolved into fiefdoms and estate managers into feudal lords (the sengoku daimyō) who had full and independent powers of taxation over the people living in their domains.

During this period of transformation in land holdings, the estate proprietors or land stewards or feudal magnates appointed prominent peasants as their

officers and agents in each village and empowered these agents to regulate access to uncultivated forests and grasslands, corvee labor, and the irrigation system upon which wet-rice agriculture depended. All the villagers were essentially tenants of the lands they worked, and they had to petition their estate proprietor or steward or manager, through his agent, for rights to enter the uncultivated lands.

With the civil wars of the 16th century the process of devolution of power to lower levels reversed itself, and the newly established sengoku daimyō embarked upon a bitter competition to survive during the process of national reunification. Victorious daimyo absorbed the domains of the losers, consolidated power, made and unmade coalitions.[16] Villagers became very concerned with communal solidarity to protect themselves from the ravages of war,[17] the daimyo or feudal lords obviously became more desperately dependent on cooperation from the peasants in their domains and villagers became more assertive about their right to enter the uncultivated land. Instead of the villagers' paying water charges to the proprietors or managers of the estates and entering the lands only with the proprietor's blessings, the proprietors or estate managers now paid fees to villagers for the use of the same kinds of facilities, and villages wrote their own codes and levied punishments to govern common lands, irrigation, and corvee labor. Nagahara documents this transformation in one village where the estate proprietor refused to pay a water charge demanded by the village so the village retaliated effectively by refusing to pay taxes to the proprietor.[18] By 1600 most villages had acquired clear use rights ("perpetual usufruct") to vast expanses of uncultivated land, held in common and shared by all the villagers.

In 1600 one Tokugawa Ieyasu established himself as the leader of a victorious coalition of daimyo by winning the last battle of the civil war at Sekigahara. His talents were not limited to military strategy or political alliances: he proceeded to establish an effective military dictatorship and complex administrative structure that gave Japan peace for over 250 years.[19] Japan was divided into 250-300 (the number varied) administrative units or domains, each governed by a "feudal" lord. Some of

these lords were survivors (both winners and losers) in the civil wars who retained their home base of operations, and others were relatives or allies of the Tokugawa rewarded for their services with strategically important lands confiscated from the losers. Although these lords had a fairly free hand within their own domains they were subject to strict constraints designed to prevent the emergence of regional power. They had to spend alternate years in Edo (the future Tokyo), leaving family members behind as hostages in Edo when they returned to their domains, they were allowed only one castle or fort per domain, and whenever a domain showed signs of prosperity it would be ordered to engage in an extensive program of public works construction to prevent the diversion of resources into military expenditures. These lords also functioned at times as administrative officers of the center and had to enforce a body of elaborate laws and decrees from the center within their own domains. The central administration imposed a rigid four-layered class structure; all manner of sumptuary laws to regulate morality, spending habits, and the behavior of the four classes; universal registration of all individuals in the country (to track down illegal Christians); and complex requirements for licenses and official permission to engage in commerce and even to travel from one domain to another, enforced by a nationwide network of police, spies, and inspection stations at domain borders.

There is understandable confusion and great controversy among historians over the relationship between this complex, nearly totalitarian administrative structure created by the Tokugawa and the newly assertive self-governing villages below it. For the most part this controversy does not affect the governing of common lands, which by now were clearly in the hands of the villages and managed freely and independently by them. But there are three important developments in the early Tokugawa period that did influence the management of the commons.

First, an administrative innovation of the Tokugawa regime may have played a role in enforcing the rules villages devised to govern their common lands: the notorious five-man groups (goningumi, much like the pao chia system in China) system of collective responsibility. Villages developed this system themselves during the era of civil war when

they had to provide their own law and order and needed internal spies. Toyotomi Hideyoshi and later Tokugawa Ieyasu adapted the system for keeping track of Christians, rōnin (warriors without vassal ties, who were therefore mercenaries and sometimes bandits), and tax evaders, but Ieyasu employed the five-man groups per se only in domains directly controlled by his family. Similar systems of collective responsibility were almost certainly used in all domains.[20] All individuals were members of a five-man group, and all members of any particular five-man group were equally responsible and liable for payment of taxes, obedience to the law, and transgressions by fellow members. By almost any standard this is a very unpleasant, unjust, and efficient way of frightening people into policing each other, and it seems to produce compliance even when people do not view as legitimate the laws or codes they are expected to obey. The Tokugawa regime and the daimyō had little jurisdiction and even less interest in how villages managed their commons, and certainly did not employ the five-man groups to intervene in this matter, but villages may have employed the system themselves for internal supervision of the commons.

Second, we will recall that the sengoku daimyo had originally acquired their positions of power within the warrior hierarchy through military occupation of the land and through the award of fiefs to their vassals. With the Pax Tokugawa, the daimyo tried to acquire more direct control over both their domains and their vassals by replacing fiefs with stipends of rice drawn from their own revenues. This process converted landed vassals into salaried bureaucrats and moved them from the lands that had been their fiefs into the cities. This freed the villages from having to bother with a local fief-holder and increased their freedom and independence in the use of all property, including commons. Moreover, it created a system in which private individuals and villages had not only usufruct but ownership in all but the final formal sense, and daimyō had not ownership but taxation rights.[21] Thus it soon became possible to distinguish between land belonging to the daimyo and other lands within their domains that belonged to peasant freeholders or to other landlords. In this way, many villages held common land that was not considered daimyō property, and thus operated their

commons quite independently.

Thirdly, the devastation of widespread civil war in the 16th century followed by peace and the rapid construction of cities and castles throughout Japan in the 17th century created tremendous demand for timber and caused considerable deforestation.[22] The problem was most severe in forests owned directly by the Tokugawa family and the various daimyō engaged in the work of reconstruction, with several results. First, their appetite for timber induced the daimyō to acquire direct control over prime forest in their domains, so that the best of the existing timbered commons passed from villages to the daimyō. Second, as daimyō realized that they had access only to a finite supply of timber, they began experimenting with conservation practices. They focused first (and inappropriately, as we shall see) on peasants to whom they had granted access rights to daimyō-owned forests (these rights are separate from and additional to villagers' perpetual usufruct on lands not claimed by the daimyō since 1600). The daimyo began regulating these access rights more strictly, often by granting exclusive access rights on a long-term basis to particular villages. In exchange for asking those villages to supervise the forests and keep others out. In effect, then, the daimyo granted these villages increasingly formal entitlement to still more common lands, in addition to the substantial commons already in existence since the beginning of the Tokugawa period and no longer claimed by the daimyō at all. Interestingly enough, deforestation never was a serious problem on village common lands or in the common forests subsequently granted by the daimyō to particular "guardian" villages for their exclusive use. Japanese villages were already good at collective management, and the visible deforestation on daimyo and Tokugawa lands seems to have made villagers aware of the very real risk of overuse. Many villages developed stricter rules for conservation on their own initiative to save their forests and commons from this fate. When the daimyo finally realized that peasant demand for timber was stable and occasional, and that the daimyō themselves were the prime culprits in increasing demand for timber, they began to develop principles of management to sustain their own prime forests. (Rational actors all along, the daimyō simply required a long period of trial and error to learn about the causes of deforestation and to develop

successful management techniques for sustaining forest productivity on their own lands.) For our purposes, the significance of this episode of deforestation during the 17th century is twofold: it resulted in the growth and institutionalization of village rights to common land, and in the development of literally thousands of highly codified sets of regulations for the conservation of forests and the use of all commons.

Management of the Commons

Two-thirds of Japan is occupied by forests and cultivated mountain plains (about 25 million hectares), and approximately half of this land was held and managed in common by rural villages during the Tokugawa period. (The other half was imperial, Tokugawa, daimyō, or private land.) Even though about three-fourths of that common land has been redesignated or sold as public or private property, something over 3 million hectares of common land remain in Japan today.[23] Japan now has one of the highest per capita incomes in the world, and many Japanese farmers today practice agriculture only on Sundays, relying on weekday jobs in nearby industries to supply the income with which they purchase color televisions, cars, expensive vacations, and elegant houses. Obviously such farmers no longer depend on products or income from the commons. But we should not be fooled; the infusion of industrial wealth into rural Japan is a very recent development, and in many parts of Japan the commons remained a vital part of the rural economy until economic recovery (in the 1950s) from the second world war.

Communities that retained their common land after the Meiji Restoration in 1868 continued to use their land in the traditional way, but they also developed other methods as their needs changed, especially as subsistence agriculture gave way to cash crop agriculture and light industry. We may group the methods of using the commons into four rough categories. The classic type, which of course prevailed during the Tokugawa period, was restricted to activities that left the commons essentially in its natural state and involved an investment of labor to yield natural products that were very important in daily life: thatch for roofs, fodder for animals, multi-purpose bamboo, firewood, charcoal, underbrush and fallen leaves, compost, wood for furniture and

tools, medicinal herbs, fowl and game to supplement the otherwise vegetarian diet of the mountains and edible wild plants that could not be cultivated but were much treasured (matsutake, warabi, and other mountain vegetables [sansai]). Those with access rights (whom I shall call co-owners of the commons) could enter the commons to obtain these items either as individuals, or by households, or in groups, and either freely or at designated times only, according to the particular set of rules devised by that particular village.

Direct group control of the commons, under which were there was no access by individuals, was used when the commons was harvested to raise cash income. The income earned was either distributed among co-owners or plowed back into some other village project or the next investment on the commons, as needed. For instance, a village might develop rice paddies, dry fields, or fruit orchards on the commons and sell the crop for village income. Some commons were converted into rock quarries. Many meadows and plains (perhaps denuded by daimyo during the deforestation of the 16th and 17th centuries before becoming village commons) have been converted since 1868 into cultivated forests with the encouragement of the modernizing Japanese government, and the villages harvest the timber and distribute the income collectively. Direct group control of the commons as a source of cash income for the village was used throughout the last hundred years to supplement village budgets, especially when compulsory mass education was adopted but local communities were expected to build the schools.

According to divided use of the commons, common land is actually divided up into pieces for individual co-owners to use as they see fit. This is akin to privatizing the commons, except that co-owners do not own their allotments, they must abide by certain limits in their use of the commons (not building structures on the land, for instance), and they are not free to sell their pieces to anyone else. Pieces are usually assigned by lot, and reassignments are conducted every two or three years to ensure fairness and to prevent the commons from degenerating into private property. This method is obviously appealing to a community where the collective decision-making required in classic or direct group control of the land has become

cumbersome or time-consuming, or where individual co-owners of the commons have widely differing needs for timber, cash income, extra paddy land, private vegetable gardens, or natural products.

Finally, the most modern innovation in common land use is contracted use, in which villages that want to hold onto their common land but cannot come up with the labor to maintain it lease it out. This is particularly true with forest land in which the village leases timber rights to a municipal body or a forestry firm and earns a percentage of the proceeds as rent.

Most communities that still possess common land combine these methods depending on the activity--the classic method for gathering wild plants and compost, direct group control for forestry or large-scale farming, divided use for forest or garden plots, and contracted use for forestry, quarrying, or large-scale farming. In certain areas of Japan, the classic method has persisted until very recently--particularly in impoverished areas that did not attract industry, where the common lands, often substantial in size and ecological diversity, provided a large share of the local livelihood. The summary of management techniques given below is drawn from studies of three such villages--Yamanaka, Hirano, and Nagaike, located on the poor volcanic soils north of Mount Fuji in Yamanashi Prefecture--that used the classic method until after World War II.[25] I have begun my survey of the traditional commons in Japan with these villages not because they are typical--I will not know what is typical until I examine the management of the commons in many other villages as well--but because they are by far the most carefully studied ones and can therefore serve as a solid starting point for further research, and because they vary in ways that are likely to prove interesting and significant in building hypotheses about successful management of the commons. Studies of Tokugawa documents from these villages indicate that the use of the commons changed hardly at all between the 18th century and the early 20th century. Yamanaka, Hirano, and Nagaike possess a wide variety of common lands:[26] forest and grasslands, large and small expanses of commons, rich productive lands and relatively poor lands. Moreover, these villages each possess some common land of their own, some common land shared with one or both of the

others, and rights of access to the very large expanse of land on Mount Fuji's north slope (Kitafuji) that are shared with a total of 11 villages.[27] The villages themselves also vary. Hirano is old and wealthy, nestled against verdant mountains, hierarchial in social structure, inegalitarian in income distribution, crusty in traditional values and intensely concerned with family and reputation. Nagaike is a younger (late Tokugawa), smaller, poorer offshoot of Hirano with very little difference in social standing or wealth among different households. Yamanaka is the largest and poorest of the three, located adjacent to the largest but least productive of the commons (the Kitafuji slope), a large village in which horizontal organizations known as kumi are at least as important a focus of loyalty as family. In addition to using the rich social science literature about these villages. I was also able to interview oldtimers whose memories of the commons went back to the 1920s.[28]

Products of the Commons

The three villages relied on the commons as a source of several products. Kaya is a grass grown to produce thatch for roofs. When it is still young it is good as horse fodder and for weaving into containers for charcoal and other household items. After it has fruited it is good for thatch. After winter when only the dried stalk (saguri) remains, it is good for weaving stiffer products, for racks to dry root vegetables, and for certain purposes in sericulture. In order to prevent the kaya from being cut at an immature stage for horse fodder, villagers usually designated an area with kaya as "closed" during the growing season.

Magusa was a grass used as fodder for draft animals and pack horses. combined with animal excrement it also made excellent fertilizer. During the growing season each household had to cut a fresh supply daily for its animals. At the end of the growing season an entire winter's supply had to be cut, dried, and preserved (called hoshikusa or kaiba) in order to be parcelled out to the animals during the winter months. In order to make sure that daily cutting of fresh fodder did not deplete the supply available for winter, villagers usually designated one area for daily cutting of fresh grass and another

area as a source of grass to be dried into fodder for the winter. In Hirano, for instance, fresh grass could be cut every day from an open commons, but the villagers designated another "closed" area for winter fodder. Most households, particularly those with more horses than usual, had to supplement their share of the common supply of winter fodder with grass collected and dried from their own private holdings.

In Nagaike, the animals were allowed to roam within a certain area and pasture at their leisure, but it was more customary for villagers to forbid the use of commons as a pasture and insist instead that people cut the grass and bring it to the horses. I do not know whether this rule was designed to eliminate the temptation for a household relying on common pasturage to acquire more animals than it could cut fodder for, and thus prevent overgrazing. I was told that villagers wanted to supervise what horses ate--in particular to make sure that they did not eat grass or plants intended for other purposes. In any case, the role of animals in Japanese agriculture was as a precious form of equipment that had work to do each day, and not as a product in itself, so there never was any need for vast pasturage for large herds to fatten up on. A household's need for animals was limited by the amount of land it had to work. Only during the late 19th and especially early 20th century, when families in all three villages began to earn extra income by breeding horses and leasing them as pack animals for transporting freight along the rough mountain roads in the Fuji area, did the production of animals become a lucrative activity in itself. As we shall see, it placed stress on the commons and caused villagers to tighten up the rules.

Firewood and charcoal came from two locations. There were patches of forest that villagers could enter at any time as long as they obeyed rules about taking fallen wood first, cutting only certain kinds of trees and then only those that were smaller than a certain diameter, and only with cutting tools of limited strength (to guarantee that no tree of really substantial size could be cut). In addition, all three villages conducted a joint annual tree cutting; on this occasion they clearcut everything but the pines and each household in each village got an equal-sized stack of wood.

Rules Governing Rights of Access to the Commons

Different villages arrived at different arrangement for guaranteeing an adequate supply of each of these products. For items that were needed regularly and that the commons yielded in abundance, a village might allow co-owners free and open entry as long as they abided by certain rules to make sure that a self-sustaining population of mature plants or animals was left behind. To enter the commons, one might need to go to village authorities to obtain an entry permit, carved on a little wooden ticket and marked "entrance permit for one person." The rules would probably restrict the villagers' choice of cutting tools or the size of the sack or container used to collect plants. Everyone would be expected to abide by the village headman's instructions about leaving so much height on a cut plant so that it could regenerate, or taking only a certain portion of a cluster of similar plants to make sure the parent plant could propagate itself, or collecting a certain species only after flowering and fruiting, and so on.

For items that had to be left undisturbed until maturity and harvested all at once at just the right time, or that the commons supplied only in adequate, not abundant, amounts, villagers usually set aside closed reserves (tomeyama or "closed mountains"). The village headman would be responsible for determining when the time had come to harvest thatch or winter fodder or other products and would schedule the event (literally, yama no kuchi ake or "mountain-mouth-opening"). The rules for mountain-opening day varied with the village and even the product being collected. If the purpose of closing off the reserve had been merely to assure that the plants were allowed to mature but there was more than enough to go round, opening day might simply mark the annual transition from a closed mountain to an open one, allowing individuals and households to enter at will and collect as much as they wanted. If, on the other hand, there was a limited supply of the item the reserve might be declared open for a limited period of two or three days and households allowed to send in only one able-bodied adult to collect only what could be cut in that time. If the item were limited in supply and had to be collected all at once in a massive effort

to prevent spoilage, then the villagers would all enter the reserve together, work until the job was done, and divide the proceeds.

Even among the three villages in this study there was great variety in the rules applied on mountain-opening days for harvesting different products from closed reserves. In Hirano, for instance, every household had to send one (two in the 1910s and 1920s) able-bodied adults and a maximum of one horse to carry what was cut on the day scheduled for opening the closed thatch reserve. Hirano was divided into five kumi, and each kumi was assigned to a particular zone within the thatch reserve.[29] The kumi changed zones according to a fixed rotational sequence each year to preserve equality among the kumi. Household representatives from each kumi gathered in their kumi zone in the morning, with the kumi chiefs standing guard to make sure no one started cutting prematurely (anyone who did would be fined). At the sound of the great temple bell, everyone started cutting. One could cut only in the zone assigned to one's kumi, but could keep whatever one cut. A strong person could cut an adequate supply in a day (say, 10-15 units), but many would stay until after dark and even come back the next day. After two days, the mountain would be closed again and households would be required to donate two units of thatch to the common village reserve used in emergencies. The punishment for entering the thatch reserve before opening day was loss of the right to cut thatch or to receive a share from the kumi or the village for that year. These years appeared to be a judicious combination that rewarded strength and hard work but that so severely constricted the circumstances in which cutting was allowed that the total supply was not threatened and no extreme inequality among households, or over time among kumi, appeared.

The very same village used different rules for collective harvesting of winter fodder for the animals from another closed mountain set aside for that type of grass. As with thatch, each kumi was assigned a zone according to an annual rotation scheme, and each household had to send one but only one adult. On the appointed day each representative reported to the appropriate kumi zone in the winter fodder commons and waited for the temple bell as the signal to begin cutting. However, this grass was cut

with large sickles and since it would be dangerous to have people distributed unevenly around their kumi zone swinging sickles in all directions, the individuals in each kumi lined up together at one end of their zone and advanced to the other end, whacking in step with each other like a great agricultural drill team. The grass was left to dry for two or three days (it became much lighter), and then two representatives from each household entered the fodder commons to tie the grass up into bundles of an even size. The haul for each kumi was grouped together and then divided evenly into one cluster per household. Each household was then assigned its cluster by lottery. This extremely scrupulous division into equal lots per household was done not merely to prevent competitive cutting or to assure an equal amount per household. Bundles of grass varied enormously in quality according to how thickly the grass grew in different spots and how much extraneous undesirable plant matter was included. The bundles were assigned randomly to eliminate the bad feelings that would result otherwise in households that discovered their bundles to be of poor quality.

In Nagaike, the rules for cutting and division of thatch and winter fodder from closed reserves were at one period the reverse of those in Hirano! In Nagaike, households kept for themselves the supply of winter fodder to feed their horses that they managed to cut on mountain-opening day, but thatch was divided equally among the households after cutting. The equal division of thatch may have originated in the fairly egalitarian distribution of income among Nagaike households, meaning that households had dwellings of similar size, and therefore similar needs for thatch. Moreover, because all of the thatch for roofing jobs came from the village reserve, there was little value in amassing a private supply. Nagaike had a highly routinized arrangement for collecting a common reserve of thatch to provide a new roof for an outbuilding or barn for two households per year and a complete re-roofing job for all the buildings for two more households per year. By the time this communal system had provided a new roof to all of Nagaike's 38 households, it was time to start all over again. In 1923 the growing population of horses in Nagaike was beginning to create a great deal of competitive pressure for winter fodder on opening day, so Nagaike switched from the "keep-what-you-cut" system to equal division

by kumi and by household, much like the practice in Hirano. (In fact, there is reason to believe that Hirano had originally used the "keep-what-you-cut" system for fodder too, like Nagaike, and that competitive cutting as well as fear of swinging sickles had produced the change to equal division by kumi and household.)

One might conclude from this brief sketch of the rules for closed reserves in Hirano and Nagaike that the poorer the village or the more dependent on its commons, the more likely that it would set aside closed reserves and develop stricter rules. However, a review of Yamanaka's practices toward the commons indicates that this is not the case. Yamanaka was the poorest of the three villages, the least endowed with privately owned land, the most dependent on day labor and pack horses and carriage trade to supplement subsistence living, and its common lands were scruffy and dismal compared to those of Hirano and Nagaike. Nonetheless, Yamanaka's own commons combined with the huge Kitafuji slope that it shared with 11 villages made up in quantity for what it lacked in quality. Yamanaka was located immediately adjacent to the Kitafuji slope and could conveniently make use of it, whereas the other villages that shared in it were located far away and could not easily take advantage of their access rights. Then in 1939 the Japanese government expropriated the Kitafuji slope, and even though the government was supposed to honor the villages' rights of access, the routine conduct of military exercises on the slope damaged the ecosystem and further reduced the productive potential of the Kitafuji commons. Yamanaka therefore grew more heavily dependent on another piece of common land that it held in its own right, and was forced then to set aside a portion of that as a closed reserve for horse fodder. Even then, Yamanaka did not need to set aside a closed reserve for thatch. The supply of thatch on Kitafuji was sufficient, though so sparsely distributed that the hunt-and-peck method required ten to fifteen times the investment of time that was needed in Hirano to collect the same quantity. A more appropriate conclusion, then, would be that as demand for the products of the commons--whether that demand reflected wealth or poverty--approached the maximum sustainable yield of the commons, portions of the commons would be set aside as reserves and the rules would be progressively tightened.

Thus far we have examined the benefits that villagers drew from the commons, but equally important is the contribution of labor to the maintenance of the commons. In the classic type of commons villagers did not till the soil or sow seeds, but they often engaged in a systematic program of harvesting and weeding of particular plants in a particular sequence in order to increase the natural production of the plants they wanted. One very dramatic technique of this sort was the annual burning of the grasslands, or noyaki. Originally practiced on a small scale on private holdings, the Tokugawa villagers gradually extended this custom; through Japan many of the common meadowlands were burned completely clear once a year. The burning undoubtedly altered the ecosystem drastically from its previous state, but apparently the altered ecosystem absorbed this custom of annual burning, and common lands survived in spite of it.[30] The burning was carefully timed in the early spring to burn off hard and woody grasses and thorny plants, along with "bad" insects, before the shoots of desirable grasses emerged. The burning essentially converted the previous season's leftover dried grass and this season's early but undesirable grasses into a layer of ash, rich desirable fertilizer to nourish the desirable vegetation, without the effort of hand-weeding, manual composting, or manual redistribution of fertilizer. Even though the furious winds around Mt. Fuji caused the fire to race across the entire Kitafuji slope in just a couple of hours, somehow the game population was able to evacuate safely, to return later after delicious new shoots of grass had appeared.

For collective work to maintain the commons--to conduct the annual burning (which involved cutting nine-foot firebreaks ahead of time, careful monitoring of the blaze, and occasional fire-fighting when the flames jumped the firebreak), to report to harvest on mountain-opening days, or to do a specific cutting of timber or thatch--there were also written rules about the obligation of each household to contribute a share to this effort. Accounts were kept about who contributed what to make sure that no household evaded its responsibilities unnoticed. Only illness, family tragedy or the non-existence of able-bodied adults whose labor could be spared from routine chores were recognized as excuses for getting out of collective labor.[31] In these cases others in

the unrepresented family's kumi might cut a share of thatch or fodder for the missing family and the accounts would be evened out later. But if there was no acceptable excuse, punishment was in order.

Enforcement of Rules

As we have just seen, villages had elaborate rules to govern both open and closed commons. Abuses were possible: taking too much or taking unallowed items from an open commons, entering a closed commons before mountain-opening day, violating the strict rules of behavior on mountain-opening days, and failing to contribute collective labor.

One mechanism for enforcement of the rules about the commons, as well as the rules about everything else, was the general atmosphere of mutual dependence and collective responsibility in the village. Japanese villages observed a universal small-town rule that everything was everybody's business, so everyone understood that a transgression in one area of life--from serving cheap tea to building a pretentious house to cheating on the commons--might cause damage in another. To the extent that the formal system of collective responsibility (five-man groups) was effective in a village, all potential violators of rules knew that those near them had strong incentives to advocate compliance as a general rule (or, when persuasion failed, to snitch on one's colleagues rather than be implicated with them). For most people most of the time, obedience to the rules was probably the path of least resistance.

But villages did not rely entirely on formal collective responsibility, or social pressure from peers or even the individual's sense of identification with the welfare of the community to protect the precious commons. Villagers were not so naive as to imagine that there would never be temptations to violate the commons, so they often created groups of detectives to patrol the commons! This task might be assigned to the young men's association or to the village fire brigade (also composed of young men), which would in turn delegate the job to its members on the basis of annual rotation. The detectives would patrol the commons on horseback every day looking for intruders. In Hirano the detectives (called tantei) had to come from families that could spare a young man's labor and a

horse for an entire year, and the job was considered one of the most prestigious and responsible available to a young man. In Nagaike these positions (called wakashū there) changed hands more frequently but all eligible males had to take a turn, so that no family was without its full labor supply for very long but all would have to serve. It is extremely interesting to note that in Nagaike--the smallest, most egalitarian of the three villages, which also happened to depend completely on the commons for thatch and animal fodder because private holding in Nagaike simply did not produce these items, appears to have had virtually no violations of the commons by Nagaike residents. The detectives there had to deal only with intruders from villages on the other side of the mountain.

Most violations were handled quietly and simply by the detectives, who would set the penalty. It was considered perfectly appropriate for the detectives to demand cash and sake for violators and to use that as their own entertainment cache. Interestingly, Yamanaka had no system of detectives to patrol its commons, although it did observe the principle of "citizen's arrest"--anyone, not merely a designated detective, could report violations. Yamanaka had no closed reserve until 1939 and fewer rules to enforce on the open commons. It may also have been too poor to spare the labor of those who might serve as detectives. In any case, the commons to which Yamanaka had exclusive access rights (not the Kitafuji slope it shared with other villages) had been formally registered as property of a Shinto shrine during the Meiji land reform (this was one of the few available ruses by which a village could preserve common land), and the elders among the parishoners performed functions akin to patrolling the shrine commons for violators.

Violating the rules devised to protect the commons was one of the most terrible offenses that a villager could commit against his peers (and that was how it was viewed), and the penalties were very serious. Most villages had written codes to govern the commons and these stipulated specific punishments for specific violations, with a built-in scheme of escalating penalties for non-cooperation. Anyone found violating the rules of an open commons or illegally entering a closed commons was instantly deprived of his equipment, his horse, and whatever he

had cut. In order to retrieve his equipment and horse he would have to pay a fine--usually a bottle or two of sake--and apologize to the detectives who apprehended him. The contraband harvest was of course retained by the village. If the offense was relatively large, or if the apology was unsatisfactory, the head of the culprit's household or his kumi or temple priest would have to make the apology on his behalf and offer a larger fine in his stead. To prevent the stain of collective responsibility and humiliation from spreading to them, the culprit's family or kumi members would exert powerful pressure on him to make adequate amends. If the intruder was a resident of another village, the leaders of his village would have to travel to the village whose commons had been violated and apologize. Very rarely did a village have to go beyond these first three stages of punishment to obtain satisfaction.[32]

When necessary, though, the village could then threaten to employ its more powerful sanctions: ostracism in increasingly severe stages, followed by banishment. The Japanese term for ostracism, murahachibu, signifies that the village cuts off all contact with the offender except for assistance at funerals and fire-fighting. In fact, it was usually employed in gradual stages, starting with social contact and only escalating to economic relations if the offender did not express remorse and modify his behavior. Ostracism was a horrible punishment for the Japanese villager, not only because it cut him off from a highly group-oriented society and made daily life unpleasant, but because it actually deprived the villager of tangible services essential to daily living: village water supplies, irrigation for his rice paddies, and, of course, access to the commons. A villager of ordinary means would never jeopardize the survival of his household and his family's reputation for many generations when a humble apology had the power to extinguish the controversy, and when strict obedience to the rules could guarantee that such possibilities would not arise in the first place. Only families of great wealth and price could afford to risk ostracism--often gambling that their social status would win them allies and allow them to defeat the established village leadership in a political contest or to secede from the village and form a new one.

Compliance and Violations

It is very difficult to ascertain how well the rules were obeyed, how well the threatened penalties discouraged violations, and how honestly the rules were enforced, especially when the offender was a resident of the village so the controversy did not go to the local magistrate's office to become a matter of public record. This is an issue in which those who have studied primary documents on Tokugawa villages and the commons have not been very interested in the past, so it is virtually impossible to arrive at reliable generalizations about all Tokugawa villages on the basis of the written record. Moreover, this is a matter about which loyal villagers then and now would be understandably defensive and reticent, and one is forced to be skeptical when the available evidence suggests that all worked well. At the risk of exaggerating dysfunction in the enforcement system, then, I will take special note below of examples of violations of the commons in these three villages that have been so carefully studied.[33]

It would appear that villagers' reluctance to incur the disfavor of their peers was usually enough to keep violations of the commons at a manageable level--that is, offenses by outsiders were far more numerous than offenses by village residents, and all offenses taken together were usually minor in degree and did not threaten the ecological health of the commons. Moreover, the villagers--certainly village elders and kumi chiefs, and probably heads of all households--thoroughly understood the direct relationship between the rules and preservation of the commons. These people lived with the seasons and natural cycles and knew their commons very well. Every time I asked about the reason for a particular rule, my informants explained the rule in terms of environmental protection and fair treatment of all the villagers. There was always a sophisticated and sensible explanation, never "well, we've always done it that way." Even if the village elders were the prime repositories of accumulated scientific knowledge of this sort, this information circulated regularly through the village. Obedience to the rules was almost certainly based on an appreciation of the value of the rules, and not merely on compliance to avoid penalties.

In these three villages taken together, there

has been only one case in which violation against the commons led eventually to ostracism. The original violation was a minor one--entering an open commons to cut fresh grass on a day that the village officially declared a holiday--that would have had no impact on the health of the commons and could have been taken care of quickly with an apology. However, the person who committed the violation was very proud and argued, in effect, that the rules did not apply to him because he was a village elder and former village chief. This claim, of course, was a more serious threat to the rule of law in the village than the act itself. The man refused to apologize, he rejected his relatives' efforts at mediation, and the controversy and punishments escalated to the point where he had to travel to distant towns to do all of his trading and marketing. Finally the village deprived him even of assistance at funerals and fire-fighting services, in effect turning murahachibu into murajūbu. [34]

Nonetheless, certain violations were almost routine. For instance, in the weeks and days preceding mountain-opening days, impatient households would occasionally enter closed reserves prematurely. The detectives ordinarily collected one bottle of sake per minor violation, but during this "peak season" prior to opening day the young men collected more liquor than even they could drink, and usually had to give it away. Similarly, the detectives were young men with predictable weaknesses, and some households intentionally sent their attractive young daughters into the commons to collect grass in violation of the rules of the commons. The detectives might then be disposed to look the other way, or even to ignore repeated offenses in exchange for sexual favors. Except for this single instance, there is no evidence of detectives exploiting their position by co-opting bits of the commons and concealing their own violations, or by terrorizing suspected offenders against the commons in exchange for favors. In addition to the supposed importance of doing one's duty by the commons and the village's well-being, and of bringing credit to one's family and future by doing the job properly (which included showing no favoritism), the detectives patrolled in teams. The old system of collective responsibility applied to these teams as well as to the rest of society, and any detective who felt tempted to violate the rules had to answer to his colleagues and risk the

possibility that they would rather turn him in than be caught later as co-conspirators in an offense.

Violations of rules to protect the commons would also increase noticeably in response to certain special circumstances. First, there might be a real challenge to the wisdom of the village chief, in, say, setting mountain-opening day too late. In this instance, an entire faction of disgruntled villagers might violate the rules together in an act of civil disobedience, in protest against an error in the leadership rather than out of any disrespect for the rules to protect the commons. One former detective in Hirano, now a respected village elder, described how he had been patrolling a closed commons one day and came upon not one or two intruders but thirty, including some of the heads of leading households. It was not yet mountain-opening day but they had entered the commons en masse to cut a particular type of pole used to build trellises to support garden vegetables raised on private plots. If they could not cut the poles soon enough, their entire vegetable crop might be lost, and they believed that the village headman was incorrect in setting opening day later than the point at which the vegetable crops required. Outclassed in both numbers and status, the detectives were unable to resolve this episode quietly and had to go through channels "all the way to the top." By way of apology the thirty offenders were ordered to make a donation to the village school (rather than giving the huge quantity of sake that would otherwise be called for to the five detectives).

Second, sudden changes in the economy or the supply of certain products that increased dependence on the commons as a source of some particular item would increase violations. This seems to have been the case in Yamanaka, which experienced a fairly severe breakdown of the rules during the depression in the 1930s. Almost all the villagers knew that almost all the villagers were breaking the rules: sneaking around the commons at night, cutting trees that were larger than the allowed size, even using wood-cutting tools that were not permitted. This is precisely the behavior that could get a tragedy of the commons started, but that did not happen in Yamanaka. Instead of regarding the general breakdown of the rules as an opportunity to become full-time free-riders and cast caution to the winds, the violators themselves tried to exercise

self-discipline out of deference to the preservation of the commons, and stole from the commons only out of desperation. Inspectors or other witnesses who saw violations maintained silence out of sympathy for the violators' desperation and out of confidence that the problem was temporary and could not really hurt the commons. Yamanaka was also fortunate to have ready access to the Kitafuji slope, so when its own commons was endangered Yamanaka could switch to its more widely shared commons instead. Finally, I strongly suspect that the rules villages adopted for the commons were very conservative and left lots of margin for error, so that the violations that did occur did not often pose a serious threat to the commons.

There is considerable evidence that whenever existing rules did prove to be too lax, or whenever violations of existing rules became serious, villagers modified their management techniques in order to save the commons. For instance, when Yamanaka found in 1939 that the Kitafuji slope was no longer very productive, it converted its own commons--from which it had silently conspired to steal earlier that decade--into a closed reserve in order to make enforcement of the rules and identification of violators much easier. Similarly, when Hirano and Nagaike discovered that competitive cutting even on a closed reserve became a problem, they removed the incentives for individuals to race against each other on mountain-opening day by abolishing keep-all-you-cut, instituting equal distribution, and assigning the harvest to households by lottery, which automatically reduced the frantic pace of cutting and thus the total quantity cut in a season.

Lessons for Regulating Access to the Commons

We have explored the experience of these three villages in governing access to their commons in order to learn about regulations that work well. I must point out that in addition these three villages had other factors--their small size, their very strong community identity, and a sense of mutual interdependence that was reinforced by a formal structure of collective responsibility--that almost certainly enhanced their ability to make any regulatory scheme work. Nonetheless, there was enough variety among the villages, among the types of

commons they possessed, and in changes in the local economy over time for us to extract a few suggestions about regulations that work better than others, all else being equal. Naturally, it is early to generalize from just three villages, and hazardous to extrapolate from the commons in an agrarian society to public goods problems in industrial society, but I will still take the liberty of presenting tentative conclusions that will serve as hypotheses to be tested and refined in further studies.

First of all, the regulations must be designed to have an obvious and direct relationship to the goal of preserving the commons. Co-owners of the commons will not obey regulations that they regard as frivolous or arbitrary. They will obey regulations that are quite clearly based on maximum-sustainable-yield principles. They will consent to being deprived of certain products of the commons if they can be convinced that what they do not extract from the commons is truly needed for the long-term maintenance of the commons.

Second, the regulations must treat all co-owners fairly. Everyone must be subject to the rules, and the rules must be devised so as not to give certain people a raw deal. For this reason rotational schemes to move the good and the bad around, random assignment by lottery, and equal division of the proceeds among the co-owners may be necessary. Such methods also have the advantage of removing the competitive impulse (which is very dangerous when it becomes a race to see who can deplete the commons first) and thus relieving pressure on the commons. Yet laziness is not rewarded because someone who fails to do his share of the work loses entitlement to a share of the proceeds altogether.

Third, although Japanese villagers had a strong community identity and were very concerned about social reputation and bonds with the group, and although they were capable of internalizing as a vital goal the preservation of the commons, even this most cooperative, compliant group of people were vulnerable to occasional temptations to bend, evade, and violate the regulations governing the commons. Thus there must be a scheme of penalties, and these must be enforced. The rules and the penalties must be aimed directly at free-riding, and to make enforcement possible they must be designed to

distinguish handily between good and bad behavior. It is harder to enforce the rules governing open commons without individual inspection of each user's activities, and as a result as pressure on the commons increases it may be necessary to close off the commons so that any intruder can be instantly designated as a violator of the commons.

Finally, these villages had an escalating scale of penalties that began with confiscation of the contraband taken from the commons--instantly negating the advantage of violating the rules--and proceeded through gradual stages of exclusion from the commons and eventually from all contact and exchange with other co-owners of the commons. This scale of punishments may seem harsh but in fact it operated rather gently, most violators confessing and apologizing quickly rather than having to suffer more severe consequences. This graduated scheme of punishments to fit the offense may be very important in controlling repeat offenders: the desperate know that they may be forgiven this once, but the malicious know that they will have the book thrown at them.

In conclusion, it is also important to point out that the villagers themselves invented the regulations, enforced them, and meted out punishments, indicating that it is not necessary for regulation of the commons to be imposed coercively or from the outside. This, along with the fact that villagers could change their own rules through a process of consultation and consensus that was democratic in form if not always in fact, almost certainly increased the legitimacy of the regulations. Although the Tokugawa social order was very oppressive toward individuals it classified as "deviant," the village itself was largely self-regulating in this regard, and did not require intervention by an autocratic state to protect the commons. The implications for democratic processes and individual liberties in societies that face tragedies of the commons are mixed: the apparently important role of a system of collective responsibility that victimizes innocent members of groups that contain free-riders, and the ability of the village to impose ostracism to the point where life is threatened, are ominous. The importance of uniform and impartial applications of law, the restraint exercised before harsh penalties are

employed, and the room for democratic rule-making and rule-amending are more assuring.

NOTES

[1] Garrett Hardin, "The Tragedy of the Commons," reprinted in many anthologies but originally in Science (162:3859, 13 December 1968), 1243-1248; Mancur Olson, The Logic of Collective Action: Public Goods and the Theory of Groups (Cambridge: Harvard University Press, 1965).

[2] For a summary of the literature of free-rider problems, see John McMillan, "The Free-Rider Problem: A Survey," The Economic Record (55:149, June 1979), 95-107. Other major works, in addition to Hardin and Olson (see note 1), are Earl Brubaker, "Free Ride, Free Revelation, or Golden Rule?" Journal of Law and Economics (18:1, April 1975), 147-161; James M. Buchanan, "Congestion on the Common: A Case for Government Intervention," Il Politico: Rivista Italiana di Scienze Politiche (33:4, December 1968), 776-778; Buchanan, The Demand and Supply of Public Goods (Chicago: Rand-McNally, 1968); R. H. Coase, "The Lighthouse in Economics," Journal of Law and Economics (17:2, October 1974), 357-376; Harold Demsetz, "Toward a Theory of Property Rights," American Economic Review (54:3, May 1964), 347-359; Norman Frohlich, Thomas Hunt, Joe Oppenheimer, R. Harrison Wagner, "Individual Contributions for Collective Goods: Alternative Models," Journal of Conflict Resolution (19:2, June 1975), 310-329; Eirik G. Furubotn and Svetozar Pejovich, "Property Rights and Economic Theory: A Survey of Recent Literature," Journal of Economic Literature (10:4, December 1972), 1137-1162; Theodore Groves and John Ledyard, "Optimal Allocation of Public Goods: a Solution to the 'Free Rider' Problem," Econometrica (45:4, May 1977), 783-809; John W. Sweeney, Jr., "An Experimental Investigation of Free-Rider Problems," Social Science Research (2:3, September 1973), 277-292; Sweeney, "Altruism, the Free Rider Problem, and Group Size," Theory and Decision (4:3-4, February-April 1974), 259-275; E. J. Mishan, "The Post-War Literature on Externalities: An Interpretive Essay," Journal of Economic Literature (9:1, March 1971), 1-28; George J. Stigler, "Free Riders and Collective Action: An Appendix to Theories of Economic Regulation," Bell

[3] Daniel Fife, "Killing the Goose," originally printed in Environment (13:3, 1971), 20-27, and reprinted in Garret Hardin and John Baden, editors, Managing the Commons (San Francisco: W. H. Freeman, 1977), 76-81, explains how some entrepreneurs (Hardin's herdsmen) may actually profit from the deterioration of collective goods. Colin W. Clark, "The Economics of Overexploitation," originally printed in Science (181:4100, 17 August 1973), 630-634, and reprinted in Hardin and Baden, 82-95, demonstrates how certain circumstances make it rational for capital-intensive harvesting of renewable resources to proceed through deterioration even to the point of extinction of the renewable resource.

[4] Works that stipulate that small groups will necessarily do better at solving free-rider problems than large groups include Olson, The Logic of Collective Action; Buchanan, The Demand and Supply of Public Goods, and Russell Hardin, "Collective Action as an Agreeable N-Prisoner's Dilemma," Behavioral Science (16:1971), 472-481. Works that find group size to be quite unimportant include Norman Frohlich and Joe A. Oppenheimer, "I get by with a little help from my friends," World Politics (23:1, October 1970), 104-120; Frohlich, Hunt, Oppenheimer, and Wagner, "Individual Contributions for Collective Goods: Alternative Models;" Gerald Marwell and Ruth E. Ames, "Experiments on the Provision of Public Goods I: Resources, Interest, Group Size, and the Free-Rider Problem," American Journal of Sociology (84:6, May 1979), 1335-1360 (section II of this article appears in (85:1980)); and Vernon L. Smith, "Experiments with a Decentralized Mechanism for Public Good Decisions," American Economic Review (70:4, September 1980), 584-599. Finally, another series of works suggests that group size may be important, but too gross a measure for what is really going on or complicated in its effects. See Philip Bonacich, Gerald H. Shure, James P. Kahan, and Robert J. Meeker, "Cooperation and Group Size in the N-Person Prisoners' Dilemma," Journal of Conflict Resolution (20:4, December 1976), 687-706; John Chamberlin, "Provision of Collective Goods as a Function of Group Size," American Political Science Review (68:2, June 1974), 707-716; Martin C. McGuire,

"Group Size, Group Homogeneity, and the Aggregate Provision of a Pure Public Good under Cournot Behavior," Public Choice (18:Summer 1974), 107-126; Stigler, "Free Riders and Collective Action: An Appendix to Theories of Economic Regulation"; Sweeney, "An Experimental Investigation of the Free-Rider Problem"; Sweeney, "Altruism, the Free Rider Problem, and Group Size."

[5] Carlisle Ford Runge, "Common Property Externalities: Isolation, Assurance, and Resource Depletion in a Traditional Grazing Context," American Journal of Agricultural Economics (63:4, November 1981), 595-606.

[6] E. F. Schumacher, Small is Beautiful: Economics as if People Mattered (New York: Harper and Row, 1974).

[7] In fact, although the Chinese were looking for increased production rather than ecological health, it was their semi-conscious discovery of this mathematical logic of collective action that caused them to retreat from the huge collective farms that the Soviets persist in having, and to decentralize the accounting of labor contributed and work points earned to the smallest units within the cooperatives, to production teams and production brigades. See Alexander Eckstein, China's Economic Revolution (New York: Cambridge University Press, 1977), 80-84.

[8] Lest this sound like an obvious and unnecessary point, let me note that many environmental regulations simply cause free riders to switch from one form of pollution or abuse (now prohibited) to another (not prohibited); from polluting air and water to polluting land, or from polluting nearby air via short smokestacks to polluting distant air (and causing acid rain) via tall smokestacks. Some scientific knowledge of the commons is needed in order to identify the behaviors that constitute abuse and to determine the thresholds or cut-off points at which a spiral toward tragedy might begin.

[9] Runge, "Common Property Externalities"; Bonacich, Shure, Kahan, and Meeker, "Cooperation and Group Size in the N-Person Prisoners' Dilemma"; Frohlich and Oppenheimer, "I get by with a little help from my friends"; Marwell and Ames, "Experiments on the Provision of Public Goods"; and Smith,

"Experiments with a Decentralized Mechanism for Public Good Decision."

[10] The literature is enormous, but two important works are Frederick R. Anderson, Allen V. Kneese, Phillip D. Reed, Serge Taylor, and Russell B. Stevenson, Environmental Improvement Through Economic Incentives (Baltimore: Johns Hopkins University Press, 1977); and J. H. Dales, Pollution, Property, and Prices (Toronto: University of Toronto Press, 1968).

[11] For instance, Mancur Olson suggests that professional societies can maintain their membership by selling their journals only to dues-paying members. Olson, Logic of Collective Action, 137-141.

[12] This is the unhappy conclusion reached by James Buchanan in The Limits of Liberty: Between Anarchy and Leviathan (Chicago: University of Chicago Press, 1975).

[13] Resource economists have of course looked at fisheries, forests, and similar resources that often fall under collective management, but usually without drawing conclusions from these cases about how societies might apply these lessons to the production of intangible collective goods. Political scientists have expressed some interest in theoretical questions of public choice and the rationality of political actors, but have ignored the enormous empirical literature on collective goods. What is needed is for scholars deeply concerned about the broad social and political implications of collective goods problems to examine the empirical literature that already exists and to re-examine the historical record in search of similar cases that have never been explored with these general questions in mind.

[14] The great body of Japanese scholarship on common lands is devoted to this process of attrition and legal and social controversies it engendered. Fortunately, Japanese scholars tend to be meticulous about publishing early documents and gathering details as they go, and as a result the primary materials compiled by these scholars serve as a catalog of management practices and even of disputes over how to deal with abuse and abusers of the commons.

[15] The brief history of the nationalization and decentralization of landholding that follows is based on Peter Duus, Feudalism in Japan (New York: Knopf, 1969); Thomas c. Smith, "The Japanese Village in the Seventeenth Century," 263-282, and John Whitney Hall, "Foundations of the Modern Japanese Daimyo," 65-78, both in John Whitney Hall and Marius B. Jansen, editors, Studies in the Institutional History of Early Modern Japan (Princeton: Princeton University Press, 1968); and Miyagawa Mitsuru with Cornelius J. Kiley, "From Shoen to Chigyo: Proprietary Lordship and the Structure of Local Power," 89-106, and Nagahara Keiji with Kozo Yamamura, "Village Communities and Daimyo Power," 107-123, both in John Whitney Hall and Toyoda Takeshi, editors, Japan in the Muromachi Age (Berkeley and Los Angeles: University of California Press, 1977).

[16] Akira Kurosawa's well-known recent film, Kagemusha, is a reasonably accurate account of the rise and fall of Takeda Shingen and his son Katsuyori, very serious competitors during the final stages of this competition for political leadership during the 16th century. Shingen's double, the shadow warrior who is the centerpiece of the film, is fictional.

[17] Another Kurosawa film, The Seven Samurai, is a plausible depiction of the struggle of one such village to protect itself against ravaging bands of warriors and thieves during the 15th or 16th century.

[18] Nagahara, "Village Communities and Daimyo Power," 116-118.

[19] This structure is sometimes called "centralized feudalism," a bewildering and misleading label for a political system that was at once federalist, authoritarian, highly bureaucratic and perhaps even totalitarian in the extent to which the state controlled information and monitored individual lives. On the Tokugawa political order, see Duus, Feudalism in Japan; Hall and Jansen, Studies in the Institutional History of Early Modern Japan; Ishii Ryosuke, A History of Political Institutions in Japan (Tokyo: University of Tokyo Press, 1980); and Conrad Totman, Politics in the Tokugawa Bakufu 1600-1843 (Cambridge: Harvard University Press, 1967).

[20] Harumi Befu, "Village Autonomy and Articulation With the State," 301-314, in Hall and Jansen, Studies in the Institutional History of Early Modern Japan; Yanagida Kunio, compiler and editor, Japanese Manners and Customs in the Meiji Era (Tokyo: Obunsha, 1957).

[21] Ownership in the Western sense did not exist in Tokugawa Japan, and did not come into existence until after the Meiji Restoration, when all land was registered so that it could be taxed by the new government. At this point much of the land that had been held and used in common by villages all over Japan was registered as public (national or government-owned) land, and the system of commons was greatly reduced. Villages were able to protect their commons against expropriation by the land-hungry Meiji government only if they had ample documentation of use rights acknowledged by Tokugawa-period daimyo or revealed in legal decisions made when disputes over land use arose during the Tokugawa period.

[22] Masako Osako, "Forest Preservation in Tokugawa Japan" (unpublished draft: May 1981).

[23] Watanabe Yōzō and Nakao Hidetoshi, Nihon no shakai to hō [Law and Society in Japan], (Tokyo: Nihon hyorōnsha, November 1975), 45-58; and Kawashima Takeyoshi, "Iriai ken kenkyū no genjō to mondaiten [The Current State and Problems in Research on Common Access Rights]," Jūrisuto (682: 15 January 1970), 70-76 and (683: 1 February 1979), 120-127. On the attrition of commons lands since the Meiji period, see Furushima Toshio, Ushiomi Toshitaka, and Watanabe Yōzō, Rin'ya iriaiken no honshitsu to yōsō [The Appearance and Reality of Common Access Rights to Forests], (Tokyo: Tokyo University Press, March 1966); Hōjō Hiroshi, Rin'ya hōsei no tenkai to sonraku kyōdōtai [The Development of Forestry Law and Village Community], (Tokyo: Ochanomizu shōbō, February 1979); Kainō Michitaka, Iriai no kenkyū [A Study of Common Access], (Tokyo: Ichiryūsha, March 1958); Kainō Michitaka, Kotsunagi jiken: sandai no wataru iriaiken funsō [The Kotsunagi Incident: A Struggle over Common Access Rights that Spans Three Generations], (Tokyo: Iwanami shoten, 1964); Kawashima Takeyoshi, Ushiomi Toshitaka, and Watanabe Yōzō, Iriai ken no kaitai [The Dismemberment of Common Access Rights], (Tokyo: Iwanami shoten, two volumes,

September 1959 and January 1961); and Watanabe Yōzō, Iriai to hō [Common Access and the Law], (Tokyo: Tokyo University Press, March 1972).

[24] A crucial distinction between owning a share of the commons and owning any other form of property jointly with others is that traditional co-ownership rights to the commons are conferred only on households of long standing in the village, and they cannot be sold to anyone else. Each household possesses one share in the commons and no more, and households or persons not invited into the group of co-owners (iriai shūdan) are simply not entitled to a share. For a brief explanation of the current legal status of ownership of common access rights, see Watanabe and Nakao, Nihon no shakai to hō, 67-97.

[25] The most important general work in the history of the evolution of common access rights is Furushima Toshio, Kinsei iriai seido ron [On the Common Access System of the Early Modern Period], (Tokyo: Nihon hyorōn shin shuppan, September 1955). The major works on the history of the common lands in the particular area studied here--Kitafuji--are Hōjō Hiroshi and Fukushima Masao, Meiji 26 nen zenkoku sanrin gen'ya iriai kankō shiryō shū: Yamanashi ken [Collected documents from the Meiji 26 National Survey of Customary Common Access to Virgin Mountain Forests: Yamanashi Prefecture], (1964); Hōjō Hiroshi, Rin'ya iriai no shiteki kenkyū (jō) [Historical Research on common Access to Forests (volumel)], (Tokyo: Ochanomizu shobō, March 1977), 191-433; Hōjō Hiroshi, Mura to iriai no hyakunen shi: Yamanashi ken sonmin no iriai tōsōshi [A hundred years' history of a village and its common access: the history of the common access struggle of the villagers of Yamanashi Prefecture], (Tokyo: Ochanomizu shobō, August 1978); Hōjō Hiroshi, Kinsei no okeru iriai no shokeitai [The various forms of common access in the early modern period] (Tokyo: Ochanomizu shobō, January 1979); Kamimura Masana, Sonraku seikatsu no shūzoku, kanshū no shakai kōzō [The social structure of the folkways and customs of village life], (Tokyo: Ochanomizu shobō, March 1979); Oshima Mario, Kinsei ni okeru mura to ie no shakai kobō [The Social Structure of Village and Household in Early Modern Japan], (Tokyo: Ochanomizu shobō, November 1978); Watanabe Yōzō and Hōjō Hiroshi, Rinya iriai to sonraku kōzō: Kitafuji sanroku no jirei kenkyū [Common Access to Forests and Village Structure: A Case Study from the North Fuji

Slope], (Tokyo: Tokyo University Press, March 1975).

[26] These three communities were three independent villages or mura during the Tokugawa period, and I will continue to use the term "village" to refer to the classical Tokugawa-period village. Since 1868 the Japanese government has encouraged administrative amalgamation of villages. The three villages of Yamanaka, Hirano, and Nagaike have in fact been amalgamated once so that together they now compose one modern village, called Yamanaka-mura, but they have rejected further amalgamation with additional communities in the area.

[27] The Japanese government expropriated Mount Fuji's north slope in 1939 for use as a military base but guaranteed that it would continue to honor traditional access rights. Villagers recently fought a lawsuit claiming that the government frequently denied them access without cause and that military practice on the land has disrupted the ecosystem and damaged the trees so that certain plants are no longer available. The villagers won and now receive regular compensation from the government for damage to their commons. During the trial the Japanese Self Defense Forces continued to use the land for practice, and at that time the villagers entered the land in non-violent protest to prevent these military operations. Many who follow the news in Japan are familiar with these Kitafuji protests against the SDF, but do not realize that the cause of the protesters is not pacifism so much as it is the tradition of centuries-old rights of access to commons. Similar arguments underlay the famous farmers' protest against the construction of Narita Airport on an expropriated commons.

[28] The following descriptions draw principally on the work of Hōjō Hiroshi, Kamimura Masana, and the interviews that they arranged for me.

[29] Kumi are spatially based horizontal organizations within a village, considered to be contemporary survivals of the Tokugawa five-man groups. On kumi, see John Embree, Suye mura: A Japanese Village (Chicago: University of Chicago Press, 1939), 112-157; and Tadashi Fukutake, Japanese Rural Society (Ithaca: Cornell University Press, 1972), 96-104. The major work on kumi and other

horizontal organizations in the traditional village has been done by followers of Yanagita Kunio's school of folklore, particularly by Segawa Kiyoko and Sakurai Tokutaro.

[30] I am assured by students of forestry that brief brush fires of this sort that do not penetrate the soil to burn roots do not tax the ability of a natural system to restore itself.

[31] Gradually with the commercialization of agriculture it occasionally became possible for a household to buy its way out of these obligations by contributing equipment instead of labor, or cash for some needed collective purchase, or even to hire someone else to stand in; on the other hand, in some villages this was regarded as dereliction of duty and the unfair exploitation of economic advantage, so substitution of material contributions for labor was not allowed.

[32] If the offender belonged to another village, the village whose commons was violated would have to take its case to the local magistrate for adjudication, and indeed we find many such disputes in Tokugawa records. Villages might make reciprocal claims of violations against each other, and the documents presented and the decisions rendered formed part of the documentary record by which villagers were later able to establish their claims to commons in the Meiji period.

[33] I have drawn these examples from Kamimura Masana's research and from several interviews with former commons detectives who were remarkably forthcoming about matters that would not ordinarily be revealed to outsiders. I am very grateful to Professor Hōjō Hiroshi for giving me the introductions that allowed these candid discussions to take place.

[34] When his children went out to play, other children threw stones at them. When the grandfather of the household drowned in Lake Yamanaka, no one would come to help recover the body. At the funeral, rather than helping carry the coffin, the village fire brigade actually tried to block the path to the cemetery until prefectural police arrived. Then finally the man's house burned down--it is said that village officials actually started the fire

intentionally--and no one came to his assistance. When other villagers felt sympathy for the man's perfectly innocent family, village officials pointed out that having any contact with a family that was the target of ostracism would destroy the effectiveness of the sanction and make the contactor subject to ostracism too. The fear of spreading ostracism was so powerful that even though prefectural police arrested some of the onlookers at the fire for negligence (standing idly by was actually a violation of fire laws), no one offered to help extinguish the fire. This episode of ostracism lasted 5-6 years and it took four generations for the family to shake off the taint of having been ostracized. See Kamimura, Sonraku seikatsu no shūzoku, kanshū no shakai kōzū, 219-222.

COMMENT: THE JAPANESE EXPERIENCE WITH SCARCITY

Thomas R. Cox
San Diego State University

When I was asked to comment on this article, I was given its title but no subtitle. The wording led me to fear that we would be subjected to yet another panegyric contributing to the myth of Japan as a nation of nature-lovers who, over the centuries, have carefully protected and cared for the natural beauty and resources of their land to a degree unequalled by any other people. I am delighted that my fears proved unfounded. This paper is based on an understanding of the social and cultural complexities that undergird the approaches of the Japanese to their natural resources and on careful first hand observation. It deserves our attention.

Since we are dealing here with an East Asian subject, perhaps rather than use Garrett Hardin's "Tragedy of the Commons" as a springboard we should use an Oriental point of departure. An old Korean saying makes the same point as Hardin: "Old-Man-Everyone's Mountain is Old-Man-No-One's Mountain." Observing the eroded, denuded mountainsides of Korea, mountain lands held in common but stripped bare because they were no one's charge to protect and nurture, one immediately understands both the aphorism and Hardin's point. Yet just across the Tsushima Strait from Korea lies Japan, where common lands have been carefully cared for. That contrast alone would be enough to justify our attention to the Japanese scene.

Unfortunately, I fear, little in the Japanese experience with common lands can be transferred to the West to improve the management of public lands here. In the first place, the iriai lands of Japan that Professor McKean discusses are not common lands in the broad general sense in which that term is frequently used today, but common lands in the technical sense--something no longer found in most Western societies. Japan has other forms of public and quasi-public ownership of lands, most of which closely parallel similar forms of land ownership in the West. The record of management on these Japanese lands, as on our own, is mixed; here the Japanese offer no model for emulation, but simply confirmation

that policies and practices dealing with public lands are everywhere fraught with difficulties and plagued by conflicting interests.

The chairman of this session suggested that perhaps the patterns of land management traced by Professor McKean offer a grassroots, democratic alternative to the choices we seem to face in the West: dictation and coercion from the top or resource destruction through rampant self-aggrandizement by individual citizens from below. He has misread Professor McKean's evidence. What she has depicted is not grassroots democracy, but grassroots oppression. I am not sure that coercion from one's neighbors is really preferable to, or any less oppressive than, coercion by a distant and often inefficient bureaucracy. True, the system seems to work in Japan, where individualism is rigorously repressed from one's early childhood and where adherence to the norms of the group is regularly achieved through a variety of direct and indirect pressures. But any attempt to transfer approaches and practices from such a society to the West would be doomed from the beginning: they cannot function successfully here unless the social context is transferred too--and I know of no one who advocates that, nor anyone who would know how to bring it about even if the goal were deemed desirable.

Iriai lands have been much studied in Japan, but the questions that Professor McKean asks differ from those posed by Japanese scholars. On the one hand, much of the work in Japan has been tied to efforts to fit Japanese history into a Marxist framework. The loss of iriai lands has been seen as central in the rise of an exploitive capitalist order. On the other hand, iriai lands have also received much attention from agricultural economists and rural sociologists. These scholars have recognized that village Japan can only be understood by going beyond the rice fields and private holdings to consider the place of other kinds of holdings--and even outside employment--in the rural economic and social order. Neither the Marxist nor the non-Marxist groups have been much interested in common lands per se; their concerns have been with humanity (and human institutions). Professor McKean's study marks a fresh departure.

In assessing any work using the case-study approach, the question of how typical the particular cases selected are must be addressed. There are, as Professor McKean makes clear, many thousands of tracts of iriai land in Japan. Inevitably, there are among them many that differ sharply from those of the three villages studied by Professor McKean. Mitsuda Hisayoshi has studied villages of charcoal producers in Kyoto prefecture; John B. Cornell a similar village in Okayama prefecture. I have studied pottery producing villages in the mountains of Oita and Fukuoka prefectures. And Sawada Shujiro has found that, similar though Miyazaki and Kagoshima prefectures are in many ways, their differing historical backgrounds have molded village landholding patterns and attitudes that are sharply divergent one from the other. Each of these examples carries with it a different pattern of iriai use, and they could be multiplied many times over. No small sample could ever adequately convey such diversity. Still, I believe that Professor McKean's villages, taken as a whole, typify the vast majority of iriai tracts in basic ways. They demonstrate the web of group controls and coercion that everywhere regulates actions. As elsewhere in Japanese society, these controls are largely external to the individual, rather than internalized. Moreover, the tracts themselves are typical in that they are not central to the economy of their villages, but for the most part supplementary sources of income or materials. For nearly all Japanese villagers, rice and other crop land was long the basis of their economic existence; this land was in all but a few cases privately, not communally, owned. Under the circumstances, I see no reason to quibble with Professor McKean's choice of villages to study; in spite of their differences one from another, her three villages reflect these widespread patterns.

However, I am convinced that the protection of the common lands of these and other villages in Japan was made possible not merely by the sorts of social control that Professor McKean delineates, but by other factors too. In the first place, most were mountainous lands; of less value and more difficult of access, they were thus easier to protect than lowland tracts would have been. Second, developments during the Tokugawa period made these lands increasingly marginal. Cropland was more and more intensively used as technology advanced and the

population grew. The rise of cities, the spread of a money economy into the hinterlands, and the adoption of commercial fertilizer were a part of these changes. The last of these dramatically reduced pressure on the commons, for prior to the use of dried fish and other early forms of commercial fertilizer fields were generally rejuvenated by plowing under grass and other greens gathered from the iriai lands. Moreover, the intensification of rice agriculture left farmers with less time to use (or misuse) their villages' commons. Third, as has been demonstrated many times, Japanese tend to take a long view. One's responsibility is not only to present members of his or her group, but to past and future members as well. Under such circumstances, there is a very real pressure to pass on to the next generation such basic possessions as iriai lands in relatively good condition. Fourth, technical knowledge of agriculture, forestry, and other forms of land use was remarkably sophisticated by the late Tokugawa period. The equally remarkable level of adult male literacy by the end of the period assured the spread of knowledge. When Professor McKean asked villagers why some particular policy or practice was used and received a rational reply rather than a resort to tradition or folklore, she was receiving confirmation that the great spread of technical knowledge of landed resources continues in rural Japan today. Finally, in a group-oriented society such as Japan, group profit rather than individual profit is not only held up as a socially desirable goal, it is frequently the goal actually pursued. Although both Garrett Hardin and individualistic Koreans might find it hard to imagine, in such a context responsible collective management of common lands may well be possible even without some of the more heavy-handed forms of coercion that Professor McKean's villagers resorted to from time to time. Of course, Professor McKean knows all this; she simply emphasizes it less than I would.

In spite of the successes in managing iriai lands, however they were achieved, it must be noted that Japan's record in resource management is in most other regards far less admirable. Forest owners' cooperatives, introduced prior to World War II and expanded during the occupation, have had very limited success. Forest smallholdings are frequently ill-managed not only because of the failures of cooperatives, but also because individual owners tend

to look upon their forest lands as treasure boxes to be tapped at times of pressing need (for a dowry or college tuition, perhaps) rather than land to be carefully managed for maximum long-range benefit. National forests have been mismanaged too. Along with other forest lands, they were heavily overcut during the Meiji period in order to help speed industrialization and during World War II to meet increased demand for fuel and other products of the forest. As Professor McKean shows in connection with Yamanaka during the 1930s, immediate social needs overrode the goal of responsible long-range management. Other problems abound: pollution of streams and onshore waters is extensive and remains largely uncontrolled. Recent outbreaks of nematode-carrying longhorn beetles went unchecked, and countless pines were killed as a result. Even Japan's admirable system of national parks, which through rigid zoning has managed to create parks in long-lived-in areas, suffers from overuse, litter, and environmental degradation from inappropriate developments, commercial and other wise. Clearly, this is no wonderland of wise and gentle nature lovers.

In conclusion, let me repeat a point made by Joseph Petulla at this conference: there are great complexities within cultural traditions regarding nature. Japan is no exception. In large part because the particular mix of traditions that one finds in Japan differs in such basic ways from those mixes found in the West, I doubt the transferability to the West of the system of land management described by Professor McKean. Even if we could, I suspect we might not want to transfer the Japanese system: what is achieved in Japan in terms of social and environmental stability is achieved at a tremendous price. It is a society that discourages individualism in order to preserve group strength. Lafcadio Hearn delineated the cost of this approach in his classic Japan: An Attempt at Interpretation, first published in 1904. What he saw then is, in many ways, still true and underlies much of what Professor McKean describes in her paper--what I called grassroots oppression a few minutes ago. Japan's management of its common lands is remarkable; but unlike Sonys and Toyotas, this product is likely to find few buyers abroad.

THE HISTORICAL ORIGINS OF SOVIET ENVIRONMENTALISM

Douglas R. Weiner
Columbia University

On November 17, 1856 at a meeting of the Moscow Agricultural Society, Andrei Petrovich Bogdanov sounded the call to immediate action on the question of the acclimatization of exotic plants and animals to Russia. His speech touched on many of the concerns that made acclimatization so appealing to contemporary proponents of agricultural modernization. Placing acclimatization squarely in the tradition of continuous human efforts to wrest ever greater bounties from nature and affirming man's "moral sovereignty" over nature, Bogdanov approvingly quoted the French acclimatizer Lacepede: "Natural science must transform and improve the entire surface of the globe." [1]

The general realization that Russia, with its archaic servile system, was facing an agricultural crisis, made the need for agricultural modernization seem all the more urgent. Exhaustion of the soil and the unchecked growth of population, noted Bogdanov, were leading inexorably to a crisis in food production and supply; "to what, if not to science, may we turn for assistance in such difficult circumstances?" he asked. [2]

Given the unlikelihood of radical changes in the organization of production in the Russian countryside as it appeared in 1856, let alone their desirability (this despite the prospect of the juridical emancipation of the serfs), it is not surprising that the gentry-dominated agricultural societies expended great efforts in the search for a "technological fix" as represented by acclimatization.

Another motif, however, was intertwined with acclimatization to make the economic organization of the country more rational. That motif was conservation. Bogdanov cautioned his listeners that

there is no rich man who can live without any sort of fiscal controls and not go bankrupt. However rich nature is, she can still become exhausted if we continue

to deplete her without 'keeping any accounts.' Where is Steller's sea cow, now known only by its name? Where are the beavers, the herds of moose outside Moscow? Everything has vanished, routed by man without any thought for the future, with only the goal of extracting as much as possible from nature for momentary profit.[3]

Bogdanov's remedy was to bring threatened animals under domestication, acclimatizing them to new habitats or re-acclimatizing them to their old ones. This, he believed, would ensure their survival--survival not for their own sake, but for the sake of the economic value these resources represented to society.[4]

Inspired by French traditions in zoology, in particular the theories of environmental induction of adaptive evolutionary change championed by Lamarck and Geoffrey-St.-Hilaire (father and son), as well as by the idea that science's rightful place was in the service of society, the Russian acclimatization movement took hold at first among a small number of academic agronomists, practical agronomists, and zoologists grouped around the Moscow Agricultural Society. Later, with the establishment of the Imperial Russian Society for the Acclimatization of Animals and Plants, this movement acquired an institutional roof over its head. In its beginnings, the movement represented a synthesis: it strove to increase the economic wealth and productivity of the nation through acclimatization, the domestication of heretofore wild breeds, and the creation of new varieties (and species, too, it was hoped) through hybridization, on the one hand, while it sought to restrain the immense and anarchic squander of the nation's natural patrimony through rational resource use on the other. The two, it might be argued, represented a Russian "gospel of efficiency."

With time, however, the synthesis disintegrated into its two constituent parts: the striving to transform and conquer nature, and conservation. Ironically, as we shall see, these two postures, which were once linked in cooperative effort to modernize a wasteful serf economy, came to represent diametrically opposite conceptions of the man-nature relationship by the Soviet period.

Despite the thoughtful remarks by Bogdanov and others, we must move ahead to the first decade of the twentieth century before we are truly entitled to speak of a conservation movement in Russia. By then, the awesome decimation of the natural resources of the Russian Empire was indeed difficult to ignore. Indicative of this was the decline in the harvest of sable and marten from 1896 to 1913 from 100,000 and 80,000 skins to 35,000 and 30,000, respectively.[5] Driven to complete extinction as late as 1876 was the wild steppe horse, the tarpan. Many more species, including the beaver, sable, European bison (both the Caucasus and Central European races), saiga antelope, and a half dozen species of egrets and herons--to cite only a few of a lengthy list--found themselves on the brink.

Industrial expansion, railroad-building, and the chronic land-hunger of Russia's peasants, the outgrowth of the deepening crisis in the inefficient communal land-tenure system, wrought appalling damage to the forests, especially in the European part of the Empire. In the quarter century that preceded World War I there was a net loss of 26 million hectares (100,000 sq. mi.) of privately owned forests, to say nothing of forests on state lands or of the village communes.[6]

As a consequence, by the onset of the First World War there already existed in Russia a vocal conservation movement, the bulk of whose adherents and whose leading lights were university professors of biology. The movement addressed its appeals to public opinion and the government alike. In the winter of 1913-1914, Professor V. N. Taliev's conservation fair had criss-crossed the Ukraine. A host of nature protection societies had made their appearance both in the provinces and in the capitals. By far the most important of these was the Permanent Committee on Conservation which functioned under the aegis of the Russian Geographical Society. Under the auspices of this semi-official body, chaired jointly by the former Minister of Agriculture and Councillor of State A. S. Ermolov and the botanist and vice-president of the Academy of Sciences Ivan Parfen'evich Borodin, representatives of all of the major scientific societies as well as from the tsar's ministries sat down together to consider this new policy frontier.

One of its first major accomplishments was the establishment by the State Duma in 1916 of the first state game reserve, the Barguzinskii zapovednik on the shores of Lake Baikal, to save the severely depleted local population of sable. For the sable, the move came none too soon. Yet there was more to be done and it was obvious that the creaky tsarist bureaucracy was neither disposed nor equipped to it.[7]

In the pre-Revolutionary period, three quite dissimilar tendencies emerged within the house of conservation. The first, associated with the names D. K. Solov'ev, N. F. Kashchenko, and B. M. Zhitkov, and exemplified by the 1916 Duma decree that established the sable reserve, had a distinctly utilitarian ethos. A direct continuation of Bogdanov's approach (indeed, Zhitkov and Kashchenko were students of his), the concern of this tendency was the rescue, recovery, numerical maximization, and introduction of select species, such as beaver, moose, sable, ermine, etc., that had direct value to man as sources of fur, medicine, food or recreation. Proponents of this view divided life forms into two categories: useful and harmful. For the former, energies were directed toward creating "optimal" conditions for their numerical increase, including enactment of hunting legislation and the creation of game reserves. For the latter, a category including such animals as the wolf, the Siberian tiger, and the snow leopard, the only acceptable fate was extirpation. This combination of ecological ignorance and crass utilitarianism was to reappear in the guise of Stalinist as we shall later see.

The second tendency was one that viewed conservation as a cultural, patriotic, and, most of all, aesthetic and ethical endeavor. It was fueled by Russian nationalism and by neo-romantic winds wafting across Russia from Germany, to the west. It was marked by a fin de siecle pessimism, a fear of a sooty, unfamiliar and socially disruptive industrialism (be it capitalist or socialist), and a yearning for a return to an earlier, more pastoral existence. Ivan Parfen'evich Borodin, himself of old gentry stock, and who maintained close ties with the German conservation leader Hugo von Conwentz, epitomized this current when he wrote:

We have already appreciated the need to protect monuments of our antiquity; it is time now for us to become aware that the most valuable of these are those remnants of our nature in which our national might was forged--in which our distant ancestors lived and worked. To lose these vestiges would be a crime.[8]

Borodin sought to create vast national parks on the grand scale of the American ones, which would serve as temples to nature and to the nation.

One of the most compellingly eloquent champions of the aesthetic and moral approach to conservation was another well-born naturalist, Andrei Petrovich Semenov-Tian-Shanskii. Man, he pronounced, was a "geological parvenu" who was "disrupting the harmony of nature's picture,...that great tableau which serves as the inspiration of the arts: music, painting, sculpture, and architecture." [9] Andrei Petrovich sought to reflect especially on the "purely aesthetic side of conservation." Writing during the bloody Civil War that followed the Bolshevik revolution, he believed that the aesthetic focus was particularly appropriate in this "time of clamor of materialist strivings," having concluded that the "socialist idea...was, all the same, (another) striving grounded in base self-interest." [10]

In addition, Semenov-Tian-Shanskii also raised the question of man's "moral obligation toward nature," likening it to "the son's duty to his mother." "At the present moment," he urged, "as burdensome as it is for all of us, we should especially vigorously strive to realize...not only a broad right for human beings to live and develop in all of their spiritual variety, but also the right (upon which humanity now tramples) of all living things on Earth to their existence!" [11]

An entirely different third approach was being developed by Grigorii Aleksandrovich Kozhevnikov, professor of invertebrate zoology at Moscow University and director of its Zoological Museum. For him, the paramount purposes of nature protection were scientific and practical, yet not narrowly utilitarian. By contrast with those of the narrowly utilitarian and aesthetic viewpoints, Kozhevnikov placed the emphasis neither on the creation of game

reserves (zakazniki) such as the Barguzin reserve for sable, nor of national parks (natsional'nye parki) but on zapovedniki, inviolate and permanent reserves of virgin nature. As early as 1908 Kozhevnikov maintained that "only a scientific study of nature could provide a firm basis for our practical activities," and that such study could only be conducted in primordial, undespoiled nature.[12] Kozhevnikov singled out ecological research as the single most important work of the zapovedniki; this represented an original application of protected territories, which up-to-then had been used merely as sources for the replenishment of wildlife, for recreational purposes, or for landscape protection.

"We know," wrote Kozhevnikov, "that a lake has its own history and frequently we can predict how this history will end....that is...that the lake will be transformed into a marsh. The composition of fauna, of course, changes--part of the population dies out, part adapts. To follow the course of this process is something of fantastic interest....Has it ever been done anywhere?...No! And where may it be done? Only in absolutely inviolable zapovedniki ...over a period of time far surpassing the life of a single man." [13]

Besides acting as centers for the study of biocoenoses and their successional dynamics, including the study of seasonal events and changes in flora and fauna, adaptation, mutations, competition, and natural selection overall, the zapovedniki would serve as etalony, or standards of nature.

In its simplicity the etalon argument was remarkably appealing. It involved viewing primordial conditions as the normal conditions of nature. It presupposed that existing biocoenoses embodied a natural "harmony" or equilibrium and were, to a certain extent, closed, self-regulatory systems. Consequently, human-induced changes or disturbances of nature, although profitable to society up to a point, were looked upon by Kozhevnikov and his school as essentially pathological states which disrupted the natural equilibrium formed over centuries of the adaptation of life forms to each other and to their abiotic environment. To restore such disturbed areas to health, society would need a knowledge of the

normal as a reference point. An inviolate tract of virgin nature would serve as that reference point, or etalon. Through the study of natural conditions within the etalon, scientists could then determine the degree to which man had already altered those original conditions in areas that presumably had once shared the natural conditions of the etalon. They could then postulate how much further man could continue to alter those conditions without triggering cataclysmic biotic simplification. This could be done by studying the key links in the food chains, identifying the presumed "dominant species" and by understanding the other biotic interrelationships of the model biocoenosis, or etalon. Exploited areas could be afforested or restocked using the etalon as a model (reacclimatization). That the implications for rational economic planning seemed grand is evident.

The revolutionary events of 1917 spurred the hopes of Russia's conservationists. In Moscow, in August, a Society for Nature Conservation was established while in Petrograd from October 17 to 20 Russia's first Conference on Conservation was convened. A draft bill prepared by the Geographical Society's Committee on Conservation was presented, envisioning the creation of a central governmental agency for conservation with broad powers to confiscate essential lands for protection. Of equal interest was Russia's first systematically-conceived plan for a nationwide network of zapovedniki, presented by Veniamin Petrovich Semenov-Tian-Shanskii, Andrei's brother.[14]

For its part, the provisional government appeared far more eager to support conservation than did its tsarist predecessor. A representative of the Ministry of Agriculture announced at the conference that the Ministry was in "complete sympathy" with conservation and was ready to support enactment of the broad legislation proposed. In response, an entire group of medical and scientific societies in Khar'kov, together with the provincial zemstvo, promptly mobilized to provide the Ministry of Agriculture with a list of sites requiring urgent protection.[15]

Amid these hopeful developments, however, were some most disturbing ones also. Conservationists were distressed by the wanton destruction of parks,

gardens, forests, and estates by rebellious peasants. One of the most "nightmarish excesses" cited in Priroda, was the murder of Prince B. L. Viazemskii and the laying waste of his estate in Tambov province with its virgin steppe, lands which Viazemskii had intended to bequeath either to the government or to a scientific society as a zapovednik. [16] Even the world-famous Askania-Nova, with its acclimatization park and virgin steppe zapovednik, was threatened by the escalating demands of its surly workers and later by the military operations of the Reds, the Whites, and Makhno's anarchist forces. Indeed, as early as mid-1917 the situation there was so perilous that the Provisional Government dispatched first the botanist I. K. Pachoskii, and later the explorer and general P. K. Kozlov, to Askania as special commissar to ensure its protection. [17]

Nonetheless, the conservationists saw the revolutionary events as opening a new era where their cause would be given serious consideration by the new leaders of the country. This attitude held true even after the Bolshevik seizure of power. In the words of one prominent conservationist, "the revolution came in under a good sign." [18] The early actions of the new Bolshevik regime were indeed encouraging. In mid-January 1919, while Kolchak's armies were crossing the Urals and making what appeared to be the decisive lunge at the heart of Bolshevik-controlled Russia, an obscure agronomist representing the local government of the province of Astrakhan was granted a personal audience with Lenin and A. V. Lunacharskii, the Commissar of Education. Growing out of this encounter were not only the creation of the first Soviet zapovednik, in the Volga delta south of Astrakhan but also the formation of an official governmental agency for conservation in the Commissariat of Education's Museum Division and enactment of the first comprehensive legislation in Russia governing the establishment of protected territories--the decree "On the Preservation of Monuments of Nature, Gardens, and Parks"--of September 16, 1921. [19]

Although after the October Revolution representatives of the various tendencies within the conservation movement continued to cooperate closely with one another, particularly within such organizations as the All-Russian Society for the Conservation of Nature (f. 1924) and the kraeved or

local-lore movement, many conservationists sensed that the new Soviet regime would be more receptive to certain arguments for conservation than to others. One student of the period observed that "no previous government in history was so openly and energetically in favor of science" as that of the Soviet Union. The revolutionary leaders of the early Soviet regime saw the natural sciences as the answer to both the spiritual and the material problems of Russia. "Science was to them not only the refutation of Russia's age-old mysticism but the key to the great wealth of the Russian land." [20] Idealism was clearly out of style; materialism was the new religion.

Committed materialists such as Kozhevnikov, who had been active in advancing the cause of Darwinism in natural science education before the Revolution, emerged as spokesmen for the movement, while aesthetic voices, such as Borodin's and A. P. Semenov-Tian-Shanskii's, faded into silence.

For its part, the regime, while tolerating all of the conservation viewpoints during the NEP period of relative social pluralism, increasingly began to view conservation as a predominantly scientific enterprise and one which held out promising prospects for rational resource use and economic planning as well. Indications of this included the creation of the world's first reserve specifically devoted to both pure and applied science goals at Miass in the Urals in 1921 (Il'menskii zapovednik), the creation of a conservator department in the Leningrad bureau of GOSPLAN, and the transfer of the Education Commissariat's Department of Conservation from the Museum Division to the Main Administration for Scientific Institutions in 1922. In addition, and of chief interest to us here, all of the zapovedniki established under the aegis of the Commissariat of Education during the 1920s and early 1930s were specifically chartered to function as etalony for ecological research, making them unique among contemporary systems of protected territories around the world. [21]

The growing partnership between regime and movement resulted in many noteworthy achievements. By late 1927, 23 zapovedniki with a combined area of about one million hectares had been securely established. Six more, still on shaky ground as a

consequence of interagency infighting, promised to add two million hectares.[22] Twelve more were at one stage or another of governmental review, having been promoted by the State Committee on Conservation, an inter-ministerial body with consultative and investigative powers. Finally, there were hundreds of zakazniki or game preserves, which fulfilled the objectives of the more utilitarian side of conservation, and hundreds more pamiatniki prirody, or monuments of nature (taken from the German Naturdenkmal) which responded to aesthetic needs. Taken together, these territories had a combined area of over 7 million hectares in 1927.[23] A proud conservation movement could count its successes in the populations of beaver, saiga, moose, and egrets moving away from the brink of extinction. Budget increases for the zapovedniki were additional evidence of genuine support by Lunacharskii, the Education Commissar, and his colleagues for the cause of conservation. From 1924 to 1928 alone, the budget of the Astrakhan zapovednik was increased from 950 rubles to 27,200 Rbls., that of the Caucasus zapovednik from 2,120 Rbls. to 74,920 Rbls., and for the six GLAVNAUKA zapovedniki as a system from 18,767 Rbls. to 188,596 Rbls., a tenfold increase.[24]

Perhaps the most exciting development of this period was the attempt by Vladimir Vladimirovich Stanchinskii to bring to life Kozhevnikov's vision of zapovedniki as centers of long-term study into the nature of biocoenoses. Professor Stanchinskii had taught vertebrate zoology and ecology at the provincial university at Smolensk. In the late 1920s, however, lured by opportunity to organize and direct all research aimed at understanding the structure and function of the fescue-feather grass biocoenosis of the Askania-Nova steppe zapovednik, he collected his brightest students and they all headed off to the southern Ukrainian steppes.

Admittedly, only a very few zapovedniki were truly involved in this research direction with any degree of depth. This was more a result of the scarcity of gifted ecologists and of a lack of clarity about the nature of ecological communities than of a failure of intent on the part of the Education Commissariat or the State Committee on Conservation.

In particular, the state of the field was marked by an international dispute over the nature of the biocoenosis, pitting the Uppsala school against the Zurich-Montpelier, and the Moscow school against the Leningrad. American ecologists also entered the fray. The central questions awaiting resolution were (1) whether the biocoenosis had an objective reality or whether it was simply a convenient abstraction, (2) if the former, was it a supraorganismic entity that could be analogized to an organism, or even a human community (as Soviet "phytosociologists" foolishly tried to do, to their later regret), (3) did it "impose" a structure on its constituent natural raw materials, or was its structure a result of its individual history and evolution, (4) was it a "closed" or an "open" system, (5) did it have the capacity, once established, for self-regulation or even self-renewal, (6) was the system inextricably linked to its abiotic physical habitat or did it encompass only the biota, and (7) how could a methodology be developed to answer the preceding?

In the spirit of Elton, and in contrast to the Swedes and the Swiss, who were preoccupied with defining biocoenoses by the presence or absence of rosters of "dominant" or "constant" species, Stanchinskii took as his point of departure the trophic relationships between species: the food web. Stanchinskii sought to answer the riddle of Elton's pyramid; why were there so few of the large animals high in the food chain. He also sought to learn why, given the theoretical ability of all animals to increase geometrically, a constancy of the average numbers of individuals of any given species per unit area could be observed in biocoenoses. Stanchinskii's approach to these problems represented a real revolution in the paradigm of the biocoenosis. Stanchinskii began by reducing all trophic transactions between organisms to their common denominator: energy. Inspired by Vernadskii's work in biogeochemistry, Stanchinskii developed a series of generalizations about the role of energy transfer in biocoenoses and in the biosphere as a whole. The most important of them were: (1) that the amount of biomass in the biosphere is a function of the amount of energy captured and transformed by autotrophs (chiefly green plants), (2) that every biocoenosis and each species plays a specific energetics role in the overall "economy of nature," (3) that the amount of energy available to herbivores is always less than

that captured by vegetation, and that available to herbivores is always less than that captured by vegetation, and that available to primary carnivores is always less than that captured by herbivores, and so on (energy is lost on each trophic level to heat as a result of metabolism--an original application of the Second Law of Thermodynamics), and (4) that in addition to each trophic level being the function of the one preceding it, there existed definite ratios of energy transfer from level to level for every biocoenosis whose maintenance was a sine qua non for the stability of the system. Thus it was the constraint of ever-diminishing availability of energy as one moved up the trophic ladder that resulted in the smaller aggregate of biomass of carnivores relative to biomass aggregates for lower trophic levels.

Eleven years before the celebrated work of G. Evelyn Hutchinson and Raymond Lindeman, Stanchinskii worked out a mathematical expression for the annual energy balance of a hypothetical biocoenosis based on his idea of energy transfer, and, together with his students, set about quantifying his coefficients of energy transfer between trophic levels (which we refer to today as Lindeman, or ecological, efficiencies) through the study of the Askania steppe beginning in 1929.[25]

By 1929, however, especially after the Shakhty affair and a wave of arrests among the intelligentsia which followed, even the most exotic fields were beginning to feel the disquieting prod of politicization. By the time that the First All-Russian Congress for the Conservation of Nature convened in Moscow in September of that year, it was clear that any conservation position that seemed to contradict the economic requirements of the First Five Year Plan would be subject to charges of sabotage, or "wrecking." One enthusiastic member of the Young Naturalist Organization declared:

We must dissociate ourselves from that understanding of conservation in which the productive...activity of society is placed in opposition to the play of natural forces, and where conservation work reduces to shielding off this natural dynamic from the planned intervention of man. Such

'conservation' cannot find a place in the work plan of Soviet youth....The naked idea of preservationism is organically alien to Soviet youth....[26]

There were even more extreme partisans of development present at the Congress who could not understand why any parcel of land should be withdrawn from direct economic use. Leading this faction were the delegates of the Commissariat of Agriculture and the Commissariat of Foreign Trade (which controlled the fur trade), both of which sought to wrest control of the zapovednik system from the Commissariat of Education with the aim of converting these reserves into de facto zakazniki (game reserves), breeding stations, and farms for acclimatization, hybridization and domestication. Ominously, with the departure of Lunacharskii as Commissar of Education and the collapse of the Commissariat's authority after 1929, the Commissariat of Agriculture's first raid--on the zapovedniki of the Ukrainian SSR--was a total success. Askania-Nova, home to Stanchinskii's pioneering research, now found itself under the jurisdiction of the Agriculture Commissariat's Ukrainian branch of the Lenin All-Union Agricultural Academy.[27]

At the Congress, the debate on the future of the zapovedniki focused on the theoretical and practical problems of the etalon concept. Many delegates questioned the possibility of viewing the ecological communities of the zapovedniki as intact systems. "Where can we find inviolate nature," queried one delegate, "since it has all been so strongly altered by man?" Another wondered how the zapovedniki could be effectively cushioned from the ecological fall-out of surrounding regions as these were subjected to more intensive development: invasions of animals, seeking refuge in the zapovedniki, as their habitats in adjacent areas were destroyed, alterations in hydrology and microclimate, the "downstream effect" in which the zapovednik would receive the wastes of upstream polluters, etc. These problems were inextricably linked with the problem of setting the area of the zapovednik so that it encapsulated an entire, (presumably) self-regulating biocoenosis. Thus, what might appear to some to be an invasion of wolves or moose could in reality reflect the truncated fashion

in which boundaries were set for the reserve failing to include the seasonal territories of wide-ranging component species. Needless to say, this discussion was played out against a backdrop of complete confusion concerning the nature of ecological communities. The economic organs pointed to this confusion within the scientific community and to the almost complete absence of practical applications at that time drawn from ecological research as justification for their conversion into game farms under the auspices, of course, of the economic organs.[28]

While the 1929 Congress reaffirmed its support for the etalon concept as the basis for zapovednik work, this whole policy direction became more and more mired in contradictions. Owing to agricultural politics, the zapovedniki indeed were grossly truncated caricatures of self-regulating natural systems. This in turn diminished their value for ecological research, on the one hand, and failed to provide a suitable context for the protection of component species, on the other. This in turn led some conservationists unwillingly to abandon the position that the zapovedniki were inviolable; it was necessary to intervene, they reasoned, if only to save the rare and endangered species of these refuge islands. This in turn necessitated ecological guesswork, trying to figure out how to compensate for one or another natural factor that was "fenced out" of the reserve. Many reserves became valueless for ecological study.

By 1932, Young Turks in biology had mounted an all-out attack on zapovedniki as centers for the study of ecological systems, alleging that the adherents for the Kozhevnikov-Stanchinskii view desired

the preservation of nature in its unchanged form in which we now find it--the permanent existence of now-existing biocoenoses...

and rhetorically asking, "Why is the preservation of existing biocoenoses for all-time so important?"[29]

As we now know, this attack was a deliberate distortion. Kozhevnikov, Stanchinskii and their followers had always maintained a strong belief in the essential successional dynamism of biocoenoses.

Indeed, nothing could have been further from their intentions than freezing a particular biocoenosis for eternity at one stage of its maturity. The object of study, after all, was to elucidate the mechanisms of change in nature, not to thwart them.

Forging an alliance with the Commissariat of Agriculture in its offensive against the zapovedniki were such self-proclaimed experts in biological theory as Isai Israilovich Prezent, head of the biological cabinet in the Leningrad Branch of the Communist Academy. Prezent's attempt to make himself the ideological arbiter of whether particular theories in the biological sciences were in accordance with (his interpretation of) dialectical materialism ended in tragedy not only for the geneticist N. I. Vavilov, as is well known, but for Stanchinskii as well. In 1930, Prezent was the very first to denounce Stanchinskii's energy transfer studies as bourgeois formalism.[30] By 1932 he was calling upon Soviet zoologists to become "inventors" and "engineers", reconstructing not only the living organism but also transforming the biocoenoses all across the Soviet Union into productive units teeming with life forms having value for the human economy. This was to become enshrined the following year as "The General Plan for the Reconstruction of Fauna in the U.S.S.R.," an early model, so to speak, of "The Stalin Plan for the Great Transformation of Nature." [31]

Tragically, Stanchinskii and his research became the first casualties of Prezent's ambitious climb to the top in Soviet biology. By the summer of 1932, Prezent and Lysenko, with the aid of their allies in the Ukrainian branch of the Agricultural Academy of Sciences, came to Askania-Nova and in the space of two weeks shut down all of Stanchinskii's research. The zapovednik was converted into the All-Union Institute for Acclimatization and Hybridization, the virgin steppe opened to sheep grazing. Stanchinskii was soon removed as the head of the chair of vertebrate zoology at Khar'kov University, and on Lysenko's orders the already-set type for his first in-depth analysis of energetics in the steppe biocoenosis was destroyed at the compositor's. There are no records for his activities from 1933 to 1937; we only know that from 1937 until his death in 1942 fleeing the advancing Nazis he was mercifully allowed to direct scientific research at the Central Forest

zapovednik north of Smolensk.[32]

Stanchinskii was not the only ecologist to come under attack. His longtime friend Daniil Kashkarov was upbraided for promoting "human ecology." G. F. Gauze and S. A. Severtsov were criticized by Present, among others, for having, like Stanchinskii, attempted to apply mathematics and a primitive systems analysis in describing the self-regulation of animal populations in a biocoenosis. G. A. Kozhevnikov, a gentle aging man, was removed as director of Moscow University's Zoological Museum and banished to the Primate Acclimatization Institute in Soviet Georgia.[33] To paraphrase Sergei Ivanovich Medvedev, one of Stanchinskii's students, all this had the effect of setting back Soviet ecology by at least two decades.[34]

A second congress, the First All-Union Congress for the Conservation of Nature, convened on January 25, 1933. Here the battle continued for control over the system of reserves. S. V. Turshu, who represented the Commissariat of Foreign Trade (which had already successfully raided the so-called "sable" zapovedniki in the Urals and Siberia), demanded that the Commissariat of Education be stripped of all its conservation functions. With a touch of ridicule, he accused the reserves of being havens for irrelevant academics, "occupying themselves with whatever they please--only not with work!"[35]

In order to maintain the very existence of the reserve system in the face of the campaign by the economic organizations and by ideologues like Present, the conservation leadership unwillingly had to make a series of far-reaching concessions. Organizationally, this meant the transfer of the zapovednik system from the Commissariat of Education to the nominal Soviet parliament, VTsIK (All-Russian Central Executive Committee). Of greater consequence, however, was the need to go along with the tenets of the new Stalinist biology. Kozhevnikov's ideas were roundly denounced by the Congress (he died at the Congress one day before the resolutions were voted); its transactions record that it closed

having decisively condemned the principle of human non-intervention in the course of

natural processes within zapovedniki as a reactionary principle opposed to the dialectical view of nature, her laws, and the role of man in nature.[36]

What replaced the ecological perspective of Kozhevnikov and Stanchinskii (which saw the biocoenosis as a relatively closed, self-regulating system in a state of equilibrium that was altered but not destroyed as the system matured through successional series) was a set of formulations that were advanced under the slogan "The Reconstruction of the Fauna and Biocoenoses of the USSR."

Its theoretical underpinnings held that nature was riddled with empty holes, niches going unused or unfilled, and that the economically-useful biological productivity of a given biotope could be almost limitlessly augmented through the increasingly skillful manipulation of the biotic components: the elimination of predators and parasites, the acclimatization of exotics and other "biotechnical" means. At the 1933 Congress, a broad plan for the widespread acclimatization of dozens of exotic species was unveiled.[37] The muskrat had already been introduced from Canada in 1928 by the Commissariat of Foreign Trade, not without opposition from ecologists,[38] but now, ironically, the new Committee on Zapovedniki of VTsIK was charged with overall responsibility for the acclimatization program. The initial sites for introduction of exotics were to be the zapovedniki themselves.[39]

Several of the ecologists at the 1933 Congress, including Stanchinskii, Severtsov, and Kozhevnikov, protested and urged caution. Not everyone immediately accepted the theory of ecological empty holes. Stanchinskii noted the absence of a solid theory of biocoenoses, which could help us to predict what trophic and other ecological ties would be affected by the introduction of an exotic.[40]

Kozhevnikov observed that the acclimatizer might select individuals from an unsuitable population (sub-species unit) and cited the authority of Nikolai Ivanovich Vavilov and other soon-to-be-purged geneticists as to the inability of animals to adapt limitlessly to new conditions or to pass along these individual, conditioned adaptations to their progeny. Acclimatization was therefore a matter of genetic

luck, even if it could be made safe for the community that was to be host to the exotic.[41]

Ripping the theory of vacant niches, S. A. Severtsov stated his objections even more bluntly. "Acclimatization," he insisted, "ultimately boils down to the ... substitution of surrogate species." If we intend to substitute an exotic for an endemic, he warned, then we need to know a lot more about the ecological and economic implications of such a move.[42]

Over such protests, however, a new work plan was adopted for the zapovedniki beginning in 1934. New zapovedniki were created and old ones redirected to the narrow objective of abetting the increase of one or a few target species: the Okskii, Khoperskii, and Kliazma zapovedniki were created for the desman (vykhukhol'), Voronezh for the beaver, Seven Islands for the eider, etc. In the 1940 Decree on Zapovedniki, acclimatization became one of the chief tasks of the reserves, as did the extermination of wolves and certain other predators. Extensive tourism, which reached 40,000 annually, for example, in the Caucasus reserve in the late 1930s, also contributed to the despoliation of the system, as did wholesale utilitarian abuses as pasturing of livestock, mining, timbering, and illegal hunting, catalogued in an unpublished report by the deputy director of the Zapovednik Main Administration in 1940.[43] Yet it was the denunciation of the principle of inviolability of the reserves, the concessions made in the early 1930s, that had opened the door to these "practical uses" of the reserves. The lamentable yet logical denouement came a mere eleven years later, in 1951, with the liquidation of 85% of the protected territories of the U.S.S.R. and their distribution to state farms and lumbering concerns.[44]

The policies of the 1930s and 1940s wreaked havoc not only in the reserves but in surrounding regions as well, where many newly-introduced forms swarmed. The attempt to nullify the environmental resistance and other regulatory factors that prevented the uninhibited increase of favored species also led to ecological calamity. The suppression of natural selection pressures on game animals, especially ungulates, led to their inordinate increase. At the same time, because the feeble and

poorly adapted individuals were no longer culled from the population by the wolves (which were exterminated in great campaigns), the genetic load of the deer and moose populations also rose, leading to the birth of a great number of defective individuals. This set the stage for a collapse of the organizational structure of the ungulate populations and subsequent huge die-offs; the abnormally high densities led to massive epidemics which spread to the surrounding livestock that illegally pastured on zapovednik territory. Feral dogs moved in to occupy the niche vacated by the exterminated wolves over immense stretches of European Russia, posing grave health and security problems for humans. As with the Kaibab Plateau episode in the American Southwest, the ecological coddling of select, economically valuable species led to a situation where the simplified, degraded ecosystem could no longer support even as many of the animals as it originally had.[45]

After the war, in the climate of intense international tension, the secret police chief Lavrentii Beria began to accuse the zapovedniki along the Soviet Union's heavily wooded borders of sheltering spies and anti-Soviet partisans. Pressure on the zapovedniki increased still more after the creation of a commission in the late 1940s, headed by Beria and Nikita Khrushchev, which had been charged with finding ways of increasing land for agriculture and for logging.

Taking his cue from the times, the new director of the Main Administration for Zapovedniki, A. V. Malinovskii, a forester with reputed connections to Beria, himself proposed a plan in 1950 calling for the liquidation of two-thirds of the reserves (with 85% of their total area) and their distribution to sovkhozy and to the Ministry for the Lumber Industry. What was in it for him was the elevation of the truncated remainder from a republican-level organ to the status of an All-Union State Committee--a significant promotion.[46]

Despite appeals to Stalin by prominent public figures, including K. E. Voroshilov, the liquidation went through in 1951, and in 1952 Statute on Zapovedniki codified the status of the surviving reserves as experimental agricultural stations. Of 128 reserves with 12.5 million hectares (0.56% of the territory of the USSR), only 40 remained, with

1,465,000 ha. or 0.06% of the USSR's total area.

The suppression of community ecology, massive, unthought-out acclimatization, and the liquidation of the reserve system itself--such was the theoretical and practical legacy handed down to the scientists who in the mid-1950s, after Stalin's death, tried to resuscitate both conservation and ecology after a twenty-year nightmare.

Epilogue

Under its broadminded director V. N. Sukachev, the Academy of Sciences' Forestry Institute had sheltered ecological research from the depredations of Lysenko and Prezent, and had even tried to resurrect the energetics approach initiated by Stanchinskii. Now Sukachev and the Academy offered the Academy as a haven for those conservationists who were dismissed from the liquidated zapovedniki. A Commission on Conservation was created to lobby for the restoration of the reserves, and after years of slow progress the reserves now number 130 with an area of 10,000,000 ha., less than in 1950.[47] One feature of the Academy's campaign in the 1950s was to make reserves once again inviolable centers for the study of ecological processes as well as to serve as representative etalons. A 1958 Academy plan, based on the principle "From each biotic zone--a representative parcel of nature" provided a detailed list of such sites and was widely discussed.[48]

However, by the 1970s, the inadequacy of this approach became evident, ironically, despite its official re-adoption by the USSR's leading conservation agencies (the USSR Ministry of Agriculture's Main Administration on Conservation, Hunting and Reserves and the RSFSR Main Administration on Hunting and Reserves) and its adoption by the International Union for the Conservation of Nature, the International Biosphere Reserves Program and other agencies.

One problem is that the goal of preserving ecosystems in an inviolable state is in potential conflict with another hallowed conservation objective: the preservation of the world's species gene pool. Let us suppose that the territory of a rare animal or plant has been reduced to a very small area, and that this is declared a zapovednik, and

let us suppose again that the boundaries of this zapovednik are properly drawn so as to include a relatively self-regulating ecological community. If a regime of inviolability is maintained there, however, the natural successional dynamics will proceed unimpeded. There is now the chance that this natural process will result in the elimination of some species from the community as it matures. Let us suppose again that our rare species is one of the unlucky ones slated for natural extinction as the community matures into a new sere. We are then faced with the unenviable choice of "freezing" the successional phase to save the species (thereby interfering with the self-regulating activity of the system) or allowing the natural processes to run their course and sustaining a loss to the world's gene pool. Soviet ecologists are currently facing such a difficult dilemma in the tiny remaining parcels of virgin steppe.

Yet another problem has to do with the fact that it is more and more difficult to find representative, "primordial" ecosystems, as more and more of the landscape has become profoundly altered by man. These considerations, plus the realization that the overall degradation of the biosphere casts a serious pall over our ability to pursue economic and even physiological activities in the foreseeable future, has led to the development of new principles to govern the establishment of protected territories. These principles, originally set out by the biologists Feliks Robertovich Shtil'mark and Nikolai Fedorovich Reimers, include the following:[49]

1. The system of protected territories are not lands taken OUT of the national economy, as they had been defined up until now, but are a distinct branch of the economy, its stabilizing sector, enabling the rest of the economy to survive and grow.

2. Instead of siting zapovedniki so that each biogeographical region is represented by only one (or a few) reserves, they should be sited to provide enough nature in the proper areas to ensure no breakdown of the socio-ecological equilibrium, that is, that balance between economic activity and ecological complexity that allows a maximum

exploitable biological productivity to be SUSTAINED.

3. This "biological productivity" must be interpreted not only as the satisfaction of human economic needs and wants, but of aesthetic needs and wants. The culturally conditioned character of both makes them difficult to measure.

4. No ONE principle, be it zapovedniki as etalony, as acclimatization bases, as recreational areas, or as refuges for the preservation of rare species, should ever again be hegemonistically allowed to define the structure and function of the entire reserve system. Moreover, one territory should not have to do the work of two or three. A reserve for the study of ecological dynamics should not have to accommodate tourism, or serve the goal of preserving a rare life form, or satisfy any other potentially conflicting objective.

5. Instead, there should be a pluralism of functions for protected territories, with appropriate areas set aside for the fulfillment of each function. This will entail a re-thinking of the system of classifying protected territories.

This long overdue reordering of conservation strategy in the USSR will apparently have to wait out the Brezhnev era for its implementation. Perhaps his successors will see more in conservation than an opportunity to publish oversize and gaudy Red Books (to impress the West and to create an aura of up-to-dateness).

Conclusion

We have seen that at the time of the Revolution there existed a movement in Russia for the conservation of nature. Its adherents held varied beliefs about why the protection of nature was an important cause. Among these was that nature should be conserved for aesthetic reasons (as a source of beauty, leisure, patriotism, and as an indirect means of expressing fear of modern, industrial society),

for utilitarian reasons (to preserve the basic stock of fur-bearers, game animals, etc.), and finally, for scientific reasons. The most important scientific reason was a desire to preserve natural communities, or biocoenoses, in their uncorrupted state in order to study their structure, as well as to conduct biological observations generally. Inviolable biocoenoses would also serve as etalons or standards against which changes in once similar parcels of land, but now subject to economic activity, could be measured. Etalons were projected to serve as models for the future rehabilitation of their degraded, economically-exploited analogues.

In the Soviet period this materialist or scientific approach to conservation gradually became dominant, in large part owing to the prevailing political culture of NEP. A sympathetic government established zapovedniki that were unique in their functions as centers of biocoenotic research and as etalons. These conditions provided a favorable context for such pathbreaking work as that done by V. V. Stanchinskii in trophic dynamics.

By the years of the Great Break and the First Five Year Plan, however, this approach was subjected to searing attacks by a variety of critics. One group of critics was based in the Commissariats of Foreign Trade and especially Agriculture. These agencies sought to take over the network of zapovedniki from the Commissariat of Education and turn them toward their narrowly utilitarian ends. Another group of critics tried to demonstrate that the "ecological" point of view was out of step with a dialectical view of nature and with the whole voluntarist ethos of the era of the Five Year Plans generally. Although some persons opportunistically invoked Marxist philosophy intentionally to discredit conservation and community ecology for reasons of crass ambition, as did I. I. Prezent, there were others who honestly believed that there was a genuine clash of world views. There is considerable truth in that.

On the one hand, the ecologists tended to view nature as organized into discrete, self-regulatory communities (biocoenoses, or later, ecosystems), maintained in a state of equilibrium. Man, for them, was a disruptive, pathological agent who had somehow

stepped outside the matrix of nature's harmony. His continual threats to disrupt equilibria in nature had to be countered, not least of all for his own good.

Although Stalinist biologists, ironically, also saw man as standing outside of nature, they did not view nature, however, as composed of systems in delicate balance. Rather, nature was merely a collection of existing and potential raw materials to be used or rearranged as man saw fit. The jeremiads of the ecologists were variously interpreted as faint-hearted or malicious bourgeois efforts to obstruct the self-realization of man through his transformation of nature.

This clash of world views is only one of a constellation of reasons that explain the suppression of research in community ecology in the zapovedniki and its substitution by unsystematic, unscientific acclimatization schemes. For one thing, acclimatization was a continuous tradition in Russia with roots going back to the 1850s. Some of Russia's most eminent zoologists in the 1930s were students of A. P. Bogdanov, or were affected by his teachings, and their continued adherence to the environmentalist theories of heredity of Lamarck and of E. and I. Geoffroy-St.-Hilaire predisposed them to support the acclimatization of exotics with at least some enthusiasm. For another, acclimatization represented, as in the 1850s, a "technological fix" for Stalinist agriculture in the period following collectivization. If peasants had to be organized into collective farms for political reasons, the only means of raising agricultural productivity remained through technological improvements. Acclimatization thus advertised itself as a potential economic miracle and was readily seized upon by a regime eager for quick successes.

There were other political factors that cut the ground out from under the conservation-oriented ecologists. The fall of Lunacharskii from power in the Commissariat of Education and the Commissariat's simultaneous loss of power and authority in the government--for reasons other than conservation policies--certainly deprived the conservation movement of a powerful and committed protector. Lunacharskii's fall was indicative of other developments as well which boded poorly for the scientific approach to conservation. Lunacharskii

epitomized the attitude so prevalent before the Five Year Plans that a genuinely scientific world-view was not only compatible with Marxism but was a sine qua non for the later development of a socialist consciousness. (As David Joravsky points out, however, there was not always agreement as to whether science /or nature/ was inherently dialectical or indeed whether it needed to be). This view of science as undisputed (if at times, unwilling) ally of the propagation of the Marxian world-view was rejected by the early 1930s. It was replaced by a view which divided science into two camps: "bourgeois" and "socialist." Community ecology, in great part owing to the efforts of I. I. Present, somehow became relegated to the "bourgeois" category (much as was classical genetics a few short years later).

For their part, the ecologists and conservationists were unable to demonstrate significant practical benefits arising from their research in zapovedniki to a regime which was now officially deriding "science for science's sake." Only a few zapovedniki actually had begun research into community ecology; most were still mired in the tedious work of inventorying their fauna and flora. What recommendations there were from the conservation-oriented ecologists smacked of technocratic presumptiveness, especially when they involved opposition to such sacred cows of the Five Year Plans as planting monocultures over huge areas in state farms (sovkhozy) and constructing a network of hydroelectric dams on the Volga and other rivers.[50]

In the land of the Great Transformation of Nature, where children were taught in biology class that there were no limits to biological productivity in nature or to nature's successful manipulation by humans there was no place for a Kozhevnikov or a Stanchinskii. The triumph of the view of an endlessly malleable and plastic nature, as much a result of changes in Soviet political culture as had been the triumph of the scientific-ecological view before it, had repercussions that are still being felt in Soviet science and conservation today.

For conservationists, the need to struggle over long decades to uphold or restore the principle of the inviolability of the zapovedniki as etalony

had the effect of freezing the conceptual development concerning the classification, structure, and function of Soviet protected territories, and delayed the appearance of necessary theoretical modifications until the past few years. These modifications will take on more importance in the decades ahead, as the model of the ecosystem as a closed, self-regulating "island-system" in nature grows increasingly tarnished among professional ecologists, which should lead to the Soviet abandonment of the zapovednik as etalon in favor of other, more useful criteria.

ACKNOWLEDGMENTS

I would like to express my deep gratitude here to the IREX fellowship program, the Zoological Museum of Moscow State University, Professor Loren R. Graham, and colleagues both here and in Moscow whose assistance proved invaluable in researching this paper.

ENDNOTES

[1] Andrei Petrovich Bogdanov, "Ob akklimatizatsii." Zhurnal sel'skogo khoziaistva, 1856, no. 12. pp. 193-194, 196.

[2] Ibid. , p. 196.

[3] Ibid.

[4] Ibid.

[5] Vasilii Nikitich Makarov, Okhrana prirody v SSSR. Moscow, 1947. p. 31-32.

[6] Ibid. , p. 19.

[7] Despite the isolated support of such Tsarist officials as A. S. Ermolov and V. V. Dits, the

director of the Imperial Hunting Grounds under the last two tsars, the bureaucracy was unresponsive to the appeals of the Permanent Committee. Although supported by Grand Prince Sergei Mikhailovich, who had leased a large tract of land in the North Caucasus from the Kuban Cossacks as a hunting reserve, the Geographical Society's Committee was unable to effect a transfer of ownership of the land to the Prince or the state for the purposes of creating a zapovednik to protect the Caucasian race of European bison. A similar initiative to establish a zapovednik in the Volga delta was rebuffed as well.

[8] Ivan Parfen'evich Borodin, "Okhrana pamiatnikov prirody." Acta Horti Universitatis Imperialis Jurjevensis, 1910, vol. XI, vyp. 4. p. 310.

[9] Andrei Petrovich Semenov-Tian-Shanskii, "Svobodnaia priroda, kak velikii zhivoi musei, trebuet neotlozhnykh mer ograzhdeniia." Priroda, 1919, nos. 4-6, p. 201.

Additionally, a significant flow of neo-romantic German tracts, translated into Russian, found its way into Russian popular science journals. One such article by Zibel, "Love of Nature and the Development of this Feeling in School" appeared in Estestvoznanie i geografiia in an issue of 1900. The article's main thesis was that nature elicits our love because it is a perfect whole, possessing limitless power. Love of nature can aid good to triumph over evil in the soul of man and aids man in finding true joy through the rejection of the superficial temptations of life. By 1929-1932 these notions would become anathema.

[10] Semenov-Tian-Shanskii, op. cit. p. 213.

[11] Ibid. , p. 212.

[12] Grigorii Aleksandrovich Kozhevnikov, O neobkhodimosti ustroistva zapovednykh uchastkov dlia okhrany russkoi prirody. (Doklad Iubileinomu Akklimatizatsionnomu s"ezdu 1908g v Moskve). Moscow, 1909. These ideas are developed by Kozhevnikov in even greater detail in his "Znachenie Kosinskogo zapovednika." Trudy Kosinskoi biologicheskoi stantsii, 1925, vyp. 2. At Beloe ozero in the Kosino zapovednik near Moscow Kozhevnikov and L. L.

Rossolimo initiated one of the first long-term ecological studies of a senescent lake.

[13] G. A. Kozhevnikov, "Kak vesti nauchnuiu rabotu v zapovednikakh." Okhrana prirody, 1928, no. 2, p. 15.

[14] "Khronika: okhrana prirody." in Priroda, 1917, nos. 11-12, pp. 1161-63.

[15] Ibid., p. 1164.

[16] Ibid., p. 1164.

[17] Ibid., p. 1164.

[18] A. P. Semenov-Tian-Shanskii, "Doklad." Trudy Vserossiiskogo s"ezda liubitelei mirovedeniia. Pervyi. Petrograd, 1921, p. 195.

[19] This account is to be found in Nikolai Nikolaevich Pod'iapol'skii, "Vladimir Il'ich i okhrana prirody." Okhrana prirody, 1929, no.2, pp. 35-38. Iuryi Nikolaevich Kurazhkovskii, in Ocherki prirodopol'zovaniia. Moscow, 1969, p. 88, reports that Lenin was kept informed of conservation matters through Lunacharskii, who in turn had a "kitchen cabinet" at his disposal consisting of such scientists as A. E. Fersman, N. M. Kulagin, S. A. Buturlin, and N. M. Knipovich.

[20] Loren R. Graham, The Soviet Academy of Sciences and the Communist Party, 1927-1932. Princeton, 1967, p. 33. In resonance with such regime sentiments as these were such scientifically-motivated conservationists as Grigorii A. Kozhevnikov, who wrote

"Precisely now, when we are building an understanding of the world not on mystical, but on materialist bases, the presence of original primordial nature and the possibility of its scientific study...is an important condition for our cultural life."

and

"To develop a materialist view of nature doesn't mean to calculate how many cubic

meters of firewood can be gotten from a forest or how many dollars squirrel pelts will fetch this year, but means--to imbue the worldview of the whole people with the correct understanding of the life of nature...of the law of evolution. In pre-revolutionary times this was impossible....Now, for this, the philosophical groundwork has been laid."

(both passages from "Zadachi okhrany prirody v SSSR." Okhrana prirody, 1928, no.1, p. 6.)

[21] The charter officially establishing the Il'menskii mineralogical zapovednik, dated May 14, 1920, amply testifies that the reserve's creation was strictly a scientific venture. For the text of the charter, see: K. N. Blagosklonov and V. G. Geptner, "Leninskie printsipy okhrany prirody." Zoologicheskii zhurnal, 1970, vol. XLIX, vyp. 4. p. 486. For texts of decrees establishing zapovedniki as etalony, see the Biulleten' (Ezhenedel'nik) Nar Kom Prosa and especially the Dec. 8, 1925 issue no. 51 (101) containing the decree "Ob okhrane uchastkov prirody i ee otdel'nykh proizvedenii, imeiushchikh preimushchestvenno nauchnoe ili kul'turnoe-istoricheskoe znachenie."

[22] Sergei Alekseevich Severtsov, "Zapovedniki SSSR." Okhrana prirody, 1929, no. 2 (pp. 48-52), no. 3 (pp. 93-97) and no. 4 (pp. 104-107).

[23] Trudy Vserossiiskogo s"ezda po okhrane prirody, Pervyi. Moscow, 1930. p. 15.

[24] Nikolai Mikhailovich Kulagin, "Sovremennoe polozhenie voprosy ob okhrane prirody v RSFSR." Nauchnoe slovo, 1928, no. 2. p. 111.

[25] These ideas were developed in three articles: "O nekotorykh osnovnykh poniatiiakh zoologii v svete sovremennoi ekologii," and "Sukhoputnye soobshchestva zhivotnykh i metody ikh izucheniia," both in Trudy IV s"ezda zoologov, anatomov, i gistologov v Kieve 1930 g. Kiev-Khar'kov, 1931, and "O znachenii massy vidovogo veshchestva v dinamicheskom ravnesii biotsenozov," in Zhurnal ekologii i biotsenologii, 1931, vol. I, vyp. 1. Moscow-Leningrad. See also S. I. Medvedev, "Pamiati Vladimira Vladimirovicha

Stanchinskogo (k istorii biotsenologii v SSSR)." Biulleten' Moskovskogo obshchestva ispytatelei prirody. Otdel biologicheskii. 1977, vol. 82, no. 6, pp. 109-117.

[26] Trudy Vserossiiskogo s"ezda po okhrane prirody. op. cit. p. 151.

[27] Ibid. p. 56 and especially the speeches of V. V. Stanchinskii and F. F. Bega in Trudy Vsesoiuznogo s"ezda po ohrane prirody. Pervyi Moscow, 1935. 93-113.

Although Askania-Nova and the other Ukrainian zapovedniki had been placed under the overall jurisdiction of the Commissariat of Agriculture of the Ukrainian SSR from their very establishment in the early 1920s, the actual management of the reserves was entrusted to a Commission for Nature Protection of the Commissariat's Scientists' Committee for Agricultural Affairs. Both the Committee and its Commission included members representing the institutions belonging to the Commissariat of Education, so that other points of view might have input and so that ongoing research in the Ukrainian zapovedniki might be coordinated with research being conducted in other institutions under the jurisdiction of the Commissariat of Education (and through NKPros of the Ukraine SSR with research being conducted in zapovedniki of other Union republics). Over the protests of the Ukrainian Commissar of Education N. A. Skrypnik the Scientists' Committee and its Nature Protection Commission were disbanded by an edict of the Council of Peoples' Commissars of the Ukraine of March 23, 1930, and the path was cleared for its ultimate transformation into the All-Union Institute for Acclimatization and Hybridization. Stanchinskii's position was thus jeopardized more than two years before he was actually driven from Askania-Nova.

[28] Trudy Vserossiiskogo. . op. cit. p. 89; Trudy Vsesoiuznogo... op. cit., p. 39.

[29] V. V. Karpov, letter to the editors, Okhrana prirody, 1930, nos. 8-10, p. 215.

[30] S. I. Medvedev, op. cit. p. 111-112.

[31] Of Special note are I. I. Present's remarks at

the Academy of Sciences' Faunistic Conference of February 1932. See: "Vsesoiuznaia faunisti-cheskaia konferentsiia." Priroda, 1932, no. 5. pp. 454-458. See also: B. K. Fortunatov, "O general'nom plane rekonstruktsii fauny" in Trudy Vsesoiuznogo... op. cit., pp. 318-337.

[32] Medvedev, op. cit. pp. 110-112. See also Present's attack on Stanchinskii's work at Askania-Nova at the 1934 Symposium on the Nature of Biocoenoses of the Botanical Institute of the Academy of Sciences, in Sovetskaia botanika, 1934, no. 3. pp. 52-63 and especially pp. 59+.

[33] I. I. Present, "Zakon edinstva organizma i uslovii sushchestvovaniia." Vtoraiia ekologicheskaia konferentsiia po probleme: massovoe razmnozhenie zhyvotnykh i ikh prognozy Tezisy dokladov Chast' tret'iaia. Kiev, 1951. pp. 22-23. Kozhevnikov was removed as director of the Zoological Museum in 1930 and very little is known of his career in the brief interval between his departure from MGU and his death at the All-Union Conservation Congress in 1933, although he did attend the 1932 Faunistics Conference in Moscow and quite likely clashed with Present there.

[34] Medvedev, op. cit.

[35] Trudy Vsesoiuznogo...op. cit. p. 37-38.

[36] Ibid. p. 5.

[37] Ibid. pp. 318-337.

[38] See, for example: S. V. Kertselli, "K voprosu ob akklimatizatsii v SSSR ondatry." Pushnoe delo, 1925, nos. 6-7. pp. 9-11.

[39] See, for instance: "Rezoliutsii IV Plenuma Komiteta po zapovednikam." Nauchno-metodicheskie zapiski Glavnogo Upravleniia po zapovednikam, 1938, vyp. 1. Moscow. p. 69 (point 9).

[40] Trudy Vsesoiuznogo...op. cit. p. 346-347.

[41] Ibid. p. 347-348.

[42] Ibid. , p. 353.

[43] V. N. Makarov, "O neobkhodimosti soiuznogo zakonodatel'stva." 6 pp. typed carbon, undated (late 1940). Fond 200, Archives of Moscow State University.

[44] "Spravka Komissii goskontrolia V. N. Merkulovu o motivakh ostavlenii i sokashchenii riada zapovednikov, peredavadykh Glavnomu upravleniiu po zapovednikam pri Sovete Ministrov SSSR." 11 pp. typed carbon, (undated c. 1952). See also: A. V. Malinovskii, "Zapovedniki Sovetskogo Soiuza." Dostizheniia nauki i peredovogo opyta v sel'skom khoziaistve, 1953, no. 7.

[45] A brilliant treatment of this problem is found in Konstantin Pavlovich Filonov's doctoral study, "Dinamika chislennosti kopytnykh zhivotnykh i zapovednost'" in sbornik Obkhotovedenie Moscow, 1977. The problem of commercial logging and of selective cutting designed to "improve on nature" in the zapovedniki is ably treated by A. M. Krasnitskii in "Lesokhoziaistvennye tendentsii v zapovednikakh." Okhota i okhotnich'e khoziaistvo, 1974, no. 11 and in other essays.

[46] See note 44.

[47] Nikolai Fedorovich Reimers and Feliks Robertovich Shtil'mark, Osobo okhraniaemye prirodnye territorii Moscow, 1978. p. 40.

[48] E. M. Lavrenko et. al. "Perspektivnyi plan geograficheskoi seti zapovednikov v SSSR." (proekt) Biulleten': Okhrana prirody i zapovednoe delo v SSSR, 1958, vyp. 3. Moscow.

[49] Reimers and Shtil'mark, op. cit

[50] Of interest here are a series of articles in Okhrana prirody which appeared in 1930, written by N. N. Pod'iapol'skii, A. A. Teodorovich, and others opposing collectivization on the grounds that the monocultural expanses that would accompany collectivization were ecologically unsound. They especially feared that such a homogeneous landscape would promote the disappearance of natural pest-control mechanisms.

Also of interest are the attacks made by A. P. Semenov-Tian-Shanskii in 1932 and 1933 against those sacred cows of socialist construction, the enormous

hydroelectric projects on the Volga and other rivers. Given the times, Semenov-Tian-Shanskii's brashness is something to be marvelled at. See his remarks as reported in "Vsesoiuznaia faunisticheskaia konferentsiia." op. cit and Akademiia nauk. Noiabrskaiia sessiia 1933 g. Trudy. (Problemy Volgo-Kaspii). Leningrad, 1934. vol. 2. pp. 223-224.

NATURE'S REVENGE: THE SOVIET DEBATE OVER NATURE AND SOCIETY, 1960-1979

Kristian Gerner, University of Lund, Sweden
Lars J. Lundgren, Swedish Environmental Protection Board, Solna, Sweden

During the 1960s, concern for society's natural environment became an issue in the industrialized Western world. In the public debate that followed, it was sometimes stated, especially by those who were most critical of the environmental situation in the West, that there existed a correlation between environmental problems, the use of natural resources, and economic structure. One tried to explain the problems by pointing to certain basic phenomena in the social system. The conditions in the planned economies of the Soviet type were rarely referred to in this context.

Though it is not so well known in the West, a vivid debate on environmental pollution and the misuse of natural resources has been going on in the USSR over the last two decades. Knowledge of the arguments put forward and the different conclusions reached in this debate can help us to put our knowledge of the Western problems in a comparative perspective. To be able to judge the validity of some of the arguments aired in the Western discussion, it is necessary to have some notion of the problems in the economically and politically different Soviet system, i.e., in a planned economy which labels itself socialist.

The urgent economic, social and political problems facing the Soviet regime immediately after 1917 made concern for the natural environment a minor issue. In the 1930s the primary goal was rapid industrialization. The natural resources were viewed exclusively as a means to accomplish that goal. Then came the Second World War with its devastation. Following that war, the ruling Communist Party entered into a new one, this time against nature. The "great plan" of Stalin, though never fully executed, was an extreme expression of the belief that man is nature's master. Stalin's ruthless treatment of the Soviet people as a mere production

factor in the work to construct a future paradise on earth, was paralleled by a brutal treatment of nature, without any regard taken of the detrimental effects on the environment.

Under Khrushchev there was some change. Environmental problems became a topic of discussion among scientists--for example, at the Third congress of the All-Union Geographic Society in 1960. The Soviet authorities became aware of the need to diminish the negative consequences on the environment of intensified production and increased consumption of material goods. Legislation on environmental questions made something of a breakthrough in the early 1960s. The new program of the Communist Party in 1961 stated that care for and improvement of the environment was an important part of the construction of Communist society. This trend has continued after Khrushchev. In 1968 a law on land use was passed, in 1969 a new law on health protection, in 1970 a water law, in 1975 a law on the use of mineral resources and in 1977 a forest law.

This paper is based on the authors' book Environmental Problems of a Planned Economy: The Soviet Discussion over Nature and Society, 1960-1976 (1978), (English version forthcoming) with new sources being brought into the analysis. The views expressed in the paper are those of the authors themselves and in no way represent official Swedish standpoints (the University of Lund and the Environmental Protection Board are Swedish State agencies).

What we have done is to bring together arguments in the Soviet environmental debate from different contexts. On this basis we have constructed a "discussion" on the use of the natural resources and the pollution of the environment that really existed, without the actors being aware of participating in it, and this for a time-span of at least two decades. The "discussion" started as scattered reaction to certain disturbances in the relationship between nature and society, as perceived by different scientists. As the years went on, the environmental problems became an important political issue--not only in the USSR--and the often rather exoteric arguments put forward by scientists from different disciplines--seen in retrospect--turned into valuable pieces of information about views on natural resource

(mis-)use and pollution current in Soviet expert circles. We have not analyzed the policymaking process, only its results: legislation, resolutions, decrees. We have not aimed at comparing the environmental situation of the USSR with that of other countries. Such comparative investigation would have been more natural science and technologically oriented than our social science and ideological analysis. We have focused our analysis on sources that are not pure natural science material and not primarily political. The bulk of our material is from the writings of geographers, hydrologists and economists, and, to a somewhat lesser degree, of biologists, sociologists and physicists. The method is qualitative content analysis with the aim of discerning and reconstructing lines of argument uniting and separating more or less distinct groups, substantially as well as ideologically.

We have investigated only the debate on the natural environment and the use of natural resources. We have not paid very much attention to preservation discussion and almost none to problems concerning the social environment, i.e., work conditions, sanitary facilities, etc.

We have not tried to analyze the eventual outcome of the debate, the implementation of certain environmentally relevant proposals. Our aim has been to try to depict the frame of reference within which environmental and related problems are being conceived by Soviet scientists and research journalists. We have not tried to tie certain scientists or groups of scientists to different persons or groups among the power elite.

We must underline that texts published in the Soviet Union and more critical Soviet evaluations published illegally or in the West only, do not differ profoundly from each other as far as data and specific evaluations of the environmental situation are concerned. The difference lies in the more direct criticism of the Party line and the frequent quotations from unpublished research reports which are to be found in a work as that by Boris Komarov, (pseudonym), Destruction of Nature (1978).

As we are concerned with the scholarly debate, there is reason to say a few things briefly about the

sources we have used. During the 1960s and 1970s the debate on environmental questions has been rather vivid in Soviet journals and newspapers. We have systematically followed the discussion in what we consider to be central scientific journals of a general character, i.e., Voprosy Filosofy, Voprosy Ekonomiki, Vestnik Akademii Nauk, Vodnye Resursy, Izvestiya Akademii Nauk/geografiya, Izvestiya Vsesojuznogo Geograficheskogo Obshchestva, Vestnik Moskovskogo Universiteta/Geografiya/biologiya i Pochovedenie, Vestnik Leningradskogo Universiteta/Geografiya and Priroda, as well as the Party journal Kommunist, the weekly Literaturnaya Gazeta and a number of books and anthologies on natural resource use and environmental questions. We have also used the materials translated and printed in Soviet Geography, which showed itself to be a valuable source.

Valuable contributions to our knowledge of the Soviet environmental problems are M. I. Goldman, The Spoils of Progress. Environmental Pollution in the Soviet Union (1972); P. R. Pryde, Conservation in the Soviet Union (1972); I. F. Elliot, The Soviet Energy Balance: Natural Gas, Other Fossil Fuels, and Alternative Power Sources (1974); M. Slocum, "Soviet Energy: an Internal Assessment", Technology Review (1974); P. P. Micklin, "Dimensions of the Caspian Sea Problem", Soviet Geography (1972); J. Füllenbach, Umweltschutz zwischen Ost und West, Umweltpolitik in Osteuropa und gesamt-europäische Zusammenarbeit (1977); and the anthologies Environmental Deterioration in the Soviet Union and Eastern Europe, I. Volgyes, ed. (1966), all of which contain extensive lists of further references. A certain aspect, not especially analyzed in our work, is the question of whether it is possible to delineate distinct interest groups in the environmental policymaking in the USSR: this is treated by D. R. Kelley, "Environmental Policymaking in the USSR: The Role of Industrial and Environmental Interest Groups", Soviet Studies (1976). The convergence theory of pollution has been rejected by R. J. McIntyre, J. R. Thornton, "On the Environmental Efficiency of Economic Systems", Soviet Studies (1978), but their conclusion that the USSR has a much better record than the market economies in this field has been convincingly refuted by C. E. Ziegler, "Soviet Environmental Policy and Soviet Central Planning: A Reply", Soviet Studies (1980). A good

comparative general investigation of the situation in the United States, Japan, and the USSR is to be found in D. R. Kelley, K. R. Stunkel, and K. R. Wescott, The Economic Superpowers: the United States, the Soviet Union, and Japan (1976).

The book by Komarov, published in the West only, is more critical. It sounds the alarm about environmental deterioration in the USSR. It offers examples of mismanagement, misuse of resources and destruction and pollution of the natural environment in the USSR. It gives some new information, not to be found in the public debate, drawing on data that have not been made public and research reports not circulated and not readily available outside the Soviet Union. Its information on the forecasts "Nature 1980" and "Nature 1990" is unique in the literature, as far as we know.

Our analysis of the Soviet discussions on evaluation of natural resources and on the organizational problems of the Soviet economy show that in the late seventies reform-minded economists were still fighting an uphill struggle against orthodox Marxism-Leninism. On both these issues the Soviet economy has reached an impasse.[1]

Parallel to the growing recognition of the seriousness of pollution and environmental deterioration in the USSR, there have been running discussions regarding the philosophical, theoretical, ideological and political aspects of the relationship between society and nature. We have been able to distinguish between "revisionists", i.e., potential reformists willing to reconsider basic notions of Marxism-Leninism in the face of serious pollution and waste, and "dogmaticists", i.e., those who adhere to the sacred truths of Marxist-Leninist views. The "revisionists" basically fall in line with those who propose a profound reorganization of the economy, sharing with them the view of international cooperation as a necessary means to fight pollution and resource waste.

The philosophical "revisionists" have also brought to light the strange mix of harsh determinism and crude voluntarism typical of the so-called Stalinist view of the relationship between nature and society. This view was articulated in Lysenkoism. (The determinism-voluntarism combination consists, on

the one hand, of regarding nature under socialism as totally subordinated to society, the function of a basic law of history and, on the other, of believing that the manipulation of each and every thing is possible when the Communist Party is in charge of it, as the Party represents History.)

During the 1970s, however, the Party leadership began to appreciate to some extent the consequences of the scientists' criticism of the environmentally harmful effects of economic policy. It is probably at least partly an environmental concern which lies behind the new Constitution of 1977's emphasis on the individual's responsibility to see to it that nature is not destroyed and behind the directives in the tenth five-year plan (1976-1980) that the growth in European Russia was to take place through increased productivity--that is, not through the construction of further industries, but through new, more efficient technique and a system to exploit minerals so as to make a more complete exploitation possible--that is, not by "skimming the cream" off the deposits, as has been done to date; through better cleaning of the water in industry; and through a more rational use of forest resources.)

It is also worth noting that in the middle of the 1970s the Soviets abandoned the old slogan "catch up with and pass the United States," substituting for it propaganda for "the Soviet way of life". Emphasis was to be placed on other values in life than the material, that is, those that build on continuously increasing production. However, at the CPSU's 25th Congress in 1976 the chairman of the Council of Ministers, A. N. Kosygin said: "Our socialist way of living excludes inconsiderate and thoughtless destruction of material values, work and energy, all of which takes place under capitalism". And at the same congress the General Secretary of the CPSU, L. I. Brezhnev, said that the natural and social sciences must see to it that the use of nature was improved and that was established an effective population policy in the Soviet Union.[2]

Obviously the Soviet leaders cannot abandon their belief in material progress as the most important way to prove the legitimacy of their holding power. Nothing really indicates that the leaders in the Soviet Union consciously aim at zero growth. The present low rate of growth in the Soviet

economy means that they are falling below the planned goal, and it is considered a serious and difficult problem--as is evident, for example, in Brezhnev's speeches to the CPSU's CC in November, 1978, November, 1979, and October, 1980. But the use of the expression "the Soviet way of life" indicates that on the ideological level at least some have the intention of preparing the working masses for something else than an affluent society.

A radical approach to the pollution problem's economic dimension is said to have been advanced unofficially by the well known Soviet sociologist and futurologist I. Bestuzhev-Lada. He spoke in favor of zero growth in both industrial production and population, although he deferred the zero growth era to the future Communist society. Another well-known Soviet social scientist, A. Ananichev, reportedly declared during a lecture that the ecological situation would be very serious in the late eighties and early nineties: extraordinary measures would be necessary and many popular beliefs /about progress/ would have to be abandoned.[3]

In a decree of the Council of Ministers of the USSR (No. 898 of the 29th of December, 1972) concerning the protection of the environment and the improved use of natural resources, it was understood that one would make scientific prognoses on the state of the natural environment of the next 20 to 30 years. Such prognoses had actually been made by special commissions headed by authoritative scientists, such as the academicians Gerasimov and Fedorenko and the director of gidrometeosluzhba, the corresponding member of the Academy of Sciences, Izrael. But the data were accessible only to a closed circle of specialists who were not allowed to publish the information they acquired. The prognoses actually made about the natural environment for 1980 and 1990 ("Nature 1980", "Nature 1990") were dismal. The real situation was said to be worse still, as neither these prognoses nor other alarming reports, stored in the safes of Gosplan had any profound effect on the course of development of the national economy.[4]

In the Soviet scholarly debate there are to be found--as we have shown-- scattered data on the regional and local devastation of land and forests and on the pollution of the water and air. The

acknowledgement of such facts makea Soviet scientists content to stress that socialism has the potential to fight environmental pollution successfully. Some Soviet scholars underline that socialism does not automatically entail a rational use of natural resources, while others maintain that the inherent advantages of socialism simply have not been realized in the Soviet Union in this respect.

Thus the Soviet planned economy has not meant a particularly rational use of natural resources. Nor has particular regard been given to the environment. Planning has been oriented towards producing fixed amounts of goods. It has been drawn up around sectors and branches of industry and has not been guided by any overall ecological view. It was not until the 1970s that consideration for the environment began to be mentioned as an important factor in the five-year plans and that the scientific debate brought to the fore the question of regional planning in a perspective of environmental protection. In practice, the responsibility for the use of nature within a region is still divided among many different ministries and departments. Since natural resources like water, land and minerals have also been considered free utilities, enterprises have been able to waste them without regard to other societal interests.

2. One way of making the environmental problems of the USSR more concrete is to consider the country as consisting of three distinct parts, i.e., European Russia (with Transcaucasia), Siberia, and Central Asia. The picture that emerges from Soviet sources is as follow:

European Russia offers a number of serious problems. The region is the most densely populated and the most industrialized and economically developed. Today there is a shortage of labor, and low demographic reproduction. Of the three ways to solve the problem--i.e., increasing the productivity of labor, increasing the birth rate, or increasing immigration from Central Asia--all three are apparently being tried without any obvious success. The impact of pollution here remains high. European Russia is now facing a shortage of "traditional" energy resources, especially hydrocarbons. In spite of the warnings of some few scientists, the policy is to increase nuclear energy production dramatically.

In European Russia there is also a shortage of water supplies. Of the two ways suggested by scientists to solve the problem--i.e., to economize strictly on water, with the help of a reasonable assessment system, and to divert the northern Russian and Siberian rivers to the south, to the Volga and Ural basin--neither has been carried out so far.

Land is also a sparse resource in European Russia. Its rational use is hampered by the lack of cadastral evaluation and a rational assessment system. Farmland is being destroyed by water reservoirs, urbanization and mining. There is a very ambitious, though costly, project underway to improve the quality of the soil in the Russian non-black earth area. No radical solution to the organizational and motivational problems of agriculture has been suggested.

Forests are being overcut in European Russia. There is a shortage of raw material for the forest industry in the area. The lack of economic indexes or fees on misuse hampers the development of a rational forest policy.

Air pollution has apparently been fought successfully in the big cities, not the least because of a general switch to central distant heating of houses and the use of natural gas as fuel. However, the pollution and effect on the micro-climate in industrial zones from the burning of coal is probably far from negligible.

As regards conservation, the projects of new zapovedniki seem to be for the non-European areas.

Central Asia has a surplus of labor, due to comparatively high birth rates, the unwillingness of natives to emigrate, and the spontaneous influx of Europeans who value the often better, everyday conditions (climate, variety of food). The large hydrocarbon supplies of Siberia are rather close to Central Asia: the energy shortage thus is apparently not a great problem yet. There is a very acute shortage of fresh water and great problems with salinization and erosion of the soil. The forests have been overcut in some river valleys.

Siberia has a great surplus of everything --land, water, forests, hydrocarbons--except labor. The Russians and the Central Asians refuse to settle down here in sufficient numbers. Some Soviet scientists warn that a further exploitation of the natural resources here will lead to destruction of the taiga and the tundra and to serious air pollution from inversion phenomena. Nature is more susceptible to damage in the polar areas than in the temperate zones, and the damage can easily become very extensive and long lasting.

The wasteful handling of both raw and production material in the Soviet Union is an important part of the environmental problem--besides the fact that it is, of course, a difficult economic problem. On the whole, twice as much raw material and energy is used in the Soviet Union than in the West to produce a given amount of goods and services.

3. In the last chapter of the Swedish version of our book we wrote that one could hardly expect the relationship between nature and society in the Soviet Union to undergo a fundamental improvement as long as the ideological, political and economic structure is not considerably changed.

At the same time as this book's Swedish edition was being printed, a conference was held in Moscow, January 23-25, 1978, on the theme "Problems concerning the mutual cooperation between society and nature". The conference was arranged by, among others, the State Committee for Science and Technology, the Academy of Sciences, Moscow University and the education association "Znanie". According to Soviet information, this was "the first all-union scientific conference" on the subject. The well-known economist, Academician T. Khachaturov stated there that "the gravity of the ecological situation has increased markedly" during the last year. A certain professor, Yu. M. Manin from Minsk, pointed out that mature socialism--that is, the state the Soviet Union has entered--brought to the fore the elaboration of a new technology to handle environmental problem.[5]

The thought of a basically new technology could mean a break from ruling ideological, political and economic principles. In order to understand this problem, one has to make clear to oneself the

ideological and historical conditions for the failure of Soviet socialism to have brought into being a use of the natural resources markedly different from traditional capitalist use.

It is evident that Marxism-Leninism, as it was codified by Lenin, objected mainly to social exploitation, the conditions of capitalist production. It did not repudiate capitalism as a system for society's exploitation of natural resources. Marxism-Leninism as economic theory did not allow for natural conditions to influence or limit the historical development produced by changes in "the base", that is, the development of the productive forces and the change in the production conditions. It has been noted that the Soviet "dia-mat" authors said less about ecological conditions than Marx himself. They completely ignored the role of natural conditions in the building of socialist society.[6]

However, because of the role which the Soviet Union occupies as the first and most powerful socialist state in the world, the Soviet use of natural resources has come to be taken as a standard by the majority of Communist Marxists everywhere. Marxism-Leninism has become "traditional marxism" within this area. It is completely captured by the statement of the Norwegian environmentalist, Hartvig Saera: "Somewhat simplified, we can say that traditional marxism is a theory about human aut-ecology." [7] Natural resources are seen as inexhaustible. When a resource threatens to become impoverished, "development" will see to it that the society can make use of a satisfactory substitute. This point of view has not gone unchallenged in the Soviet Union in more recent times--as we have shown in our analysis--but it was taken as the guiding view from the beginning, and is still predominant in actual economic policy.

Several historians have pointed out that the 1917 Russian Revolution and the Bolsheviks' assumption of power did not bring a complete break with the past in every respect, neither immediately nor in the long term. This also applied to the economy.

Already at the turn of the century, Russia's Finance Minister, Witte, had been working according

to a general plan for the whole economy and aiming at balanced development. As the large industrial enterprises in Russia easily got into critical situations through difficulties with capital formation and a relatively small domestic market, they had got used to relying on state support.[8]

There was thus a domestic model for state planning of the economy for the Bolsheviks to fall back on. The French historian, Alain Besancon, maintains that they quite simply expanded Witte's system and strengthened the role of state power. On the other hand, they did not have much to draw from Marxism's classics, which carefully avoided providing any concrete directions on how to shape a socialist planned economy. As pointed out by the German economic historian, Heiko Haumann, the Bolsheviks were reduced to using the German Ballod's model "The Future State", Neurath and the German and Hungarian planning discussion, and, not the least, the experiences from the German war economy.[9]

Because of Lenin's role as a master of Marxism--Leninism, and because of the fact that he is referred to by Soviet economists in today's debate as an authority on economic planning questions, it is illustrative here to give some attention to Lenin's own conceptions. In an article in Pravda, February 22, 1921, Lenin praised the work of electrification, GOELRO, and pointed out that in Germany the "scientist Ballod" had produced a similar plan--that is, a scientific plan for the socialist reconstruction of the economy. But since Germany was capitalistic, the plan could not be realized, Lenin pointed out.

According to Lenin, the most concrete existing example of state capitalism was wartime Germany. Lenin said: "History has taken such a peculiar turn that it gave birth in 1918 to two non-connected halves of socialism, existing side by side like two future chickens in the same shell of international imperialism. In 1918 Germany and Russia had become the most striking incarnations of the material realization of the economic, production and socio-economic conditions for socialism, on the one side, and of political conditions, on the other". Lenin maintained that it was an important task to study German state capitalism and that no effort should be spared in the attempt to copy it. He

recalled that already in September, 1917, he had pointed to state monopoly capitalism as a complete material preparation for socialism, the threshold to socialism. In his statements in 1921 Lenin not only maintained that capitalist organization was worthy of imitation, but emphasized the need to use capitalist technology as well. He would be glad to exchange dozens of Communists for one conscientious and qualified bourgeois specialist. Socialism was unthinkable without large-scale capitalistic management, based upon the latest discoveries of modern science. Lenin did not see any alternative to capitalist technology.

The American scholar F. J. Fleron, Jr. expressly maintains that Bolshevism represents an unbroken continuity with capitalist technical rationality and that it recreates parts of capitalist technical infrastructure. An indirect proof that Fleron is correct is that several Soviet researchers have lately hinted at the need for a new technology to solve the problems of today; quite recently, as we have seen, the same demands have been presented in an environmental protection context.[10]

It is also important to note that neither in Lenin's statements nor in the actual economic policy during the Bolsheviks' first year in power--including the beginning and ending of war communism--can one find any signs of any consideration given to another relationship to natural resources than the one established by capitalism or another technology than the one capitalism developed.

It seems as if Soviet economic policy, as a development strategy, has been characterized by what one could call a "frontier spirit", conditioned by geographic, administrative and ideological circumstances. It has been of an extensive rather than intensive character. There has been, and there is still, a tendency to emphasize short-term advantages and neglect the long-term disadvantages of various projects. Impact analysis and environmental-economic analysis have evidently often been superficial. This has been due partly to evident technological optimism, partly to the "branch effect"--that is for example, that the Mining Ministry can allow its enterprises to destroy millions of hectares of arable land and push the costs, the losses, over to the Ministry of

Agriculture.

It is generally known that central planning can be efficient for concentrating major resources in large projects where known techniques can be used. But when it is a question of experimentation, adaptation and creation of new techniques, the hierarchical structure in the socialist planned economy has always turned out to be an obstacle to rapid progress.[11]

A very serious problem is the low innovation level in the Soviet economy in comparison with that in the West. This is due to the centralized organizational structure, the enterprises' short time-horizons, and the difficulties of taking "risks", that is, to market by themselves new, better products without being sanctioned by bonuses omitted for insufficient plan fulfillment, or without gaining too low a profit in the short run. The American economist J. S. Berliner, who shows how resource waste and economic inefficiency go hand in hand in the Soviet Union with slow technological development, notes that technology borrowed from the West cannot replace the need for structural changes in the economy, changes that would encourage innovations and give greater independence to the enterprises, thereby making the Soviet economy less wasteful.[12] The question is whether one can take over a technique without, at the same time, suffering its consequences, positive and negative.

The official justification for the proposed river diversions is that agriculture and, to a certain extent, industry in Central Asia and some areas of the southern Urals require an increased supply of water. Food production could thereby increase. If, instead, the yield could be increased in those parts of the country where the water supply is sufficient, then the Soviet Union could cover its food needs without diverting any Siberian rivers. But an increased yield could probably be dependent on political and administrative reforms to improve the effectiveness of the collective holdings. One might say that the river diversions are the price the Soviet Union may have to pay to maintain its inefficient farming.[13]

A rational, environmentally conserving development of the Soviet economy is thus made

difficult by the fact that development to date has reinforced the uneven geographic distribution of several basic resources: the overwhelming majority of the population and the industrial plants, the dwellings and the transport routes, lie in the European USSR and the Urals, where there is now a lack of energy supplies, clean water and forest raw material. The new, large deposits of oil and gas are in Siberia, as are most of the necessary water resources and forest supplies. One of the largest interventions in nature planned in the world, the Soviet river diversion projects, are to be seen against this background. It may become a necessity, in as much as the Communist Party's centrally managed economy has not been planned from a long-term or overall environmental perspective. Therefore, the scientists' often serious criticism of the earlier use of nature and of present practice is, in a way, a questioning of the wisdom of the Soviet people's "collective reason", the Communist Party.

The debate on the use of nature in the Soviet Union which we have reconstructed shows that one has not been able to avoid conflicts between different interests in this planned economy: region stands against region, industrial branch against industrial branch, social sector against social sector. This is evident in the use of natural resources as land, water, forests and fuel, as well as in the location of polluting industry. For instance, 18 Soviet Estonian scientists, in a letter to colleagues in the West--not published in the Soviet Union--criticized the phosphorite and oil shale exploitation in northern Estonia as a ruthless exploitation of Estonia's resources directed from Moscow.[14]

It is clear from the public debate that industrial forces are working against extensive environmental measures. They act like an interest group. One can ask oneself if Soviet enterprise, trust, and ministry leadership, as an interest group, is more powerful than corresponding groups in the West. In a way it would be reasonable to presume that the political leadership could more easily manage these groups in a socio-political system in which almost everyone is employed by the state than in one in which these are leaders of mainly private enterprises. However, the question is whether this is self-evident. Can it be that if an interest group is allowed to function within the state apparatus, it

will become a power within this apparatus and thereby more difficult to control than when it is outside the state apparatus as a counterweight? It is also evident that there are disagreements between different expert groups both on how different goals--traditional economic growth or concern for the environment--are to be balanced, and on the means which are best suited to allow a balancing of economic and environmental interests.

It is evident that the classic economic view--one that is now particularly maintained by Marxists--that only human labor creates value, has contributed much to the fact that in the Soviet Union one has been able, without hesitation, to destroy arable land to such a large extent, to overcut forests, and to waste scarce water resources. However, one should add the influence from the Russian habit, sanctioned by long usage, of sometimes suddenly investing in large projects without regard to the costs of human suffering or to the damage to the natural environment.

The Soviet Union has evidently entered a period of rather low growth. For the 1980s this will likely mean that the environmental area will be given lower priority. But it may also lead to the abandonment of some gigantic projects, although not for their questionable environmental features, but for pure economic reasons.[15] The point of departure for criticism has always been the desire for an effective long-term use of natural resources. This is something else than merely traditional nature preservation.

Our investigations support the presumption that it has been the researchers, primarily geographers, and not the politicians in the Communist Party, who have been leading the re-orientation towards a more resource preserving way of thinking, which, despite all else, must be said to have taken place in the Soviet Union during the last twenty years. The scholars evidently have a more distinct picture of the threats from pollution than the leaders.

The American scholars Kelley, Stunkel and Wescott have concluded that in the Soviet Union scientists more than others have raised the question of environmental protection, though "frequently waging an uphill battle against hostile government

bureaucrats and industrial managers, sceptical fellow scientists, and an apathetic public". According to Kelley, et al., medical and biological sciences have played the largest role, while the social scientists have contributed "very little" to public discussion.

While agreeing in general with the findings of Kelley, and others, we must stress, however, the active part played by geographers, i.e., scientists who can be said to belong partly to the sphere of natural, partly to the sphere of social science. Another American researcher, J. Kramer, has found that the most frequent participants in the conservation and pollution debate have been scientists and academics, followed at a considerable distance by Soviet deputies, members of conservation or pollution abatement agencies, and economists (but not factory managers).[16]

It has not been possible for us to register the attitude of the general public. However, it is probable that with living standards characterized by a shortage of good housing and diverse food and consumer goods, it has considerably less understanding for demands for the consideration of the natural environment than it has for promises of rapid economic growth. The public debate in the often "environmentally concerned" weekly magazine Literaturnaya Gazeta --a source which we have used greatly--reflects the opinions of the well-educated intelligentsia and not that of the industria or agricultural worker. According to a late 1960s Soviet survey of the readers of Literaturnaya Gazeta, ecological subjects interested those with a low education considerably less than those with a higher education.[17]

This also reflects, of course, a problem of information. B. Komarov, a Soviet dissident, has observed that the lack of public information concerning large projects inhibits the possibility of public control and of checks on bureaucratic one-sidedness. "Which CC, which Academy of Sciences can maintain that it is in possession of complete knowledge about all the problems that concern the fate of the Earth?", Komarov rhetorically asked.[18]

In the Soviet Union it is maintained that no

antagonistic contradiction exists among the three classes--workers, farmers and intellectuals. Apart from the fact that this is a very gross division, it is probably not too bold to state that a part of the intelligentsia--among them researchers who have been the object of our investigation--have come to embody long-term social interests (the political dissidents are recruited from the same class, by the way). The Party leadership and the majority of the people are evidently more given to the short-term. Furthermore, our analysis shows that there is a serious opposition in Soviet society, precisely between short-term economic and long-term ecological and economic interests.

We think it is worth pointing to one important result of our investigation: namely, in the Soviet Union there has been an often broad and at times lively and heated debate on the use of natural resources and environmental protection. In certain cases it is characterized by a great openness about the problems' causes and about the solutions which might be possible and reasonable to effect. Possibly this is due to the fact that environmental problems were a "safe" subject for discussion for some years into the 1970s, as it took time before the highest political organs interested themselves in the question and marked out a clear position.

In the Soviet Union governmental activity in environmental areas was long unsystematic and segmentary, probably due, in part, to an ignorance about and indifference to the problems. A centralized planned economy does not necessarily mean good administrative coordination or a rational use of natural resources. The bureaucratic system obviously has communications and coordination difficulties. Cooperation between the ministries has not always functioned satisfactorily. Not surprisingly, the different ministries have seen to their own interests first. A society with an extensive division of labor and specialization develops many inter-relations. This, in turn, means that it is difficult to direct centrally.

That is not to say that the Soviet authorities have been incapable of setting to work large environmental protection projects. Since the state owns all the means of production, it must sooner or later also bear all the social costs of production.

For a long time the authorities paid little attention to environmental costs. Few attempts have been made to date to put these costs on to the enterprises.

The price formation system in the Soviet Union has succeeded no better than in capitalist market economies in including the social costs of production and consumption. Thus prices have formed a poor basis for optimality calculations. To the extent to which pricing in the Soviet Union has been used to attain political goals, it has not occurred for environmental conservation reasons.

In the United States, Sweden and the Soviet Union there has been rejection until now of fees, "price on the environment", as a means to improve the environment. But in all three countries there are advocates for such methods. Several Soviet scientists maintain that various forms of fees are more effective than merely administrative measures.[19] However, so far various direct measures dominate. The question is if these are an effective solution to environmental problems.

The directives which the state leadership give to the enterprises are often contradictory. The environmental conservation directives are, as a rule, in the nature of "general admonitions" from the central level. They are not able to counteract such things as pollution, the devastation of forest land, etc., which are the consequences of the economic rationality at the enterprise level. When the enterprise leaderships give priority to production goals over environmental conservation, they can probably do it fully convinced that it is normally the priority of the political leadership also.[20]

It is not only a conflict over time, however, the difficulty of weighing immediate needs against future interests. It is also a conflict in space, between the interests of the whole state and those of the individual republics and regions. The principle that decision-making within all social sectors is to be strictly centralized prevents the development of increased independence at the regional and republic levels. Larger political and economic independence for the republics could lead to greater self-consciousness and to a feeling of opposition to the desires and directives of the central power. Leading party circles have pointed to a "recidivism"

of "bourgeois" ideology in the present day Soviet Union, and warnings have been made against local patriotism and tendencies to nationalism in the western Ukraine and Georgia, for example.[21]

At first glance it might seem that the central direction of both the economy and environmental protection would be the best way to unite economic and ecological efforts. But it is not that simple in practice. This is shown by the great problems that have arisen within the economy as such, apart from ecological dimensions. Soviet economists pointed out during the 1960s that industry in the Soviet Union was in important aspects as chaotic and anarchistic as it ever was in capitalist countries. One failed to achieve a continuous, comprehensive and balanced development of the economy, due to the fact that the concentration of all important decisions in the central state organs overloaded these organs with information which they could not handle. They lost contact with reality, and the interference in the individual sector's and branch's economy became extremely arbitrary. At the same time enterprises and local organs lacked knowledge of the surroundings. One got a system that was "overplanned from above and underplanned from below".[22] It is evident that overplanning, together with the lack of an overview or of information on different acting levels, will be a problem that will be further accentuated when, in addition to strict economic goals, ecological components will also have to be taken into account and brought into the planning.

The use of natural resources is often not a question of their "right" or "wrong" use. The use of natural resources often entails conflicts between different important interests and national goals, conflicts between industrial expansion and the quality of the environment, between different resource users, between different regions and authorities. The all-union legislation has, as a rule, only drawn up the general guidelines on how the natural resources ought to be used. The authorities of the different republics and the enterprises have themselves been permitted to specify and complete them. On the other hand, the republics' environmental legislation is evidently not applicable to industrial projects carried out from all-union interests, that is, centrally determined in Moscow.

In principle, Soviet leaders are free to decide whether one is going to have a polluting production or not. However, this freedom is, of course, limited in practice by political, economic and bureaucratic realities, by the value structure of Soviet society, and by the Soviet citizens' demands for an increased material standard.

The Soviet decision-makers, however, apparently still regard the issuing of decrees as the best means. Late in 1978, the Central Committee of the CPSU and the Council of Ministers of the USSR adopted a resolution "On Additional Measures for Strengthening the Protection of Nature and Improving the Utilization of Natural Resources". The new resolution noted that ministries and departments had not fulfilled the quotas set by the decree of 1972. Party and government bodies at the union republic level and below had "not carried out effective measures for the conservation of land, for protecting waters and the air basin against pollution and for the rational utilization and reproduction of natural resources".

Singled out for criticism in the 1978 resolution were the USSR Ministries of Chemical Industry, of Oil Refining and Petrochemical Industry, of Chemical and Petroleum Machine Building, of Nonferrous Metallurgy, of Agriculture, of Construction, Road and Communal Machine Building, of Instrument Building, Automation and Control Systems, of Power Machine Building, of Fisheries, of Land Reclamation and Water Resources, of Power and Electrification, of Pulp and Paper Industry, of Tractor and Agricultural Machine Building, and of Automotive Industry. The shortcomings enumerated included the neglect of production of new types of equipment, instruments and chemical agents for purifying effluents; too slow development and introduction of low-waste production processes, lack of attention to the questions of rational use of mineral resources; insufficient measures to recultivate lands and diminish soil erosion; and deficiencies in organizing natural reserves.

The USSR Academy of Sciences and the Union Republic academies of sciences were also criticized for not fully organizing "fundamental research on a series of major problems in the conservation area". The 1978 decree contains a number of rulings on how

to overcome all the shortcomings. The already existing Hydrometeorological Service was transformed to the USSR State Committee for Hydrometeorology and Environmental Control. It was entrusted with the task of organizing, controlling and monitoring the activities in the environmental protection area. Ministries and enterprises should create special departments for environmental questions. Managers as well as workers were to be held responsible for the realization of the environmental protection programmes decided upon.[23]

The chairman of the State Committee for Hydrometeorology and Control of the Natural Environment, Yu. Izrael, was interviewed in Literaturnaya Gazeta in the spring of 1979. Answering a question about the means to counteract the negative characteristics, he said that "the main thing" was "that every producer, from worker up to director, and especially those working in an enterprise which influences the environment and pollutes it, behaves responsibly toward this problem, and not feel that his business is merely to produce the primary product".[24]

Izrael thus pointed to a conflict of interests within the producers themselves, between the immediate concern for economic efficiency and the long range interest to diminish the pollution of the environment. He also showed that although "the state" makes the general decisions and is the owner of the basic means of production (and many others) in the Soviet Union, individual responsibility cannot be left out. What Izrael is asking for amounts to a basic change of the value system of Soviet citizens, as it is impossible, for obvious reasons, to think of reducing the role of state authority in Soviet society and economy.

6. From a Marxist viewpoint it is readily said that the scientific-technological revolution bodes the ruin of capitalist society. This may be correct. But it is a fact that technical and scientific development also sets the socialist systems rocking. The Finnish philosopher G. H. von Wright notes that both marxism's classics and their orthodox followers were and are guided by a scientific utopianism, or a belief that a scientific insight alone can give us the skill and ability needed to build a humane society.[25]

Many good environmental protection projects are carried out in the Soviet Union. But the lesson which inexorably comes forth is that Marxism-Leninism as a state ideology, state ownership of the means of production, and "real socialist" planned economy, obviously needs in no way imply that important environmental considerations are integral to the development of the economy. The Soviet Union has missed its historical chance to demonstrate how one protects environmental interests when establishing and building a socialist society. The majority of those participating in the debate in the Soviet Union consider that particular historical circumstances are to be blamed for the fact that environmental interests were ignored for so long a time. Much truth lies in this view. But all socialist societies will likely be constructed under "particular" circumstances. Since in the Soviet Union one has been forced to wait so long before trying to realize socialism's capacity to protect the environment, one can now use experiences from other countries in this area.

The course of events during the next decade will show how the new regulations will be applied and what further measures will be needed to solve the problems. Therefore, it would be both important and interesting to follow the development in the Soviet Union in this area: will the pretension that the Soviet Union plays the role of avant garde in the area of environmental conservation become a reality or will that role be reduced to an ideological fiction to serve as compensation for the inadequacies in the practical environmental conservation work?

ENDNOTES

[1] Cf. D. R. Kelley, K. R. Stunkel, R. R. Wescott, The Economic Superpowers and the Environment: The United States, The Soviet Union, and Japan, San Francisco 1976, p. 116.

[2] A. A. Pavelev, Sotsial'nii optimizm i ekologicheskii pessimizm, Moscow 1977, p. 50, 59.

[3] B. Komarov, Unichtozhenie prirody, Frankfurt/M. 1978, p. 156 ff.

- [4] Komarov, op. cit., p. 30 ff.
- [5] Filosofskie Nauki, No. 5, 1978, p. 163 ff.
- [6] G. Skirbekk, Økologi og politikk (mimeographed), Bergen 1972, p. 39.
- [7] H. Saetra, Ekologi och marxism, Stockholm 1977, p. 95.
- [8] H. Haumann, Beginn der Planwirtschaft, 1974, p. 122 ff.
- [9] A. Besoncon, The Soviet Syndrome, 1978, p. 53 ff; Haumann, op. cit., p. 31, 98.
- [10] F. J. Fleron, Jr., "The Western Connection" Soviet Union/Union Sovietique, No. 1, 1977, p. 59, 83 ff.
- [11] Ch. Edquist, O. Edqvist, Social Carriers of Techniques for Development, Stockholm, 1978, p. 28 f.
- [12] J. Berliner, The Innovation Decision in Soviet Industry, Cambridge, Mass. and London 1976, p. 415 ff, 439 ff, 518ff.
- [13] N. M. Udgaard, "Miljøvern og økonomi i Sovjetunionen", Internasjonal Politikk, No. 3B, Supplement, 1979, p. 536 ff.
- [14] Letter from 18 Estonian scientists to colleagues in Finland, Sweden, Denmark and the Federal Republic of Germany, 1977.
- [15] J. Sanness, "Miljøvern og sosiopolitisk system", Internasjonal Politikk, No. 3B, Supplement, 1979, p. 553 ff.
- [16] Kelley, Stunkel and Wescott, op. cit., p. 130 ff.
- [17] "Literaturnaya Gazeta i ee chitatel'", Problemy sotsiologii Pechati, Vyp. 2, Novosibirsk 1970, p. 134. See also E. Mickiewicz, "Policy Applications of Public Opinion Research in the Soviet Union", Public Opinion quarterly, vol. 36, 1972, p. 571.
- [18] Komarov, op. cit., p. 162 ff.

[19] J. Füllenbach, Umweltschutz zwischen Ost und West. Umweltpolitik in Osteuropa und gesamteuropäische Zusammenarbeit, Bonn 1977, p. 97, 129.

[20] Sanness, op. cit.

[21] M. F. Nenashev, "Vazhnaya zadacha ideologicheskoi deyatelnosti partii", Voprosy Istorii KPSS No. 8, 1977, p. 27 ff. V. Zaslavsky, "Sociology in the Contemporary Soviet Union", Social Research Vol. 44, No. 2, 1977, p. 350 f. points out that only in 1973 the concept "sovetskii obraz zhizni" began to be propagated by Soviet authorities.

[22] M. Lewin, Political Undercurrents in Soviet Economic Debates, London 1975, p. 143 ff.

[23] Sobranie Postanovlenii Pravitel'stava SSSR 1979, No. 2, pp. 27-41; Decree of the CC CPSU and the USSR Council of Ministers on Additional Measures to Strengthen Environmental Conservation and Improve the Use of Natural Resources, Moscow, Dec. 1, 1978. (We thank G. Waxmonsky, EPA, Washington, D.C. for drawing our attention to this decree).

[24] Interview with Yu. Izrael', Literaturnaya Gazeta, No. 14, 1979.

[25] G. H. von Wright, Humanismen som livshallning och andra essayer, Stockholm 1978, p. 144, 151.

ENVIRONMENTAL POLICY AND AMERICAN LIBERALISM:
THE DEPARTMENT OF THE INTERIOR, 1933-1953

Clayton R. Koppes, Oberlin College

The period 1933 through 1953 is a critical era in American environmental history. The New Deal made a major contribution to environmental policy; the fate of that legacy during World War II and the Truman administration is equally important as a study in the continuity of policy. Historians have tended to assume that the Fair Deal continued New Deal environmental measures, as they do for liberalism as a whole. A closer look at the Truman period reveals, however, a marked change in its approach to environmental issues, even at times a reversal of New Deal policy. The purpose of this paper is to present a new synthesis of environmental policy in relation to broader currents of American liberalism from 1933 through 1953.[1]

To understand New Deal environmental politics it is necessary to analyze briefly the inheritance of the periods 1890-1916 and 1917-1932. The first conservation movement produced marked changes in the ways Americans dealt with the environment, but the nature of the shift has aroused very different interpretations. The "conservation as efficiency" school, ably represented by Samuel P. Hays, is perhaps dominant. The efficiency thesis has a major cost, however; it all but ignored the preservation side of the conservation movement and hence slighted the nonmaterial considerations that were prominent in the conservation ethos. On the development side Hays and others performed a notable service in rescuing the study of conservation from a frequently uncritical acceptance of the conservationists' democratic and anti-big business rhetoric. And yet in their preoccupation with efficiency, historians have gone too far in dismissing the conservationists' rhetoric as mere window dressing or cant. Regardless of the conservationists' intentions, conservation policies raise one of the central concerns of politics--to use Harold Lasswell's classic dictum, "who gets what, when, where, and how." In other words, both the use of natural resources and the environmental consequences directly affect the distribution of power and benefits in society. The effects tend to vary according to the position of

individuals and groups in the power structure.[2]

Furthermore, the choice of the political arena in which environmental issues are decided usually is directly related to the hoped-for outcome and who benefits from the policy decisions. The attempt to deal with issues on a local, state, or national level is not simply an abstract question of efficiency or of centralization versus decentralization, although these may be involved. Rather, organized groups try to raise issues at the particular levels where they anticipate their interests will triumph. Historically conservationists have usually sought action at the federal level and tried to build a national constituency. Their opponents have tended to concentrate on local and regional decision making. Political power in America, as Grant McConnell has shown, has historically been local.[3]

It is therefore, incomplete and even misleading to discuss environmental politics, whether of the first or second Roosevelt administrations, as simply efforts to improve efficiency or to centralize decision making. Environmental politics is more than Taylorism on a national scale; it also embodies in a major way questions of equity, ethics, and nonmaterial values.

An example may help clarify the point. A decision by the Bureau of Reclamation to build a dam involves questions of efficiency, to be sure. But the first question to be asked is the appropriateness of the dam to begin with--in other words, such essentially nonmaterial values as free-running rivers or preservation of wilderness. The efficiency category might be thought of as increases in national productivity, use of an otherwise "wasted" asset, expert management, relationship to a comprehensive planning scheme, and presumably rational choice based on scientific criteria rather than political bargaining. But such an approach overlooks some of the most important and most interesting questions. One such group of issues involves such questions as the locus of decision making, the values of the persons making the decision, and what interests are likely to be heard in such forums. Another set of questions involves the benefits from the dam. Should the electrical power that is generated be sold to a private utility or should it be distributed to consumers by the government? Should the heavily

subsidized irrigation water from the dam's reservoir be made available to any landholder in any amount, whether a family farmer or an agribusiness conglomerate; or should the water be distributed in such a way as to benefit smaller interests exclusively? Retreat to Gifford Pinchot's abstract efficiency standard of "the greatest good for the greatest number in the long run" begs almost every question, although it implies a utilitarian, production-oriented approach in keeping with general capitalist expansion and a minimum of redistribution. The progressive conservation movement addressed these issues, although tentatively and sporadically. One of its major legacies was the 160-acre law, which by limiting the water supplied to any one landowner tried to assure wide distribution of federal irrigation subsidies. In other cases, notably the national forests, the ideal of efficiency tended to favor big lumber companies and large stockmen. But whatever success conservationists had in grappling with the issues, the interpretive problems of environmental history cannot be solved by ignoring equity, ethical, and nonmaterial considerations.

From World War I through 1932 environmental policy was characterized by minimal protection and frequently outright abuse. In the drive for maximum production during World War I many environmental safeguards lapsed, often with serious consequences. In one of the classic environmental blunders, stockmen were allowed to run sheep in the national parks; pristine areas bore the scars for years to come. In the 1920s such conservation legislation as was passed represented a defeat for the conservation movement, as Hays has observed of the Water Power Act and Mineral Leasing Act of 1920. Early attempts to deal with oil pollution encountered such heavy opposition from the petroleum industry that when a statute finally emerged it had neither teeth nor money for enforcement. The Interior Department's administration was tinged with scandal in the Teapot Dome episode; more generally its administration was quiet and unimaginative. And at times the very basis of comprehensive management of natural resources was threatened, as when the Hoover administration attempted to cede the remaining public domain to the states, who declined to accept the burden. The period 1917-1932 may not have marked so dramatic a reversal of conservation movement as isolated dramatic events such as Teapot Dome have suggested to

some historians. But measured against the need for environmental action and the partial victories of the conservation movement of 1900-1916, the period of World War I and the 1920s left a long agenda for the New Deal. In dealing with this backlog the Roosevelt administration found the situation exacerbated by economic collapse and environmental disasters, such as the Dust Bowl--phenomena which were related, as Donald Worster has perceptively observed. The conjunction of these economic and environmental problems presented the New Deal with both a challenge and an opportunity.[4]

The social crisis of the 1930s insured that the New Deal environmental agenda would address not only the issue of efficiency but those of equity, ethics, and nonmaterial considerations with greater attention than previously. By 1941 the Franklin Roosevelt administration had amassed as significant an environmental record as any previous presidency. Three elements contributed to a reinvigoration of conservation in the 1930s: liberal ideology, strong executive leadership, and a receptive Congress. Undergirding those political realities were the economic conditions of the depression. When the economy shifted to expansion during the war and postwar booms, the three engines of New Deal environmental policy would move in a very different direction.

The first element--liberal ideology--imbued 1930s conservationists with a distinctive holistic view of natural resources and society. This philosophy represented a fusion of environmental ideas and what might be termed "commonwealth liberalism." The commonwealth liberals grouped around such figures as Harold L. Ickes, Secretary of the Interior, 1933-1946; Henry A. Wallace, Secretary of Agriculture, 1933-1941, and Vice President, 1941-1945; Rexford G. Tugwell, brain truster, Assistant Secretary and Undersecretary of Agriculture, 1933-1936, and administrative utility infielder; Arthur E. Morgan, chairman of the Tennessee Valley Authority, 1933-1938; and organizations such as the National Resources Planning Board. Their analysis of nature and society began, not with private interests, as was true of corporate liberals, but with the welfare of the commonwealth as a whole. They favored comprehensive planning that would design programs that fit together as an

integrated whole. The market threatened this web of interconnections; it therefore needed to be modified by a stronger community sense to further "social justice and social charity," said Wallace. The primacy of nature and the commonwealth meant that long-range social goals should take precedence over short-term private interests. As Morgan said: "We are not complete owners of the soil, but only trustees for a generation." Their attitude took fundamentally an ethical stance. "We must get a sense of personal responsibility toward the national resources as a whole," said Ickes.[5]

From the scarcity economics of the thirties, they took the idea that three centuries of economic expansion, which had raised living standards by creating a surplus to be divided, was ending. The pie could no longer be enlarged indefinitely; it therefore had to be resliced. "Economic surplus does not necessarily result in a prosperous and happy people," Morgan pointed out. "We need a greater sharing . . ." The National Resources Committee called for reducing "glaring inequalities of wealth and income." [6]

The environmental philosophy entailed a large measure of structural change, i.e., shifts in the loci of power in society. Although perhaps stopping short of socialism, New Deal conservationists favored more state management of the economy than anything yet attempted and an alteration in the groups which stood to benefit from federal programs. Ickes summarized the environmentalist vision in a suggestive metaphor: "A forest is a community of trees, as a city is a community of human beings," he said. There is a struggle for existence in a forest, "but, on the other hand, a forest is a cooperative community in which each tree helps its neighbor and contributes its part to the common protection of the young." What occurred naturally in the wilderness required intervention in human society. "We now undertake to achieve a grand vision for the whole country, saying that this land shall be cropped, this shall be range, this shall be forest, this shall be worked for minerals," Ickes continued. "In this way, and no other, can we properly conserve--that is to say, use wisely--our natural resources and provide for a more equitable distribution of their bounties." [7]

As important to New Deal environmentalists as structural change was a desire to develop citizens' aesthetic and psychological faculties. They therefore sought a balance in the long-standing internal conservationist feud between preservationists and developers. Preservation of nature had links to other New Deal programs, such as the arts projects; more than merely work-relief measures they marked a new government interest in aesthetic and community activities. Wallace hoped the New Deal could "leave something that contributes toward giving life meaning, joy and beauty for generations to come." Conservationists believed that modern man found psychological refreshment in nature. "It is more vital for many humans to view the sunset across some wilderness lakelet or scale the summit of a deeply wooded mountain, than it is to enjoy any material comfort which twentieth century mechanization has bestowed," argued Robert Marshall, chief forester of the Bureau of Indian Affairs. In their fullest expression, New Deal environmentalists held out the ideal of an ecological, cooperative commonwealth.[8]

The commonwealth liberals gave the New Deal a distinctive leaven, but their position was tenuous. Much of the New Deal's disorder can be understood as a struggle between the commonwealth liberals and what might be termed "corporate liberals." [9] Instead of starting with commonwealth values, corporate liberals saw the public good as arising from the clash of society's constituent parts. Corporate liberals often favored increasing federal power, but since they for the most part accepted the existing distribution of power in society, the benefits of a larger federal presence usually flowed to groups already favored. Thus big business could be seen eventually as a potential ally of liberalism, as during World War II and the Cold War.

Strong leadership, particularly by the President and the Secretary of the Interior, provided a second supporting element for New Deal environmental policy. President Roosevelt, who once listed his occupation as "tree farmer," was interested in conservation from grand design to minutiae. An "instinctive collectivist," Roosevelt endorsed structural change through conservation. He infused the Tennessee Valley Authority concept, which previously had been conceived of mainly for electricity generation and

flood control, with the planning ideal. When he first explained TVA to Arthur Morgan, "he talked chiefly about a designed and planned social and economic order." The President wanted federal irrigation projects to be undertaken "not for the benefit of the man who happens to own the land at the time," but to provide small tracts that would "give first chance to the 'Grapes of Wrath' families of the nation." He envisioned a planned Columbia Basin Project that could support 80,000 families in agriculture and 20,000 others in small industries. A dedicated preservationist, he ordered a special photographic survey so that he could personally demarcate the boundary of the new Olympic National Park in Washington. He halted the introduction of nonnative flora and fauna into the Okefenokee swamp and lamented, "Why, oh why, can't we let original nature remain original nature!" In the crowded last months of his life he took time to plan an international conservation conference.[10]

Secretary Ickes, a Chicago lawyer, Bull Mooser, and veteran of reform causes, sought to remake his department into a comprehensive conservation agency. Public power took a central position. Private utilities epitomized exploitation and special privilege--he once cheerfully consigned utilities magnate Samuel Insull to the same inferno as John Dillinger and Al Capone. On the public domain rehabilitation and redistribution were crucial. Throughout his term he emphasized comprehensive planning, especially in the form of valley authorities, which he hoped to locate in his department. He balanced the developmental side with a strong interest in preservation; he wanted the national park system "greatly enlarged." The secretary drew upon the talents of a notable corps of young, energetic New Dealers, such as Oscar L. Chapman, assistant secretary from 1933-1946; lawyer Abe Fortas, head of the division of water and power from 1941-1943 and under secretary from 1943-1945; economists Arthur Goldschmidt, Paul Raver, and Stephen Raushenbush; and wilderness enthusiast Robert Marshall. Cadres of bright, idealistic young liberals staffed the middle levels of the bureaucracy. With their help Ickes transformed the once scandal-ridden, unimaginative Interior Department into a dynamic agency that stood in the forefront of New Deal liberalism.[11]

Congress provided the third element of support for New Deal conservation. Congress was more responsive to private economic interests with a short-range outlook, partly because of the outsized Western bloc in the Senate. With the formation of the conservative coalition in 1937-1938, legislative support became increasingly limited to specific development programs. Congress rejected some of the boldest conservation ideas, such as a measure to establish "seven little TVAs" and Ickes' attempt to turn most of southeastern Utah into a spectacular national park. Nevertheless congressional backing was substantial, chiefly among liberals who supported the public power program, antimonopoly activities, and park expansion.[12]

By the time of the national defense buildup in 1939-1941, the New Deal record equaled any in American environmental history. Structural changes proved far-reaching. Transformed from a floundering irrigation agency, the Bureau of Reclamation became the vehicle for a vast expansion of public power. The installed capacity of its generating plants rose from 30,000 kilowatts in 1933--the size of a town light plant--to 2,178,197 kilowatts in 1946. But more significant than yards of concrete or millions of kilowatts was the department's redistributive intent. The Reclamation Project Act of 1939 gave the department the authority it needed to formulate a strong pro-public position on power. Ickes also resurrected the nearly forgotten excess land law. This measure limited individuals to receiving the heavily subsidized irrigation water from reclamation projects to 160 acres apiece and required landowners to sell excess lands in order to receive project water. Conservative reclamation officials at first told "Honest Harold" that the law had been "a dead letter for years" and that it was better to "let sleeping dogs lie." But sensing the redistributive and community-building possibilities in the acreage limitation, the secretary mapped a program for enforcement.[13]

Besides public power, the Interior Department also attempted to assert commonwealth values over two new areas of the public domain. First, the Taylor Grazing Act of 1934 established federal control over the 142 million acres of the public domain, which had seriously deteriorated after decades of unregulated private use. Although badly flawed in its

administration in the 1930s, the measure raised the possibility of more equitable distribution of usage privileges, comprehensive planning, and assertion of long-run community values over short-term private profit through eventual rehabilitation of the range. Second, the management of the \$100-million-a-year fisheries in Alaska was transferred to the Interior Department from the Department of Commerce in 1939. An oligopoly of large food-processing firms had badly depleted the resource through overfishing. At war's end Ickes moved to redistribute fishing permits in favor of smaller fishermen and eventually to stabilize the resource by reducing the catch.[14]

The department's development program was balanced by upholding the obligation to preserve. The principle of the national park system called for maintaining natural areas as near their pristine state as possible. New Deal preservationists increasingly viewed the parks, monuments, and wilderness areas as ecological units--a point of departure that distinguished the commonwealth liberals from conservatives, who tended to see the national parks as isolated scenic gems, often open to commercial encroachment. Several new national parks were established, sometimes over heavy local opposition; they included four predominantly wilderness units, Olympic, Kings Canyon, Big Bend, and Everglades. The number of national monuments was increased from 33 to 86, and a host of wildlife refuges were added. The size of the park and monument system grew from 14,739,405 acres in 1933 to 20,346,249 acres in 1946.[15]

The Interior Department's programs were representative of conservation activities throughout the government. Public power made great strides in the Rural Electrification Administration and Tennessee Valley Authority; the federal share of electricity generated in the country rose from 1.6 percent in 1937 to 12.7 percent in 1944. The Civilian Conservation Corps enrolled two million young men, who carried out innumerable activities, including planting more than half the trees placed in public and private forests before the 1930s and stocking lakes and streams with a billion fish. Working with local farmers, the Soil Conservation Service (originally Soil Erosion Service) began reversing the erosion that was affecting 80 percent of the nation's farmland. More than eleven million

acres were added to federal forestry management. Wildlife conservation and research advanced in the wildlife bureau, aided by new money made available under the Pitman-Robertson Act. The National Resources Planning Board and its predecessors made a start on comprehensive planning. Most federal conservation agencies wrote detailed planning documents and some, notably the Bureau of Reclamation, Soil Conservation Service, and Forest Service, attempted to include a large degree of planning for private lands as well.[16]

Impressive though these accomplishments were, however, 1930s environmental policy was, as has been observed of the New Deal as a whole, "an ever recurring story of what might have been." The Roosevelt administration achieved Ickes' "grand vision" only in a small measure. Many reasons accounted for the shortfall. Entrenched economic interests blunted many New Deal initiatives. Legislation sometimes was flawed. Bureaucrats inherited from previous administrations often diluted new programs; some officials, notably in the Grazing Service and Fish and Wildlife Service, were more responsive to the industries they were supposed to regulate than to conservation principles. Exasperated with the obstructionism of Bureau of Reclamation engineers, Ickes finally took the distribution of electricity away from them and placed it in a new office, the Division of Water and Power, under his direct control.[17]

Liberalism also bore some of the blame. Commonwealth liberals proved dismayingly vulnerable to jurisdictional feuds: Wallace snatched the Soil Erosion Service when Ickes was out of town, "the old curmudgeon" schemed continually to get the Forest Service into his department, and Agriculture and Interior traded charges and countercharges over which agency should manage grazing on the public lands. Other New Dealers had their own empires to build and defend, and often eyed the commonwealth liberals' goals suspiciously. David Lilienthal of TVA carried on a running feud with Ickes, for example, over whether valley authorities should be independent agencies or should be located in regular departments. What seemed at times mainly bureaucratic infighting, was at root a struggle over whether valley authorities would strive for more radical structural change than did TVA. Finally, Franklin Roosevelt,

who gave so much stimulation to conservation emerged, ironically, as a major disappointment. He often restrained or gave only token support to those who tried to implement what he advocated. Roosevelt seemed prey to a fatal ambivalence: He was attracted intellectually to commonwealth liberalism, but when it came to action he tended to side with the corporate New Dealers.[18]

The famous dispute between Arthur E. Morgan and his successor in TVA, David Lilienthal, epitomized the split between commonwealth and corporate liberalism in the late New Deal over both policy and strategy. Sometimes caricatured unfairly as simply an anachronistic sponsor of craft industry, Morgan in reality had a sweeping vision of planned regional development. "The TVA is not primarily a dam building job, a fertilizer job, or power-transmission job," he said. But that was what the agency became. After his departure in 1938, TVA deliberately avoided the word "planning," concentrated on electricity and fertilizer production, and through its much-touted "decentralization" gave up structural change as it embraced the regional power framework. "By 1936 TVA should have been called the Tennessee Valley Power Production and Flood Control Corporation," Rexford Tugwell and E. C. Banfield remarked sardonically. The outcome of the struggle between commonwealth and corporate liberalism which the split in TVA foreshadowed would have a decisive effect on the liberal vision during and after World war II.[19]

Pearl Harbor unleashed serious dangers for the Roosevelt conservation program. By then the New Deal legislative program had lost much of its momentum, although occasional advances were still possible. As an administrative and ideological vehicle, however, the New Deal continued to function fairly well. Demand for increased production replaced the scarcity economics of the depression. The preservationist camp was threatened first. Grazing interests wanted to run stock in the national parks, as they had been allowed to do in World War I. The lumber and aircraft industries tried to cut the superb stands of Sitka spruce in Olympic National Park. Ickes rebuffed both these inroads. Although the National Park Service suffered budget cuts, the administration upheld the principle of preserving nature intact despite wartime emergency. The park system even gained an important addition when Roosevelt signed an

executive order making the Jackson Hole country in Wyoming a national monument. His action irked Congress, which refused to appropriate funds to operate the monument. But the President's bold move saved Jackson Hole from commercial development until its status could be resolved in 1950.[20]

The department also managed successful holding actions and some advances in structural matters. A showdown developed over enforcement of the 160-acre law in the Central Valley of California, which had perhaps the most skewed landholding pattern in the country. Applying the 160-acre limit offered "the best opportunity now available for correcting the land pattern in California," Arthur Goldschmidt pointed out. Large landowners in the valley counterattacked by pushing an amendment through the House of Representatives in 1944 that exempted the area from the acreage limitation. But the department, aided by liberal senators, reinstated the 160-acre standard in the upper chamber. Reclamation's redistributive purposes advanced in the Columbia Basin Project in 1943 when the department secured legislation to acquire title to lands to be irrigated and then divide them among small farmers. Ickes insured the department could achieve its redistributive plans for public power when Congress authorized the secretary to acquire some transmission lines and related facilities in 1944.[21]

The World War II experience offered a lesson for the postwar years, for it showed a liberal administration dealing with conditions similar to those that would prevail from 1945 through 1953. Congress, one element of support for New Deal conservation, had become less reliable; that mixture of opposition and favor forecast Congress's position during the Truman administration. Roosevelt complained to his budget director, Harold Smith, in 1944 that "no out-and-out Republican Congress could possibly be worse than this one." Indeed, Truman would find the 81st Congress of 1949-1950 more responsive to the executive branch than any since 1938. Liberal ideology, which had provided another element of support, had begun to shift gradually toward corporate liberalism under pressure from the foreign threat. But so long as this erosion was not too far advanced, and the third element of support, executive leadership, showed resilience, the New Deal environmental program remained intact.[22]

Commonwealth liberals feared, however, that the attacks on conservation, coupled with the demise of such programs as the Farm Security Administration, threatened an "agrarian counter-revolution." Donning the rhetorical garb of 1943, Oscar Chapman warned: "It is the organized big men against the unorganized little men; the kulaks against the peasants; the haves against the have-nots." Liberals took heart from FDR's enunciation of a sweeping Economic Bill of Rights in 1944. As the war drew to a close and Harry Truman assumed office in April 1945, they made restarting the New Deal engine their domestic priority.[23]

Ickes focused on structural issues: public power and public domain management. A firm position on public power had evolved. Electricity "must be produced and distributed to the people, without private profit," Abe Fortas said. The department renounced the pre-New Deal concept of power as a profit-making "cash crop" for reclamation and reduced its rates to public customers. Ickes formalized these ideas in a policy statement in January 1946. The department would actively assist the formation of cooperatives and other public bodies to distribute electricity, would build standby steam generating facilities in case the flow of power from dams was interrupted, and would string its own transmission lines to deliver power directly to preferred customers, such as cooperatives and municipal power plants. He wanted the department to control power from stream to socket and entirely shortcircuit private firms. If these plans were realized, the department could dominate the hydroelectricity production of entire regions, with potentially vast implications for its redistributive purposes. When worried officials of the Pacific Gas & Electric Co. in California broached a compromise, Ickes warned his lieutenants to have nothing to do with that "piratical private utility." [24]

Public domain reform seemed possible in 1944-1945. Ickes appointed Clarence Forsling, an aggressive Forest Service official who was anathema to the stockmen, to revitalize the Grazing Service in 1944. Forsling proposed to raise the fees stockmen paid--they had been held to an artificially low level during the war--and to redistribute permits in favor of smaller operators. He also outlined a range

rehabilitation program that would sharply reduce usage and convert the grazing-oriented administration into a comprehensive land management program. In the Alaska fishing imbroglio, Ickes called hearings for February 1946 as his first move to "smash the salmon monopoly" and redistribute permits among small independent fishermen and cooperatives.[25]

But the attitudes of some of Ickes' subordinates, like those of many liberals at war's end, were beginning to change. Two themes emerged from a department-wide conference on postwar policy in late 1945: Economic expansion replaced the prewar focus on redistribution, and the community and aesthetic emphases of the 1930s slipped as material abundance became the foundation of policy. Land planners downplayed the family farm as a way of life in favor of the "development of successful farms operated as business enterprises." Fisheries management should concern itself solely with insuring an abundant resource; the Fish and Wildlife Service opposed redistribution of permits "to accomplish social objectives." These ideas represented both a return to pre-New Deal goals of efficient management above social policy and a forecast of midcentury liberalism's overriding interest in economic growth. Departmental officials began to talk disparagingly of "the old man's" penchant for hiring "these intense, well-meaning types." The changed atmosphere permeated Washington: Harold Smith noted that morale had reached its lowest point since he had come to the capital. Liberals, such as Oscar Chapman, who wanted to stay in the Truman administration adapted to the trends; those who opposed them felt more comfortable outside.[26]

Personnel departures contributed to the malaise. The most notable for conservationists was Ickes' resignation in February 1946 in a celebrated dispute with Truman over the nomination of oil millionaire Edwin Pauley as Under Secretary of the Navy. Adeptly seizing the right issue to end a long career in a blaze of glory and self-righteousness, Ickes had become increasingly dismayed by Truman's appointments and his failure to revive the New Deal. For commonwealth liberals Ickes' departure capped a year in which Truman had moved ever farther from the Roosevelt standard. Other resignations thinned the ranks of New Deal conservationists, particularly that of Abe Fortas at the end of 1945. Many middle and

upper-level bureaucrats, disappointed with the direction of the new administration, left in droves for private professional practice and the suddenly booming academic world.[27]

The President tried to repair the damage Ickes' departure caused by wooing two Western liberals, William O. Douglas, Supreme Court justice and an ardent preservationist, and Oscar Chapman, for the Interior secretaryship. But Douglas decided to stay on the court, and Chapman, who feared liberals would turn on him if he succeeded Ickes, wound up as under secretary. Truman's eventual choice, Julius A. "Cap" Krug, fit the emerging pattern of corporate liberalism. A Milwaukee-born electric-power engineer, Krug had served as chief engineer of TVA in the 1930s. As chairman of the War Production Board from 1944 to 1946 he epitomized the cooperation between government and big industry typical of wartime procurement and reconversion. He appeared to be most interested in applying the managerial techniques of the engineer and career administrator. A protege of Lillienthal and Bernard Baruch, he found National Park Service Director Newton Drury, an Ickes appointee, "nearly impossible to talk with because he has no business sense." Krug sought mainly to increase the productive capacity and use of national resources, particularly public power, but with less interest in structural change than his predecessor. Krug's administration was "much more passive than Mr. Ickes'," recalled Warner W. Gardner, assistant secretary for Ickes and Krug. The able but indolent new secretary kept "quite a lively eye out to his business future," said Gardner, and confessed during one of his numerous absences from Washington: "Things go better when I am away." [28]

The Krug administration, like Truman's first term, marked a transitional period. The embers of 1930's liberalism still flickered intermittently, but it was only after Truman's re-election that the Fair Deal found its characteristic voice. Krug could cite some successful holding actions, if few new programs. He worked for expansion of public power and for a Columbia Valley Authority, on the style of TVA. He beat back congressional efforts to weaken the excess land law. But the trend of his administration unmistakably moved away from Roosevelt-era conservation. His declining interest in structural change became apparent as he reversed Ickes' public

domain management policies even before the 80th Congress was elected in November 1946. One of his first problems was the Alaska fishing imbroglio, which his predecessor's resignation had left in abeyance. Krug at first tried to compromise with the large fish processors, then abandoned reform efforts. As a result the situation continued to deteriorate. By the time Alaska assumed management of the fishery upon becoming a state in 1958, the resource had dwindled to a fraction of its former size, and the small fishermen competed fecklessly with the giant firms. The recognition of regional power interests thus produced neither efficient management nor distributive justice.[29]

Krug's retreat on grazing was equally precipitous. He scuttled Clarence Forsling's ideas and adopted a plan drawn up for him by Rex Nicholson, a former WPB official with close ties to the livestock operators. Fees should be based not on the value of the resource or the stockmen's ability to pay, Nicholson said, but solely on the cost of administration. He outlined in turn an undernourished Grazing Service of just 242 employees to administer an area almost half again as large as California. This minimal force made possible low fees, which, even after an increase, were only about half the value of the grass the users were buying. Moreover, the plan strengthened the role of the district advisory boards, which were virtual extensions of the big stockmen's associations, to the point that they became de facto managers of the range.[30]

Tailored almost exclusively to stock-raising, the Nicholson formula ignored the public domain's importance for wildlife, watersheds, wilderness, and recreation; comprehensive management planning was essential. Krug nevertheless accepted the program with only minor qualifications, and even allowed the industry to dictate the transfer of Forsling and three other officials out of the Grazing Service. The department faced stiff political pressure, but Krug could have found allies in the conservation movement and in the House Interior Appropriations Subcommittee, which was scandalized by the low fees. The new secretary's action showed he had kept his promise to the stockmen: "I don't think on any basic point there can be any real disagreement between us." [31]

The balance began to favor development over preservation. Krug compared preservationism to a "hair shirt that the National Parks Service has worn, perhaps for the Nation's sins against conservation." When lumbermen again eyed the prime timber in Olympic National Park in 1947, Krug, somewhat surprisingly aided by park director Drury, tried to placate them by agreeing to delete 56,000 acres from the reserve. But conservation groups, abetted by liberal luminaries such as Mrs. Eleanor Roosevelt and Harold Ickes, mobilized to save the park. When the Republican chairman of the House Interior Committee, Richard Welch of California, opposed the cuts, Krug reversed himself and began defending the park's inviolability. Krug and Drury also appeared willing to abandon a crucial segment of Jackson Hole National Monument, which Roosevelt and Ickes had secured against heavy odds. As with Olympic park, the department changed course and kept Jackson Hole intact only when it felt preservationists' pressure.[32]

The full extent of the shift to corporate liberalism became apparent when Oscar Chapman succeeded Krug, whose lax administration and failure to campaign for the ticket had upset Truman, on December 1, 1949. Chapman was an archetypical liberal. To contemporaries and historians he was "one of the few authentic New Dealers left in the Cabinet." A native of Virginia who moved to Denver, Colorado, for his health in the 1920s, he had imbibed the liberalism of Judge Ben Lindsey and Senator Edward P. Costigan. Identified with the commonwealth liberals, he worked hard for Henry Wallace's renomination as vice president in the climactic liberal crusade of 1944. Chapman's ideas began to change after the war, however. By 1947 he concluded that Wallace was dangerous and in 1948 he became one of Truman's earliest and most devoted campaign yeomen. Chapman was, foremost, a politician and a survivor. Amiable and conciliatory by nature, he reflected the opinions of those around him; his choice of the Truman administration as a political and intellectual environment was therefore crucial.[33]

The new secretary's public philosophy suggested how much he had changed in a few years. Chapman now emphasized almost exclusively the department's role

in economic growth to maintain prosperity and national security. Economic growth constituted "the very essence of our development as a nation," he argued. "Conservation does not mean . . . the locking up of some resource in order to keep people from touching or using it. It means to develop the resource in a wise way." He all but read preservation out of departmental policy. His interest in structural change diminished. The New Deal had done just about enough to introduce self-correcting mechanisms into the economy, and with prosperity, redistribution seemed unimportant. Chapman no longer demonstrated the comprehensive outlook of commonwealth liberalism. Planning gave way to expansion of productive capacity, shorn of redistributive intentions. The core of Chapman's conservation program consisted of big dams in the Columbia and Colorado basins--in effect, the federal government as builder of public works.[34]

Truman shared a similar outlook. He displayed little of Franklin Roosevelt's concern for the environment. Truman interpreted conservation mainly as dam-building for power generation and flood control and as some soil protection programs to expand farm production. Planning declined. He favored TVA-style administration for the proposed Columbia Valley Authority; as Vice President he had killed a strong Missouri Valley Authority bill by referring it to a hostile committee. Little interested in preservation, Truman endorsed the highly controversial Echo Park Dam in Dinosaur National Monument, which threatened the very concept of the park system. "It has always been my opinion that food for coming generations is much more important than bones of the Mesozoic period," he said. The attitudes of the President and Secretary contrasted sharply with Roosevelt and Ickes and indicated that an element of support for environmental policy--executive leadership--had been critically weakened.[35]

Changes in the third pillar, liberal ideology, completed the shift away from New Deal environmental ideas. A continuation of the wartime partnership of New Deal government and corporate capitalism seemed to offer the elixir of economic growth. Corporate liberals found it a short step from the "grass roots democracy" of Lilienthal's TVA: Democracy on the March of 1944 to his praise of giant corporations

and Eisenhower decentralization in Big Business: A New Era of 1952-1953. These ideas culminated in the doctrines of Leon Keyserling, chairman of the Council of Economic Advisors, 1949-1953. He argued that government-business cooperation would fuel prosperity, finance a protracted Cold War, and obviate the need for income redistribution. The Brannan Plan, the Fair Deal's most imaginative agriculture concept, stressed production for abundance; as Truman said, it was "not intended to redistribute wealth." If the pie could be enlarged, it need not be resliced.[36]

Corporate liberals thought that the New Deal had introduced enough structural changes to make equality of opportunity a reality for most individuals, and that "countervailing powers" maintained the system in dynamic equilibrium. To deal with special problem areas, such as racial discrimination, the Truman administration advanced civil rights--a response to pent-up demands that could no longer be ignored and which commonwealth liberals had advocated in the 1930s. The welfare state continued to expand, as indeed it would under Eisenhower. But Bismarckian Germany had long since shown that welfare programs, like the growth of centralized government, did not necessarily change the structure of power in society.

The community and spiritual emphasis of 1930s liberalism eroded. Afraid of appearing soft, naive, or utopian, midcentury liberals stressed the hard, the immediately practical, and the material. There was little interest in reviving the prewar arts projects. The Indian New Deal, which had tried to build tribal identity and community, was dismantled in favor of "withdrawal programming" and "termination," which called for the breakdown of tribal groups and the assimilation of Indians into white society as individuals. Social problems became engineering projects. "There is almost nothing, however fantastic, that (given competent organization) a team of engineers, scientists, and administrators cannot do today," said Lilienthal. New Deal words such as "planning," "community," "cooperation," "beauty," "spirit," and "more equitable distribution" disappeared from the liberal lexicon.[37]

As Secretary Chapman strove for material

abundance, the federal power empire expanded, but the chance for structural change diminished. The Bureau of Reclamation's installed generating capacity doubled, from 2,178,197 kilowatts in 1946 to 4,421,000 kilowatts in 1953. The Interior Department's declining support for a Columbia Valley Authority indicated the emphasis on public works over social purposes. In May 1949 the Bureau of Reclamation and the Army Corps of Engineers signed the Newell-Weaver agreement that divided the choice dam sites of the Columbia Basin between the rival agencies. Krug feared the agreement would sabotage the CVA. Chapman, however, hailed the pact as "a marked step forward" that would enable construction of dams to begin at once. "Consideration of the method of permanent administration . . . should not deter us from taking action now to implement desirable physical developments," he said. By dividing the Columbia Basin into two spheres the agreement virtually insured that a valley authority, and the social policy it might have pursued, was thwarted. The CVA proposal foundered in the backwash of congressional opposition and flagging administration support, but the Bureau of Reclamation got to build most of the dams it wanted.[38]

The department reversed the New Deal position on the distribution of federal hydroelectricity. Pioneered by Krug and extended by Chapman, the department's "wheeling" agreements allowed private utilities to buy federal power for their own use and to resell it to federal preference customers, such as municipalities. This had one advantage for the government; wheeling agreements used existing private transmission lines at a time when it was often hard to get Congress to appropriate funds for federal lines. But the disadvantages bulked large. The private utilities often reaped a windfall profit by buying federal power cheap and selling dear. The comptroller general sharply criticized this feature of the most controversial wheeling contract--Chapman's pact with Pacific Gas & Electric, Ickes' arch-enemy. These agreements virtually precluded formation of other municipal or cooperative power districts. In short, the Chapman-Krug policy reduced the government's role--which once had promised substantial structural change--to that of a producer of cheap power, some of which it then turned over to private companies for their profit. The shift to corporate liberalism had gone so far that

Paul Raver, Ickes' appointee as head of the Bonneville Power Administration, suggested in 1952 that the federal government get out of power production entirely in the Pacific Northwest, the area where public power was strongest.[39]

Reclamation's redistributive policies were reversed through administrative subversion of the 160-acre law. Commissioner of Reclamation Michael Straus, who had once been a New Deal liberal, had become "principally interested in obtaining work and jurisdiction and is not greatly interested in the social and economic problems," Abe Fortas warned. Straus devised a program of legal loopholes and nonenforcement that would allow landowners to keep their excess lands but technically comply with the law. He humorously acknowledged that his scheme would not produce "spiritual compliance." Under his plan, for instance, corporations might avoid selling excess lands by apportioning 160 acres per stockholder. The department solicitor cooperated by filing a highly suspect opinion in 1947 which enabled water user districts to buy their way out of compliance by paying off construction charges in one lump sum. (The crucial opinion was overruled by a later solicitor in 1961; his decision was confirmed in 1976 by the Ninth Circuit Court of Appeals, which expressed amazement at the 1947 opinion's "obvious" errors and "surprising superficiality.") [40]

Chapman endorsed most of Straus's program, and technical compliance established a pattern of widespread evasion of acreage limitations over the next thirty years. Technical compliance turned a law that was designed to encourage family farms into a program which allowed corporations, such as Southern Pacific and Tenneco who received reclamation water on more than 100,000 acres apiece, to receive multimillion dollar annual subsidies. At the very moment when liberals could have effected some redistribution by enforcing long-established laws, they chose instead to increase capacity and eschew structural change. "We certainly deserved better from the avowed friends of acreage limitation," liberal Senator Paul H. Douglas of Illinois reflected sadly. Economist Paul S. Taylor mused: Ickes was "solid," Krug was "almost solid," and Chapman "wobbled." [41]

By 1952 federal policy on power and water,

grazing, and fishing was reinforcing powerful interests instead of furthering structural change. Secretary Chapman was scarcely recognizable as the defender of the "have-nots" against the "haves" in 1943.

The drive for development imperiled the New Deal environmental balance, and provoked the Echo Park controversy, the most serious crisis the national park system ever faced. In 1950 the Bureau of Reclamation which claimed 61 percent of the Interior Department's budget, unveiled its grandest new plan, the Upper Colorado Basin Project. (UCB's largest dam, Glen Canyon, would create a 186-mile-long lake in the area Ickes had proposed for the Escalante national monument. But since that almost inaccessible stretch of the Colorado had not come into the park system, the dam aroused relatively little protest.) Key structures in the UCB plan were the proposed Echo Park and Split Mountain dams, which would flood the heart of Dinosaur National Monument on the Colorado-Utah border. Created by President Woodrow Wilson to protect eighty acres of dinosaur relics, the monument had been enlarged to approximately 325 square miles by Franklin Roosevelt to preserve the spectacular canyons carved by the Green and Yampa rivers. Straus contended that Echo Park-Split Mountain provided the optimum combination of water storage, economical development, and power-generation capacity for Western economic development. Chapman listened politely to the pleas of the preservationists, but he approved the dams on June 27, 1950. "Dinosaur National Monument is potentially a good park unit," Chapman acknowledged. ". . . Yet, I am convinced that the growth and development of the West depends upon the adoption of a sound Upper Colorado River Basin Program, and that this is the most important consideration to be faced in this matter." [42]

His decision backfired. Preservationists lobbied effectively against the dams. Augmented by opposition from Easterners and fiscal conservatives, they threatened to block the entire UCB program in Congress. Chapman waffled. He told preservationists that he hoped an alternative to Echo Park-Split Mountain could be found; then he assured developers he would still approve the dams if the alternatives proved inadequate. His final recommendation called for building "Echo Park or an alternative." Although

Chapman softened his original stand, he continued to make economic considerations the touchstone of decision. The secretary's position left preservationists more worried than at any time since the Hoover administration. Well they might have been. The Bureau of Reclamation and Army Corps of Engineers had dams on the drawing boards for Glacier, Big Bend, Kings Canyon, and Grand Canyon national parks, if they were successful in Dinosaur.[43]

As it was, the dam-builders threatened Hells Canyon of the Snake River. Though not in the park system, the Snake wilderness contained the deepest canyon in the world. High Hells Canyon Dam would create a reservoir 93 miles long on the Idaho-Oregon border and generate 1.6 million kilowatts, more than one-third of the reclamation bureau's total. "The compelling reasons for starting construction . . . immediately cannot be questioned," Chapman said in January 1952. The proposal became snarled in a dispute between public and private power advocates which staved off construction long enough for the growing preservation movement to succeed in stopping any dam at all. (The Supreme Court, in a decision written by William O. Douglas in 1967, stalled construction on ecological grounds, and Congress later enacted legislation that preserved the gorge.) The conservation balance had always been the central issue. Straus sought Ickes' endorsement for the public power dam in 1951, but the former Secretary rejoined that neither a private nor federal dam should mar Hells Canyon.[44]

The Echo Park and Hells Canyon decisions overshadowed Chapman's minimal preservation efforts. He arranged a somewhat questionable compromise which combined Jackson Hole with Grand Teton National Park. Truman added a small tract to Olympic National Park, bringing it near the expanse authorized in 1938. Meanwhile, however, the condition of the parks deteriorated badly with the onset of the postwar tourist boom. And Truman was the only president between Grover Cleveland and Gerald Ford, except for John F. Kennedy, who failed to add a new national park. Outstanding units added since 1953, such as Canyonlands in Utah, North Cascades in Washington, and Redwoods in California, suggested the Truman administration missed an opportunity.[45]

The shift away from the New Deal in the Interior

Department appears to have been representative of environmental policy in other departments during the Truman administration. Leadership in the Agriculture Department was mottled. Following Wallace were the inept Claude Wickard, 1941-1945; the friend of agribusiness, Clinton P. Anderson, 1945-1948; and the expansionist Charles F. Brannan, 1948-1953. Policy in that department reflected these Secretaries. Brannan directed the Forest Service to stop redistribution of grazing permits; by largely halting the cutbacks of permits on overgrazed land, the service in effect shifted the burden of financing range rehabilitation from the users to the public at large. The Soil Conservation Service relaxed its conservation efforts. On public power neither the Rural Electrification Administration nor TVA measured up to even the Interior Department's performance on distribution. Krug and Chapman continued efforts Ickes had initiated to assert federal control over the offshore oil lands, but his administration remained content with loose control of oil production. Nor did the Fair Deal attempt to revive the Civilian Conservation Corps or the New Deal planning agencies.[46]

The Truman administration's retreat from New Deal conservation established a consensus that was, in broad outline, acceptable to Eisenhower and "modern Republicanism." On structural issues Interior Secretaries Douglas McKay, 1953-1956, and Fred Seaton, 1956-1960, essentially continued their predecessor's policies. Despite rhetoric about federal-state-private "partnership" in electricity, McKay and Seaton carried the projects they inherited to fruition and initiated new ones, including the huge Upper Colorado River Basin Project. The federal share of electricity generated in the nation increased from 13.2 percent in 1952--almost the same as in 1945--to 17.1 percent in 1958. Chapman's wheeling agreements continued. On two structural issues the Eisenhower secretaries actually managed modest advances. They revised the grazing fee structure to begin to reflect the value of the range instead of merely the cost of administration and partially tightened administration of the excess land law.[47]

The putative conservatives did not don the hair shirt of preservation, but they began to restore the balance with development. They accepted an agreement

engineered by Western senators to drop Echo Park Dam and save Dinosaur National Monument, and they avoided further threats to the integrity of the park system. Virgin Islands National Park was established in 1956. An overdue program, Mission 66, made possible a badly needed upgrading of park facilities.[48]

The continuity in postwar conservation suggests that the greatest change in conservation policy occurred not in the transition from Truman to Eisenhower, but from Roosevelt to Truman. The reasons for this shift must be sought in the interplay of the three elements that supported New Deal conservation. Congress, always the weakest support, bore some responsibility for the decline of New Deal conservation. In some cases, however, congressional pressure forced the executive branch closer to the New Deal. But this discussion of environmental policy suggests that it is more important to look at the two other elements--liberal thought and executive leadership--to see what midcentury liberals' goals had become. The retreat from New Deal conservation may indicate a broader shift in liberal policy. Studies of planning, oil policy, and development and preservation find a break between the New Deal and Fair Deal, and continuity between the Truman and Eisenhower administrations. Public housing, "one of the most radical legacies of the New Deal," provided housing for low-income groups, although few units were built before the war intervened. The main thrust of the Fair Deal housing program, however, embraced slum removal but put little low-income housing in its place; moreover, its subsidy of middle-class housing through tax breaks and mortgage insurance endeared it to the real estate industry. The New Deal's policy towards big business oscillated between collectivism and atomism, but at least showed receptivity to structural change. In the spirit of "countervailing power," the Truman administration tended to accept industrial combinations. Even in labor policy Truman, despite his veto of the Taft-Hartley Act, helped curb the power unions had won under the New Deal. He threatened to draft striking railroad workers into the army in 1946, and he invoked the act's eighty-day cooling-off period more than did his successor. Truman and Eisenhower sometimes employed different rhetoric, but they often found a common meeting ground in policy.[49]

If this interpretation of environmental policy is correct, it may have wider use for the study of American liberalism. In testing this hypothesis, studies should escape the confines of a single presidential administration, which has characterized most historiography of the period 1933 to the present. Historians who follow a theme across presidential boundary lines, such as Otis Graham on planning and Mark Gelfand on urban policy, tend to support an interpretation of discontinuity between the Roosevelt and Truman administrations. Equally important, further work should move beyond its emphasis on legislation and examine administration. This review of environmental policy demonstrates that, even though legislation remained unaltered and many New Deal programs continued in name, changes in the way they were administered produced results very different from their original intent. Historians should remember Theodore Roosevelt's insight: "The bulk of government is not legislation but administration." [50]

By 1953 the Fair Deal had reversed much of the New Deal environmental program. This change did not occur in isolation but appears to have been representative of a broad shift in liberal ideology and policy at midcentury. By Truman's second term commonwealth liberalism, which had remained vigorous as recently as the end of World War II, had gone underground. The dominance of corporate liberalism marked a constriction of possibility, for environmental policy and liberalism generally, that would narrow political dialogue until the midcentury consensus broke apart in the 1960s.

ENDNOTES

[1] Most interpreters of American liberalism accept at close to face value Truman's and midcentury liberals' pledges to want to preserve and extend the New Deal. Viewpoints differ, however, on the success of the attempt. Eric Goldman finds that "liberalism [was] triumphant as a sort of conservatism." See Rendezvous with Destiny (New York, 1952), p. 337. Richard Kirkendall contends that Truman tried to "build upon the liberalism of his predecessor" but inherited a "domestic deadlock" he could not break. See Richard Kirkendall in "Harry S. Truman," in

Morton Borden, ed., America's Eleven Greatest Presidents (Chicago, revised ed., 1971), pp. 277, 282. Other representatives of this interpretation include Richard E. Neustadt, "From FDR to Truman: Congress and the Fair Deal," Public Policy, V (1954), 351-381; William E. Leuchtenburg, "A Troubled Feast," in Leuchtenburg, ed., The Unfinished Century: America Since 1900 (Boston, 1973), pp. 693-694, and Dewey E. Grantham, The United States Since 1945: The Ordeal of Power (New York, 1976) chap. 3. The study that addresses the question of the continuity of liberalism from the 1930s to the 1950s most fully also expounds the most positive interpretation of Truman and midcentury liberalism. Alonzo L. Hamby concludes not merely that the Truman administration "successfully defended and institutionalized the New Deal" (p. 513) but that the administration, through its legislative victories and abandonment of the Popular Front, moved liberalism "beyond the New Deal" (p. 516). See Alonzo L. Hamby, Beyond the New Deal (New York, 1973). New Left and revisionist historians also suggest continuity; for them the failures of the Truman administration tend to be those of FDR writ large. See, for example, Barton J. Bernstein, "America in War and Peace: The Test of Liberalism," in Bernstein, ed. Towards a New Past: Dissenting Essays in American History (New York, 1969), pp. 289-321. Exceptions to the continuity interpretations are Bert Cochran, Harry Truman and the Crisis Presidency (New York, 1973), and Samuel Lubell, The Future of American Politics (New York, 1952), pp. 21-27. These studies have in common a tendency to define the New Deal in terms of the Fair Deal legislative program; the argument therefore has elements of circularity. Instead, any evaluation of the Fair Deal and midcentury liberalism should start with the New Deal bench mark, not vice versa.

Because the Department of the Interior had the broadest environmental mandate, and because of the need for economy of presentation, this essay focuses on that department; it also attempts, however, to introduce environmental programs from other federal agencies where relevant.

[2] Samuel P. Hays, Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920 (New York, 1969). The persuasiveness of the counter-interpretation has been diluted by a failure to look beyond the conservationists' words to

their actual deeds. See J. Leonard Bates, "Fulfilling American Democracy: The Conservation Movement, 1907 to 1921," Mississippi Valley Historical Review, XLIV (June 1957), 29-57.

[3] Grant McConnell, Private Power and American Democracy (New York, 1966). For Hays's recent ideas on centralization versus decentralization see "The Structure of Environmental Politics Since World War II," Journal of Social History, XIV (1981), 719-738.

[4] For an overview of the years 1921-1933, which is probably too positive in its assessment, see Donald C. Swain, Federal Conservation Policy, 1921-1933 (Berkeley, 1963). On the acts of 1920 see Hays, Conservation and the Gospel of Efficiency, p. 240; on oil pollution, Joseph Pratt, "Environmental Planning During the Ascent of Oil," unpublished paper, Business School, University of California at Berkeley; on the Dust Bowl, Donald Worster, Dust Bowl: The Southern Plains in the 1930s (New York, 1979). There is no satisfactory overall study of New Deal conservation but an early attempt is Anna Lou Riesch, "Conservation under Franklin Roosevelt" (Ph.D. diss., University of Wisconsin, 1952); see also Frank E. Smith, The Politics of Conservation (New York, 1966), pp. 204-263. The best study of an overall aspect of conservation in the period 1933-1961 is Elmo Richardson, Dams, Parks & Politics: Resource Development and Preservation in the Truman-Eisenhower Era (Lexington, Ky., 1973).

[5] Henry A. Wallace, New Frontiers (New York, 1934), p. 20; Arthur E. Morgan, "Bench-Marks in the Tennessee Valley," Survey Graphic, XXIII (January 1934), 8, 9; Harold L. Ickes, "Saving the Good Earth: The Mississippi Valley Committee and Its Plan," Survey Graphic, XXIII (February 1934), 91-93; William E. Leuchtenburg, Franklin D. Roosevelt and the New Deal (New York, 1963), pp. 33-36, 84; Bernard Sternsher, Rexford Tugwell and the New Deal (New Brunswick, N.J., 1964), pp. 106-108, 138-141.

[6] Morgan, "Bench-Marks in the Tennessee Valley," 8, 9; National Resources Committee, "Our Cities: Their Role in the National Economy," Feb. 1937, National Resources Committee Files, Franklin D. Roosevelt Library, Hyde Park, N.Y.; Theodore Rosenof, Dogma, Depression and the New Deal: The

Debate of Political Leaders over Economic Recovery
(Port Washington, N.Y., 1975).

[7] Marquis James interview with Harold L. Ickes, "The National Domain and the New Deal," Saturday Evening Post, CCVI (Dec. 23, 1933), 55, 10.

[8] Wallace, New Frontiers, p. 273; Ickes, "Saving the Good Earth," 93; Robert Marshall, The Social Management of American Forests (New York, 1930), p. 9; Paul Conkin, Tomorrow a New World: The New Deal Community Program (Ithaca, N.Y., 1959); Leuchtenburg, Franklin D. Roosevelt and the New Deal, pp. 345-346; Harold L. Ickes, The New Democracy, (New York, 1934), pp. 38, 43, 72-73; Clayton R. Koppes, "From New Deal to Termination: Liberalism and Indian Policy, 1933-1953," Pacific Historical Review, XLVI (November 1977), 543-546.

[9] Because of the pervasiveness of liberal ideology and rhetoric in American politics and political thought, the adjectives linked with liberalism often assume decisive importance. Even though commonwealth and corporate liberals considered themselves to be part of the same political philosophy and coalition, the internecine fighting could be as bloody as between liberals and conservatives. This confirms the observation of Samuel Lubell that "the key to the political warfare of any particular period will be found in the conflict among the clashing elements in the majority party" (Future of American Politics, p. 217, emphasis in original). This paper suggests that the key division in the New Deal, and post-1932 liberalism generally, may be expressed in the commonwealth/corporate dichotomy instead of the collectivist/atomist terminology borrowed from the New Nationalism and the New Freedom. (On collectivism versus atomism see Rexford G. Tugwell, The Democratic Roosevelt (Garden City, N.Y., 1957), pp. 217-221, 327-328.) The collectivist/atomist typology is adequate, so far as it goes; but it says little about the distribution of power in society. "Collectivists" of the National Recovery Administration, for instance, could use planning to enhance the power of big business and wealth. Though more collectivist than atomist, commonwealth liberals could draw on either approach to fulfill their plans for structural change. Ickes could advocate central planning on the one hand and, on the other, call for breaking up the concentration of wealth in "America's

sixty families" because both tactics contributed to the structural change he sought.

[10] Morgan, "Bench-Marks in the Tennessee Valley," 43; Edgar B. Nixon, ed., Franklin D. Roosevelt and Conservation, 1911-1945 (2 vols., Washington, 1957) 204, 547, 635, 734, 960, 1133, 1165; Otis L. Graham, Jr., Toward a Planned Society: From Roosevelt to Nixon (New York, 1976), pp. 20, 37-45; Roosevelt to Ickes, Dec. 21, 1939, box 75, President's Secretary's File, Roosevelt Papers, Franklin D. Roosevelt Library.

[11] Ickes, The New Democracy, 64; Linda Lear, The Aggressive Progressive: The Political Career of Harold L. Ickes, 1874-1933 (New York, 1981), pp. 330-350; Richardson, Dams, Parks & Politics, pp. 1-18; Donald C. Swain, "The National Park Service and the New Deal, 1933-1940," Pacific Historical Review, XLI (1972), 330; Eugene Trani, The Secretaries of the Interior (Washington, 1975), pp. 246-263.

[12] William E. Leuchtenburg, "Roosevelt, Norris and 'Seven Little TVAs,'" Journal of Politics, XIV (1952), 418-441; Elmo Richardson, "Federal Park Policy in Utah: The Escalante National Monument Controversy of 1935-1940," Utah Historical Quarterly, XXXIII (Spring 1965), 109-133; see also James T. Patterson, Congressional Conservatism and the New Deal (Lexington, Ky., 1967).

[13] Clayton R. Koppes, "Public Water, Private Land: Origins of the Acreage Limitation Controversy, 1933-1953," Pacific Historical Review, XLVII (November 1978), 607-636; Annual Reports of the Secretary of the Interior, (Washington, 1933), p. 82, (Washington, 1946), p. 173; Philip J. Funigiello, Toward a National Power Policy: The New Deal and the Electric Utility Industry, 1933-1941 (Pittsburgh, 1973), ch. 7-8; Donald C. Swain, "The Bureau of Reclamation and the New Deal, 1933-1940," Pacific Northwest Quarterly, LXVI (July 1970), 137-146; Charles E. Coate, "Water, Power and Politics in the Central Valley Project, 1933-1967" (Ph.D. dissertation, University of California at Berkeley, 1969), pp. 95-101.

[14] E. Louise Peffer, The Closing of the Public Domain (Stanford, Calif., 1951), ch. 12; Richardson, Dams, Parks & Politics, p. 8; Richard

- A. Cooley, Politics and Conservation: The Decline of the Alaska Salmon (New York, 1963).
- [15] Annual Reports of the Secretary of the Interior (Washington, 1933); (Washington, 1946); Swain, "The National Park Service and the New Deal," p. 330.
- [16] Thomas K. McCraw. TVA and the Power Fight, 1933-1939 (Philadelphia, 1971), pp. 37-38; Graham, Toward a Planned Society, pp. 38-40; Leuchtenburg, Franklin D. Roosevelt and the New Deal, pp. 164-165, 174; Funigiello, Toward a National Power Policy, p. 257; John A. Salmond, The Civilian Conservation Corps, 1933-1942: A New Deal Case Study (Durham, N.C., 1967), ch. 7; Electrical World, CXLI (Jan. 25, 1954), 167, Joseph M. Petulla, American Environmental History (San Francisco, 1977), pp. 324-326.
- [17] Paul Conkin, FDR and the Origins of the Welfare State (New York, 1967), pp. 70-73; Funigiello, Toward a National Power Policy, pp. 269-270; Ickes manuscript diary, Oct. 30, 1935, pp. 1231-1232; Harold L. Ickes Papers, Library of Congress Manuscript Division, Washington, D.C.
- [18] Harold L. Ickes, The Secret Diary of Harold L. Ickes, 3 vols. (New York, 1953), vol I, The First Thousand Days, pp. 325-326. Richard S. Polenberg, Reorganizing Roosevelt's Government: The Controversy over Executive Reorganization, 1936-1939 (Cambridge, Mass., 1966), ch. 5. Tugwell notes that the administration of New Deal measures was often entrusted to its enemies and suggests: "Perhaps it was characteristic of the whole New Deal that its own confusion of aims, and especially its fright at any show of teeth from dissenters, should serve so often to defeat its purposes and to restrengthen its opponents for its own defeat." See Rexford G. Tugwell, The Stricken Land (Garden City, N.Y., 1947), p. 22.
- [19] Morgan, "Bench-Marks in the Tennessee Valley," 43; Rexford G. Tugwell and E. C. Banfield, "Grass Roots Democracy--Myth or Reality?" Public Administration Review X (Winter 1950), 50; Norman Wengert, "TVA--Symbol and Reality," Journal of Politics, XIII (August 1951), 378, 383; David E. Lillenthal, TVA: Democracy on the March (2nd ed., New York, 1953), 191.

[20] Richardson, Dams, Parks & Politics, pp. 11-13; Robert W. Righter, "The Brief, Hectic Life of Jackson Hole National Monument," American West, XIII (1976), 30-33, 57-60.

[21] Goldschmidt to Ickes, April 10, 1944, Ickes to Harry Barnes, Aug. 16, 1944, File 8-3, Records of the Office of the Secretary of the Interior, Record Group 48, National Archives; Minutes, meetings of Advisory Committee on Policy in Connection with Central Valley Project, March 18, 21, 1944, box 98, Joel D. Wolfsohn Files, Records of the General Land Office, Record Group 49, NA; Koppes, "Public Water, Private Land," 616-618.

[22] Harold Smith conference with Roosevelt, Feb. 16, 1944, Harold Smith Papers, Roosevelt Library; Pells, Radical Visions and American Dreams, ch. 8; Hamby, Beyond the New Deal, p. 515. On the fate of the New Deal during World War II see John Morton Blum, V Was for Victory: Politics and American Culture During World War II (New York, 1976), ch. 7-8; Richard S. Polenberg, War and Society: The United States, 1941-1945 (Philadelphia, 1972), ch. 3; Norman D. Markowitz, The Rise and Fall of the People's Century: Henry A. Wallace and American Liberalism, 1941-1948 (New York, 1973), ch. 1-3; Richard Chapman, "Contours of Public Policy, 1939-1945" (Ph.D. dissertation, Yale University, 1976); and Clayton R. Koppes and Gregory D. Black, "What to Show the World: The Office of War Information and Hollywood, 1942-1945," Journal of American History, LXIV (June 1977), 87-105.

[23] Chapman to Ickes, Oct. 13, 1943, box 67, Oscar L. Chapman Papers, Harry S. Truman Library, Independence, Mo.; Ickes manuscript diary, April 29, 1945, p. 9678, Ickes Papers, LC; Mary H. Blewitt, "Roosevelt, Truman, and the Attempt to Revive the New Deal," in Alonzo L. Hamby, ed., Harry S. Truman and the Fair Deal (Lexington, Mass., 1974), 78-92.

[24] Abe Fortas, "Relationship of Power to Reclamation," Reclamation Era, XXXI (December 1941), 312; Ickes to Truman, Nov. 23, 1945, OF 360, Harry S. Truman Papers, HSTL; House Committee on Expenditures in the Executive Department, Hearings, Investigations of the Bureau of Reclamation, (80th Cong., 2d. Sess., 1948), pp. 1321-1324; Charles

Coate, "Seventy-Five Years of the Bureau of Reclamation: An Assessment," paper read at Western History Association annual meeting, Portland, Oregon, Oct. 13, 1977.

[25] Forsling to Ickes, Jan. 14, 1946, Chapman to Secretary, Feb. 21, 1946, File 6-2, RG 48, NA; Warner Gardner to Chapman, Feb. 27, 1946, box 3, Warner Gardner Papers, HSTL; Richard A. Cooley, Politics and Conservation, pp. 31-35, 47-68.

[26] Charles E. Jackson to Ickes, March 16, 1944, File 3-4, RG 48; Evelyn Cooper to C. Girard Davidson, April 30, 1946, box 95, Joel D. Wolfsohn Files, RG 49, NA; Smith conference with Truman, Oct. 16, 1945, Smith Papers, Roosevelt Library.

[27] Ickes to Truman, Feb. 12, 1946, Truman to Ickes, Feb. 15, 1946, OF 6, HSTL; Ickes manuscript diary, Sept. 9, 1944, pp. 9209-9210, Jan. 20, 1946, p. 10,283, Feb. 10, 1946, pp. 10,340-10,345, Feb. 17, 1946, p. 10,355, Ickes Papers, LC; author's interviews with William E. Warne, Sacramento, Calif., Dec. 30, 1973, Warner W. Gardner, Washington, D.C., May 6, 1975, and Walter Goldschmidt, Los Angeles.

[28] Warner W. Gardner oral history interview, pp. 30, 60 HSTL; transcript of telephone conversation between Krug and Chapman, June 19, 1947, box 48, Krug to Chapman, Nov. 17, 1947, box 76, Julius A. Krug Papers, LC; William A. Brophy to John Evans, April 2, 1946, box 16, William A. Brophy Papers, HSTL; David Lilienthal, The Journals of David E. Lilienthal, vol. 2, The Atomic Energy Years, 1945-1950 (5 vols., New York, 1964), pp. 6, 25; Richardson, Dams, Parks & Politics, pp. 20-22; Barton J. Bernstein, "The Removal of War Production Board Controls on Business, 1944-1946," Business History Review, XXXIX (1965), 244-247; author's interview with Chapman, Washington, D.C., Aug. 15, 1973.

[29] Gardner to Chapman, Feb. 27, 1946, Interior Department press release, March 6, 1946, Krug to Arthur Vandenberg, June 11, 1947, box 3, Warner W. Gardner Papers, HSTL; Ernest L. Gruening, The State of Alaska (2nd ed., New York, 1948), pp. 395-398; Koppes, "Public Water, Private Land," 623.

[30] Rex L. Nicholson, "Reorganization Plan No. 3 as Proposed to J. A. Krug, Secretary of the Interior,

Nov. 12, 1946, " box 27, Chapman Papers, HSTL; Russell Thorp to Ralph Campbell, March 6, 1942, box 67, Joseph O'Mahoney Papers, Western History Collection, Coe Library, University of Wyoming, Laramie; Forsling to Arthur Carhart, March 13, 1947, box 74, Arthur Carhart Papers, Conservation Library, Denver Public Library, Denver, Colo.

[31] "Minutes of a Meeting of Livestock Representatives from the Eleven Western States with Secretary Krug, at Salt Lake City, Utah, Hotel Newhouse, September 3, 1947," p. 62, File 6-2, RG 48, NA; transcripts of telephone conversations between Krug and Nicholson, Oct. 17, 1946, and Krug and Chapman, Sept. 23, 25, 1946, Feb. 7, 1947, box 48, Krug Papers, LC; Peffer, Closing of the Public Domain, ch. 15-16.

[32] Transcripts of telephone conversations between Krug and Chapman, June 2, 1948, box 49, April 7, 1949, box 50, Krug Papers, LC; Richardson, Dams, Parks & Politics, p. 42; Chapman to Henry M. Jackson, March 14, 1947, box 105, Chapman Papers; Eleanor Roosevelt to Truman, June 12, 1947, OF 6P, HSTL; "Meeting to Consider Jackson Hole National Monument," March 5, 1947, box 4, Director's Personal File, Records of the National Park Service, Record Group 79, NA; Donald C. Swain, Wilderness Defender: Horace Albright and Conservation (Chicago, 1970), pp. 280-287.

[33] Thomas Sancton, "Gentle Crusader," Nation, CLXVI (March 5, 1949), 267; "Chapman for Krug," New Republic, XCCI (Nov. 21, 1949), 8; Hamby, Beyond the New Deal, p. 335; Clayton R. Koppes, "Oscar L. Chapman: A Liberal at the Interior Department, 1933-1953" (Ph.D. diss., University of Kansas, 1974), chap. 1; author's interview with Chapman, Aug. 15, 1973.

[34] Senate Committee on Interior and Insular Affairs, Hearings, Nominations of Oscar L. Chapman To Be Secretary of the Interior (81st Cong., 2nd Sess., 1950), p. 6; Chapman speech to Americans for Democratic Action, Jan. 27, 1950, box 76, interview between Frank Burgholtzer and Chapman on National Broadcasting Company "Pro and Con" program, Sept. 16, 1949, box 75, Chapman Papers, HSTL.

[35] Truman to Irving Brant, Feb. 20, 1951, OF 284,

HSTL; Public Papers of the Presidents: Truman, 1948 (Washington, 1964), passim, esp. pp. 531-535, 545-546; Ickes manuscript diary, Feb. 9, 18, April 2, 1950; Hamby, Beyond the New Deal, p. 50. For assessments of Truman-period domestic historiography see Robert Griffith, "Truman and the Historians: The Reconstruction of Postwar American History," Wisconsin Magazine of History, LIX (Autumn 1975), 33-50; Harvard Sitkoff, "Years of the Locust: Interpretations of Truman's Presidency Since 1956," and Alonzo L. Hamby, "The Clash of Perspectives and the Need for New Syntheses," both in Richard S. Kirkendall, ed., The Truman Period as a Research Field: A Reappraisal, 1972 (Columbia, Mo., 1974); Richard Polenberg, "Historians and the Liberal Presidency: Recent Appraisals of Roosevelt and Truman," South Atlantic Quarterly, LCCV (1976), 20-35; and Geoffrey S. Smith, "'Harry, We Hardly Know You': Revisionism, Politics and Diplomacy, 1945-1954," American Political Science Review, LXX (June 1976), 568-582; and on Truman administration economic policies, Darrel Cady, "The Historical Record: A Bibliographic Essay," in Francis Heller, ed., Economics and the Truman Administration (Lawrence, Kan., 1981), pp. 143-170.

[36] Harry S. Truman, Memoirs, vol. 2, Years of Trial and Hope, (2 vols., Garden City, N.Y., 1955), pp. 264, 266; Hamby, Beyond the New Deal, pp. 297-303; Blum, V Was for Victory, pp. 140-146, 323-332; Leon H. Keyserling, "Deficiencies of Past Program and Nature of New Needs," in Seymour H. Harris, ed., Saving American Capitalism (New York, 1948), 81-95; David E. Lilienthal, Big Business: A New Era (New York, 1952), esp. chap. 1; John Kenneth Galbraith, American Capitalism (Boston, 1952); Willard W. Cochrane and Mary E. Ryan, American Farm Policy, 1948-1973 (Minneapolis, 1976), p. 26.

[37] Lilienthal, TVA: Democracy on the March, pp. 2-3; Koppes, "From New Deal to Termination," 560-566. Arthur M. Schlesinger Jr.'s Vital Center (Boston, 1949), which epitomizes midcentury liberal thought, is suffused with dichotomies such as hard and soft (p. 36), sentiment and fantasy as opposed to power and pragmatism (p. 40), doughfaces and realists (p. 38), and doers and wailers (p. 159).

[38] Senate Committee on Interior and Insular Affairs, Hearings, Columbia River Basin (81st

Cong., 1st and 2nd Sess., 1950), p. 88; Krug to Straus, May 6, 1949, box 28, Program Staff Central Files, RG 48, NA; Benton J. Stong to Chapman, May 18, 1950, File 1-318, RG 48, NA; Richardson, Dams, Parks & Politics, pp. 32, 36-38.

[39] Coate, "Water, Power, and Politics in the Central Valley Project," pp. 167-179; John R. Waltrip, "Public Power During the Truman Administration" (Ph.D. diss., University of Missouri, 1965), pp. 68, 122-124; Phyllis R. DeLuna, "Public Versus Private Power During the Truman Administration: A Study of Fair Deal Liberalism," (Ph.D. diss., University of Alberta, 1974), pp. 565-566.

[40] Fortas to Ickes, Nov. 10, 1944, box 258, Ickes Papers, LC; Senate Subcommittee of the Committee on Public Lands, Hearings, Exemption of Certain Projects from Land-Limitation Provisions of Federal Reclamation Laws (80th Cong., 1st Sess., 1947), 104-8; U.S. v. Tulare Lake Canal Co., 535 Fed.2d at 1139, 1140; 68 I.D. 370; Koppes, "Public Water, Private Land," 623-636.

[41] Paul Douglas to Paul S. Taylor, Jan. 23, 1953, 26.3 Case File Correspondence, Paul Douglas Papers, Chicago Historical Society, Chicago; Paul S. Taylor, California Social Scientist (oral history interview, 3 vol., Bancroft Library, University of California at Berkeley), II, p. 234; Koppes, Public Water, Private Land," 624-636.

[42] Chapman to Arthur Carhart, Nov. 6, 1951, box 122, Chapman Papers, HSTL; Chapman to Straus and Drury, June 27, 1950, File 8-3, RG 48, NA; Richardson, Dams, Parks & Politics, chap. 3; Owen Stratton and Philip Sirotkin, The Echo Park Controversy, (University Press of Alabama, 1959).

[43] Chapman address to National Audubon Society, Nov. 13, 1951, box 77, Chapman Papers; Chapman to Arthur Watkins, Nov. 21, 1951, File 8-3, RG 48; William Voigt, Jr., to J. W. Penfold and Arthur Carhart, Dec. 11, 1950, Arthur Carhart Papers, Conservation Library, Denver Public Library, Denver, Colo.

[44] Chapman to Truman, Oct. 8, 1951, box 122, Chapman to Paul J. Raver and Harold T. Nelson, Jan.

21, 1952, box 123, Chapman Papers; Ickes manuscript diary, Dec. 17, 1950; Udall v. Federal Power Commission, 387 U.S. 428 at 450.

[45] Transcript of telephone conversation between Chapman and Krug, April 7, 1949, box 49, Krug Papers; monthly narrative report of the National Park Service for April 1949, box 35, Program Staff Central Files, RG 48, NA; Chapman to Newton Drury, Jan. 3, 1950, box 24, Chapman Office Files, NA; Swain, Wilderness Defender, pp. 285-287; Public Papers of the Presidents: Harry S. Truman, 1952-1953 (Washington, 1966), pp. 1113-1114; William C. Everhart, The National Park Service (New York, 1972), pp. 252-257.

[46] Harold K. Steen, The U.S. Forest Service: A History (Seattle, 1976), pp. 269-271, 274; William Voigt Jr., Public Grazing Lands: Use and Misuse by Industry and Government (New Brunswick, N.J., 1976), pp. 132-148; Gerald D. Nash United States Oil Policy, 1890-1964: Business and Government in Twentieth Century America (Pittsburgh, 1968), pp. 185, 190, 208; Charles McKinley, "The Impact of American Federalism upon the Management of Land Resources," in Arthur W. MacMahon, ed., Federalism: Mature and Emergent (New York, 1952), pp. 321-323.

[47] C. Petrus Peterson to Fred Seaton, May 23, 1957, Peterson memorandum, "Kings River Contract," n.d., ca. June 1957, Reclamation Files, Fred Seaton Papers, Dwight D. Eisenhower Library, Abilene, Kansas: 64 I.D. 273; Coate, "Seventy-Five Years of the Bureau of Reclamation"; Electrical World, CLVII (Feb. 26, 1962), 59. If the New Deal conservation programs are properly defined, interpretations that view Fair Deal conservation as an extension of the New Deal and Eisenhower era environmental policy as a retreat lose their force. Public power, for instance, is sometimes cited as one of the "substantial" accomplishments of the Fair Deal and a retreat under Eisenhower. (See Leuchtenburg, "A Troubled Feast," p. 673, and Hamby, Beyond the New Deal, p. 515.) But closer examination reveals that these authors interpret public power as simply expansion of federal generating capacity; they overlook the New Deal's distinguishing element: distribution. Although Eisenhower called for a "partnership" of federal, state, local, and private agencies in resource development, the federal role still bulked large.

"We must more than match the substantial achievements in the half-century since Theodore Roosevelt awakened the nation to the problem of conservation," the GOP president said in his first annual message to Congress, in 1953. See Public Papers of the Presidents: Dwight D. Eisenhower (Washington, 1960), p. 26. Reclamation appropriations, though not equaling the Truman-era record, continued at a high level, and in some cases Democratic Congresses cut the administration's requests. Thus to argue, as does Gary Reichard, that "the years 1953-1954 witnessed the end of an era of active government involvement in the development of the country's natural resources" involves vast exaggeration. See The Reaffirmation of Republicanism: Eisenhower and the Eighty-Third Congress (Knoxville, Tenn., 1975), p. 149. George Van Dusen interprets Republican conservation policy as a retreat from the Fair Deal because he mistakenly assumes that New Deal conservation remained intact through 1953. See "Politics of 'Partnership': The Eisenhower Administration and Conservation, 1952-1960" (Ph.D. dissertation, Loyola University of Chicago, 1973). Much of Van Dusen's evidence actually sustains an interpretation of continuity between Truman and Eisenhower; see for instance, the discussion of public domain management, pp. 252-254.

Some might consider the federal attempt to assert federal control over the off-shore oil lands from the late 1930s to 1953 to be the major exception to the similarity of Truman and Eisenhower resource policies, since the Republicans turned the "tidelands" over to the states in 1953. By the late 1940s, however, the tidelands question was no longer a structural issue, if it had ever been one. Chapman based his defense of federal ownership on national security criteria. During the Korean War he attempted, without legal authority, to start a leasing program in order to begin oil production, but retreated quickly when Congress objected. Both the Truman and Eisenhower administrations favored rapid exploitation of the resource by private oil companies. See Koppes, "Oscar L. Chapman," pp. 394-416.

[48] Richardson, Dams, Parks & Politics, pp. 196-198.

[49] Graham, Toward a Planned Society, ch. 3; Nash, United States Oil Policy, p. 201; Richardson,

Dams, Parks & Politics, esp. pp. 198-201; Mark I. Gelfand, A Nation of Cities: The Federal Government and Urban America, 1933-1965 (New York, 1975), p. 199; Lawrence Friedman, Government and Slum Housing: A Century of Frustration (Chicago, 1968), pp. 116-119; Richard O. Davies, Housing Reform During the Truman Administration (Columbia, Mo., 1966), 116-142; Ellis Hawley, The New Deal and the Problem of Monopoly (Princeton, 1966); Robert L. Branyan, "Anti-Monopoly Activities During the Truman Administration" (Ph.D. dissertation, University of Oklahoma, 1961), 237; Arthur F. McClure, The Truman Administration and the Problems of Post War Labor, 1945-1948 (Rutherford, N.J., 1969), 242-243; Griffith, "Truman and the Historians," 36-41.

[50] John Morton Blum, The Republican Roosevelt (New York, 1965), p. 17.

Gerald D. Nash, University of New Mexico

We have been privileged to read an interesting and provocative article by Professor Koppes that deals with an important era in American environmental history. To be sure, neither the subject covered nor the nature of the approach to it are entirely unfamiliar. Koppes applies the traditional liberal ideological suppositions to examine the activities of certain selected self-styled New Deal liberals who espoused their particular views concerning needed environmental policies. Within this narrow framework Koppes' paper is a model of historical scholarship--well researched, well thought out and well written.

But the question arises whether in 1982 such an approach is adequate for environmental history, considering that similar themes, and a similar orientation have permeated much of the research and writing about environmental history in the last forty years. It is questionable whether what I would designate as a moralistic-elitist approach is as useful in understanding environmental policies in 1982 as it was in 1942 or whether the New Deal decade should be taken as the benchmark of American environmental policies in the twentieth century--by which policies before 1933 and after 1945 should be evaluated. Is it not time to question our traditional assumptions? Is it not time to seek new approaches to old familiar themes? Have we not gained historical perspective over the last forty years? From the vantage point of historians interested in organizational development, like myself, Koppes' analysis reflects a lack of realism. The conceptual framework used in the paper is not only unduly narrow but at times leads unwittingly to serious distortion of the evidence. In my commentary I wish to dwell on these two aspects of his fine paper, analyzing first, the conceptual framework, and secondly, distortion of the available evidence, including research data utilized for this study.

In analyzing Koppes conceptual framework I would like to emphasize what I consider to be at least five major influences in environmental history for the period covered which he largely ignores because of a

limited perspective. I would hasten to add that these are not the only influences on the shaping of environmental policies from 1933 to 1953 which are missing from his analysis. Yet they are illustrative, I think, of the broader dimensions of the subject which are slighted in this paper. Let me enumerate them before engaging in a closer examination of each. In the first place, Koppes largely ignores regional or sectional conflicts over use of the environment. Since in the 1980s sectional disputes over environmental policies are becoming more vocal, a consideration of this significant influence seems particularly pertinent. In fact, as I read Koppes' paper it struck me that it might also be entitled: "The Easterner as an American Liberal."

In the second place, I think that Koppes needs to consider more fully the crucial role of the bureaucracy in the implementation of American environmental policies. Koppes is aware of the importance of the bureaucrats but perhaps should delve more deeply into their internal conflicts and their desire to expand both their personal power as well as that of their particular agencies. Without an appreciation of bureaucratic struggles an examination of environmental policies takes place in a vacuum and smacks of a lack of realism. From an organizational perspective some of the self-styled liberals whom Professor Koppes so admires--Ickes, Fortas, Chapman among them--do not seem terribly liberal at all, but emerge as self-serving power brokers.

In the third place, I wonder whether Koppes places too great a faith in the rhetoric of those involved in the formulation of environmental policies, without probing deeper into the self-interest which that rhetoric was often designed to cover. Fourth, I think that this fine paper could be made even better by considering the broader contextual framework of American environmental policies from 1933 to 1953. Many of the actions Koppes attributes to individual policy makers had their roots in changing economic and social conditions in the United States. Their own shifts were often merely political reactions to more far reaching changes in the nation, not so much ideological as pragmatic. Perhaps Koppes assumes that we are all aware of these changes, but to ignore

them is to magnify the role of individuals some of whom were merely striving for political survival.

Finally, has the time come for more detailed study of the grass roots support of environmental policies? Should we focus as much on the masses as well as the classes? Should we not consider the many interest groups who impinged on the formulation of environmental policies in the United States rather than exclusively on a bureaucratic elite composed of self-styled liberals? I raise that question because I think that a consideration of the wide range of interest groups who have a role in determining environmental policies is more realistic and meaningful than a primary focus on selected spokespersons for one particular orientation. These concerns over the conceptual framework used in this paper are not all inclusive but illustrate what I consider to be an unduly limited perspective on environmental policies in the two decades after 1933.

A consideration of regional antagonisms and sectional conflicts over the use of the environment is essential, I think, for American environmental policies in the twentieth century. Such a concern is vital because between 1933 and 1953 a major portion of America's remaining natural resources happened to be located west of the Mississippi River. In the 1980s we are becoming more aware of this obvious fact than ever. This is due not only to our increasing awareness of energy problems. It is also directly related to the Census of 1980 which revealed that for the first time in the history of the United States its center of population was west of the Mississippi River--about twenty miles west of St. Louis. It seems to me that historians of twentieth century America have until now consistently ignored these regional conflicts. Historians living east of the Mississippi River have between 1945 and 1980 by and large ignored the West, and have focussed their attention on eastern population centers, on social change, and on minorities. Western historians, on the other hand, have tended to concentrate on developments in the region before the twentieth century and have not sought to place its growth within the mainstream of American life after 1890. Thus, although much evidence is available concerning conflicts between East and West over utilization of the environment the subject has barely been tapped by

historians.

An awareness of evidence concerning sectional conflicts would alter our present views of twentieth century environmental policies, however. In the case of the Koppes paper, for example, it is striking that most of the leaders of environmental policies he describes are Easterners. Not only were they individuals born and bred in the East, but they were Easterners who were seeking to dispose of resources located in the West. To Westerners their policies often appeared not as liberalism but as colonialism whereby representatives of the older and more populous, powerful East were seeking to impose their particular views concerning utilization of the environment on a region where they were considered absentee landlords. From the perspective of some Westerners the self styled eastern liberals were not liberal at all, but reactionary colonialists seeking to exploit the West for their own particular economic or social interests. My point in raising the issue of Western colonialism is not to heap praise or blame, or to cast a judgment about who was right or wrong in these disputes. It is, rather, to emphasize that historians who seek to understand the formulation of environmental policies need to consider the clash of regional interests and sectional antagonisms. Politicians like Franklin D. Roosevelt, Harry Truman and Dwight Eisenhower were far more sensitive to the clash of sectional interests than the bureaucracy involved in the administration of environmental policies. In Professor Koppes' paper his sympathies are clearly with the latter. Perhaps the political leaders were more realistic than the liberal dogmatists in their ranks, and possibly historians, too, should be more sensitive to geographical diversity and become more detached by broadening their own vision of these conflicts.

Although Koppes is clearly aware of the importance of the bureaucracy in the implementation of environmental policies he does not delve far into its inner workings. Much of public policy emerges not out of lofty ideals or pristine policy statements, but out of the morass of bureaucratic in-fighting. To ignore this basic element of the political process is to create an environmental Disneyland. Between 1933 and 1953 many aspects of environmental policies emerged directly out of such

bloody backstairs politics. Not only did internal conflicts between bureaucrats in particular agencies shape the contours of environmental policies. Individuals charged with the implementation of such programs were often engaged in simply seeking to expand their personal power.

Many examples could be adduced to illustrate this trend, but one example can suffice. In many ways Harold Ickes was a most admirable figure in the conservation movement. As Koppes writes, "he sought to remake his department into a comprehensive conservation agency." But that was only part of the story, for it cannot be denied that he was also constantly engaged in seeking to expand his personal influence and jurisdiction, to the constant irritation of his co-workers. If we are to understand the reluctance of Congress between 1945 and 1953 to authorize new regional development authorities in the image of the TVA we need to consider Ickes' constant attempts between 1935 and 1945 to centralize control and direction of such authorities in the Department of the Interior under his direct supervision. And this desire to achieve centralization was not limited to electric power, but extended also to petroleum, fish and wildlife, forest resources, to name only a few. The fear of centralization--and possible nationalization of natural resource industries--which he inspired brought about a profound reaction among those affected by environmental policies even after he left office. In short, bureaucratic conflicts are an endemic part of environmental policies and historians need to consider them if they strive for a realistic analysis.

An examination of environmental policies between 1933 and 1953 needs to delineate the distinction between rhetoric and self-interest. A case in point concerns petroleum. During the 1920s, and certainly by 1933, leaders of the large oil companies happily espoused the cause of conservation because it endowed their own oligopolistic efforts to control production and market demand with a beneficent cause in the service of the public's interest. Similarly, President Roosevelt and his advisers defended governmental limitation of petroleum production both under the NRA and under the Connally Act of 1935 as a necessary conservation policy. My contention is that environmental policies are rarely divorced from

economic policies. But historians need to sift beyond the rhetoric of the participants to sort out the blend of economic, political, and environmental considerations which are often intertwined. Similar themes run through the development of state as well as federal policies concerning timber or fisheries during these years. The rhetoric of conservation was frequently used by participants to veil their more pressing economic or other self interests.

I would argue also that environmental policies must be studied within a broad rather than a narrow context. By focussing largely on the actions of selected individuals Koppes conveys the impression that they were the prime movers of environmental policy--operating in a vacuum. Thus, in discussing the alleged transition from commonwealth liberalism to corporate liberalism in 1945 Koppes writes that "the Krug administration, like Truman's first term, marked a transitional period . . .(a) retreat." And in an even broader vein he notes "The continuity in post war conservation suggests that the greatest change in conservation policy occurred not in the transition from Truman to Eisenhower, but from Roosevelt to Truman. The reasons for this change must be sought in the interplay of the three elements that supported New Deal conservation." Why New Deal policies should be a sacrosanct benchmark is unclear, but Koppes assigns the blame for the decline of New Deal conservation policies to executive leadership, Congress, and weakening liberal thought. That is a rather narrow framework in which to evaluate an issue as diverse and complex as environmental policy.

For, in truth, these shifts of environmental policy did not take place in a vacuum. Policies that seemed appropriate in times of depression--and in an era of perceived scarcity--were not at all deemed suitable by the President, Congress, and varied interest groups in an era of affluence--and perceived abundance. Such changing conditions and perceptions need to be considered since they may have been more significant than the views of individuals who were reacting to them. I think that Koppes ignores the crucial impact of World War II on economic and environmental policies. More so than the New Deal the war represented a turning point in American public policies. In the 1930s Americans were understandably deeply influenced by the Depression. Leading economists like the Keynesian Alvin Hansen

were obsessed with scarcity in the economy. They eagerly embraced the myth of the closing of the frontier in 1890 to justify their proposals for compensatory spending in an economy which had reached the limits of its growth. But World War II rudely disrupted the weltanschauung of these and other prominent economists of the Depression era. The war revealed that the American economy was a sleeping giant, one which had gone through a temporary period of stagnation, but which in 1945 seemed to have almost unlimited potentials for further development. This changed perception--to culminate in the preoccupation of most economists with economic growth--during the 1950s directly affected American environmental policies. It explains the changing emphasis of public policy from conservation to development. This represented not so much a recanting of New Deal liberalism as a pragmatic response to changing conditions in the United States. Koppes is surprised that men like Krug, Chapman, Lilienthal, Paul Raver or Michael Straus reversed some of their views on environmental policies in the 1950s. Yet it seems that they were only reflecting changing perceptions of the American economy and the environment. From the perspective of an organizational historian their behavior was not at all surprising. They were not backsliding liberals but forward looking pragmatic bureaucrats. Some were capable of intellectual growth while others simply reflected strong instincts for bureaucratic and political survival.

I believe also that a realistic framework for the analysis of environmental policies needs to consider the grass roots elements comprising various interest groups involved in the formation of environmental policies. Koppes in a sense idealizes a bureaucratic elite as the bearers of liberalism. In a sense they represented what C. Wright Mills at the time (1951) dubbed as The Power Elite. That this trend was not confined to the United States was revealed by the appearance in 1957 of Milovan Djilas' pathbreaking book, The New Class, detailing the rise of a new bureaucratic managerial class in eastern Europe. Comparative history is hazardous, but I would like to suggest that men like Ickes, Fortas, Krug, Lilienthal, and others described by Koppes represented a similar class of power brokers in the American political system. These men were not responsible to the electorate, nor did they have a

large constituency. Who, for example, gave a mandate to a planner like Fortas to substitute public for private power development wherever it was feasible? I would suggest further that the perspective provided by Djilas is useful in analyzing many major figures involved in the formulation of American environmental policies from 1933 to 1953. Yet I would like to take this perception one step further by suggesting that it would be well for American environmental historians to study not only the leaders, but the grass roots constituents of environmental groups. The complexity and diversity of these groups remains hidden as long as historians maintain a narrow focus on the leadership.

A perspective that focuses primarily on the views of liberal environmentalists may at times seriously distort factual evidence. A good example concerns the circumstances surrounding the departure of Under-Secretary Abe Fortas from the Department of the Interior. Koppes notes that "personal departures contributed to the malaise (of the decline of New Deal conservation)" in bemoaning the shift from Roosevelt to Truman. "Resignations thinned the ranks of New Deal conservationists particularly that of Abe Fortas at the end of 1945." This represents a serious distortion of the evidence. Fortas did not leave because of disillusionment over environmental policies under Truman. He was fired and forced to leave. Although Ickes had relied heavily on Fortas for several years, he became increasingly disenchanted with his overbearing arrogance, and persistent efforts to downgrade others in bitter bureaucratic fighting and struggles over the extension of his personal power. Environmental policy considerations were often lost amidst the heat of these battles. By the fall of 1945 Ickes was particularly aroused by Fortas' vicious and unprovoked attacks on Ralph Davies, the Deputy Petroleum Administrator for War on whom he had come to rely even more heavily than on Fortas in 1944 and 1945. As Fortas became more vehement in seeking to besmirch Davies' integrity by carefully planted rumors Ickes lost his patience and asked for his resignation. Thus, Fortas left the administration. It would be nice to believe Koppes that Fortas departed in a halo of glory to stand by high ideals which he found tarnished. But the evidence suggests that not only was he fired, but that petty motivations such as jealousy and personal

aggrandizement were major considerations dictating his return to private life.

Although the documentation used by Koppes is impressive it reflects a relatively narrow orientation. He has mainly used the records of the bureaucratic New Deal elite he admires. Like any author, he tends to find what he seeks. He has not broadened his perspective to include records of those not sympathetic to his central characters, be they Congressmen and Senators from the Western states, corporate spokesmen, cattlemen's associations, or groups representing miners, oil producers, or timber interests. Many of these were small producers. Nor did they speak with one voice. But should not historians heed their role as well as those of elitist bureaucrats?

In conclusion, I believe Koppes has written an able article. I think it would be even better if it were suffused with a greater degree of realism. I think the time is apt to ask some new questions in environmental history. We need to be aware of regional divergences in views on the environment and we need a greater in-depth understanding of the bureaucrats who molded many phases of environmental policies. We need a clearer delineation between the rhetoric and the self interests of those involved in the formulation of environmental policies--and we need to relate them to the changing context of economic and social conditions from which they emerge. In particular, we need to consider the grass roots elements of environmental groups. What were the regional and the social origins of the varied people active in environmental groups? And in the process of considering such questions we need to broaden our research base and to utilize historical data generated by these varied interests. But we should be grateful to Koppes for his stimulating paper, for raising our consciousness to questions such as those that I have posed, and for encouraging us to seek out new paths for research in environmental history.

COMMENT

Harold L. Burstyn
U.S. Geological Survey

Though I agree in part with Professor Nash's strictures on Professor Koppes' paper, I want to direct my comments to some issues raised in my mind by the paper rather than to the paper itself. It seems to me that the Federal Government works very well as the arbiter among conflicting, organized interests. In Koppes' terms, the Federal Government follows the model of "corporate liberalism." At the same time, the Federal Government is far more benign as an employer than are almost all corporations. Only universities, it seems to me, are more benign. Of course, civil servants do have constraints on them. "The business of a civil servant . . . is to do what he is told." [1] Nevertheless, there is far more opportunity to do what one sees ought to be done in the Federal Government than there is in private industry. This seems to me to be the reason one finds in Federal employment civil servants of the intellectual caliber and historical importance of Gifford Pinchot and Aldo Leopold.

With the Great Depression, the Federal Government became almost the only place for jobs for the well-trained, especially the science and engineering graduates of the major universities. They entered the Federal civil service in large numbers. Since the newcomers were ambitious as well as able, the civil service became far more oriented to action than it had been before. Furthermore, the collapse of the American economy made it possible to think about, if not to implement, really radical solutions.

Robert Moses, a lifelong Republican, once taxed Franklin D. Roosevelt with reversing the historic difference between the Republican and Democratic parties. [2] Until the New Deal, the Republicans were for stronger central government and the Democrats for stronger states' rights. With the New Deal, what Koppes calls "commonwealth liberalism" became the basis for policy, and the Federal Government stepped in to take on responsibilities that had previously belonged to states and municipalities.

The most powerful of the "commonwealth liberals"

was Harold Ickes, who dominated Roosevelt's cabinet as Herbert Hoover had dominated the Harding-Coolidge cabinet. As a Bull Moose Republican, Ickes found his agenda in the first conservation movement of Theodore Roosevelt. He made his own the traditional Interior Department attempt to get back the management of the National Forests by wresting the Forest Service away from Agriculture. Though he failed to get the Forest Service, Secretary Ickes did pry loose the Biological Survey and the Fish Commission in 1939, and he merged them to form the Fish and Wildlife Service in 1940. (After almost exactly one generation, the Bureau of Commercial Fisheries--the heart of the old Fish Commission--became independent and moved to the Department of Commerce. Such is the politics of bureaus.)

On the larger issue raised by Professor Koppes' paper--who had the better policies, the New Deal's "commonwealth liberals" or the Fair Deal's "corporate liberals"--I can offer only the briefest of observations. The problem, for the historian as for the statesman, of deciding which are the correct policies, is that there is a split between local and national interests in the eyes of their proponents. For the public lands, these local interests are largely western. This is what Professor Nash has come from New Mexico to tell us, and why he asks Professor Koppes if the New Deal ought to be the touchstone for the policies of Truman and Eisenhower. Perhaps the answer to this dilemma is for historians to stop behaving like judges in a contest. Rather than awarding after the fact the crown of a moral victory, we are better engaged, in my judgment, in uncovering the hidden assumptions behind the choices that were available, in weighing the impact of diverse judgments of value on the political choices that were made.

Professor Nash also points to the crucial role of the bureaucracy. As an agency, or a department such as Interior, grows in size, it becomes harder to reform. That is, the direction it moves in tends to be set, not by the party in power, but by the permanent bureaucracy. The Congress can't give clear political guidance on long-term issues, because "for the politician in a democratic society, infinity is the election after the next one." [3]

Finally, let me point out that the Federal

Government has, since 1920, carried out the policy of trusteeship for the public land that Roderick Nash has called for so eloquently. Both the Mineral Leasing Act of 1920 and the Taylor Grazing Act of 1934 abandoned the traditional alienating of public lands in favor of making the Federal Government their trustee, giving the users leases rather than titles.

ENDNOTES

[1] Sir Thomas Little Heath (Joint Permanent Secretary to the British Treasury, 1913-1919), quoting his predecessor, Lord Welby (Permanent Secretary, 1885-1894), in The Treasury (London and New York, 1927), 9.

[2] Robert Moses, "Why I Oppose the Fourth Term," Saturday Evening Post 217 (15): 17, 109-110 (October 7, 1944).

[3] Roger Revelle, "The Scientist and the Politician," Science 187 (1975): 1100-1105, 1101.

Clayton R. Koppes

Since much of my paper is either ignored or misconstrued in these critiques, it may be useful to re-establish the original intention of this session. My purpose was to offer a synthesis of New Deal and Fair Deal environmental policies and to relate that synthesis to an interpretation of the changes in liberal ideology from 1933 through 1953. This strategy grew from my conviction that environmental policy was integral to larger ideological and policy trends of the Roosevelt and Truman administrations, that environmental policy helped illuminate important intellectual and policy differences between the two periods, and that this area of policy recalled some of the more radical possibilities of the New Deal that are often overlooked. I believe, moreover, that what we need today for the Roosevelt-Truman period of environmental history is synthesis. We have an abundance of bureaucratic and organizational monographs; more are always welcome. But our major task is to create a framework for what will otherwise remain discrete policy events.

The pattern I found showed a marked change in environmental policy from the New Deal to the Fair Deal. I attribute this change primarily to the expansionary capitalist economics of World War II and the postwar period. (Having overlooked this part of my paper, Professor Nash goes to some lengths to reinforce it.) Throughout the paper the three points of analysis--liberal thought, executive leadership, and Congress--are used not merely because of their importance to policy making but as reflections of the large context. This is not the only synthesis that one might attempt, but I believe that trying to reconstruct the intellectual climate is an essential component of policy analysis.

Professor Nash has charged me with not writing a book on this subject, for his compendium of omissions would require no less. I can only plead guilty. But in any case I would not limit the book as he suggests. I prefer to be explicit about the normative considerations. I begin with the proposition that environmental issues are peculiarly community concerns. Environmental policy is not merely sectional but national in scope. Although

most of the resources the the Interior Department administered were in the West, they were not Western resources. Environmental protection tends to be a very generalized good; this is hard to express in a political system geared to interest groups devoted to particular issues, especially when a generalized environmental good impinges on a specific economic interest. Federal policy therefore becomes especially important for environmental issues; however imperfectly, the federal government, the executive branch in particular, is the agency for carrying out these community concerns on a national level. This is not to idealize federal officials (also known as "bureaucrats") but to begin to wrestle with the problem of how environmental concerns are expressed in the American political system.

Environmental policy is scarcely addressed in Professor Nash's critique. Although his approach to the subject is unclear, he seems to see environmental policy as the flip side of economic policy. To that end he has framed a critique ostensibly of methodology, but one that is suffused with value judgments and ideological predelictions. I wish to consider three examples from his provocative account.

First, regional conflict and the related analysis of the grass roots. Anyone who studies the Department of the Interior knows that from 1933 through 1953 it was even more of a Western-oriented department than it is today. Presentist references to population shifts and current controversies, if anything, obscure our recognition of that reality. Westerners comprised about one-third of the Senate; that block, coupled with their domination of the public-land committees, gave them substantial influence on policies affecting the section.

But the West was not--and is not now--a unified region. Take United States senators. Some, such as Patrick McCarran of Nevada, harassed the bureaucracy interminably when even its timorous efforts impinged on the large stock growing interests. Others, such as James Murray of Montana and Edward Costigan of Colorado, were ardent New Dealers for they knew what real economic colonialism was--exploitation of the region by absentee corporations, usually in extractive industries that built no enduring regional base. The West was riven with intra-sectional, even

intrastate rivalries, to say nothing of economic conflict. Nor were all the relevant environmental and economic interest groups Western. Many were national in scope or headquartered outside the region. As an analytical concept "the West" is a blunt instrument. It is useful only when coupled with more fine-grained techniques, including some rigorous social analysis rather than Professor Nash's spurious inversion of "classes" and "masses."

Second, there is an important place for the contribution of organizational or bureaucratic historians, so long as we are not trapped by it. The best works of this type, such as Graham Allison's Essence of Decision: Explaining the Cuban Missile Crisis, [1] are useful in analyzing why choices are made from a relatively narrow range of options. They are less effective--indeed often uninterested--in explaining why the choices available are so limited. Yet this prior question of why the context of decision making is thus contrained may be the more important. For example, Allison is helpful in explaining why the blockade was chosen over an immediate air strike. But we need a different mode of analysis to understand why diplomatic measures were rejected from the start--never considered, really--in favor of an immediate, public military confrontation.

The organizational or bureaucratic perspective tends to assume that "where you stand depends on where you sit." The trouble is that actors seldom conform to what verges on a deterministic model of behavior. Harold Ickes and Ray Lyman Wilbur both sat in the secretary's chair, and both faced the same economic circumstances of the Great Depression. But they stood in quite different places. Ickes tried to increase federal control, implement planning, and encourage redistribution. Wilbur, on the other hand, tried to diminish his department's authority by ceding public lands to the states, eschewed planning in favor of so-called market forces, and assisted large interests against small landowners by administratively exempting the Imperial Valley from the 160-acre law. An understanding of the two men's ideological differences may not form a complete explanation of their different policy patterns, but it is an indispensable point of departure.

Finally, Professor Nash's discussion of

bureaucracy leads back to the very normative problems he claims he is trying to overcome. His view of the role of the bureaucracy in policy making is unclear. At times he suggests that policy emerges from the clash of interest groups. At other points he seems to see the bureaucracy as virtually self-actualizing. Although Professor Nash intimates that all bureaucracies are the same, he aims most of his strictures at New Deal officials. His methodological suggestions are not advanced in a spirit of neutrality but in a dichotomy between victim and victimizer.

Note his witches' sabbath of New Deal bureaucratic policy making. The West, wanting only the freedom and economic development it deserves, is set upon by Eastern elitist liberals, who, acting not for the public interest but out of personal and institutional lust for power, foist their alien schemes upon the region--presumably in defiance of the section's wishes. The rhetoric of the "bureaucrats" cannot be trusted: it serves chiefly to cloak their darker purposes and hidden drives. The world of these "colonialists" is a byzantine maze of "bloody backstairs politics" and is peopled with individuals who "were often simply seeking to expand their personal power" (emphasis added). Professor Nash suggests that the West lay in the grip of a bureaucracy comparable to that imposed on postwar Eastern Europe. But the inspiration for this comparison, Milovan Djilas' idea of the new class, dealt with a party or political bureaucracy that had "control of the national income and national goods." As political scientist Andrew Hacker says: "Even if his analysis is correct for Communist regimes, Djilas' conception of a 'new class' seems only marginally applicable to the American experience." [2] Western polemicists have sometimes made similar leaps. In California Senator Sheridan Downey's book They Would Rule the Valley "they" were Bureau of Reclamation bureaucrats. [3] Such hazardous essays in comparative history are, however, relatively rare among scholars.

Despite his implication that the nature of bureaucracy is implacable, Professor Nash detects a transformation after World War II. He finds "forward looking pragmatic bureaucrats," some of whom are even "capable of intellectual growth." Why Professor Nash prefers this line-up is not immediately clear, for

these Fair Dealers would seem to offer equally compelling examples of bureaucratic mischief. They effectively turned over administration of the public domain to the large stockmen, dropped efforts to rehabilitate the Alaska salmon resource, abandoned the redistributive principles behind public power, and through administrative subversion eviscerated the clear congressional mandate of the 160-acre law. One of these bureaucrats, Michael Straus, engaged in empire building on a grand scale: By 1950 his Bureau of Reclamation controlled 61 percent of the department's budget (a peacetime record), launched a program of massive environmental change in Western river basins, and with the Echo Park Dam proposal attempted what was perhaps the ultimate act of bureaucratic aggrandizement in environmental policy--the invasion of wilderness areas dedicated in perpetuity.[4]

Since these two sets of bureaucrats exhibit similar behavior, Professor Nash is not making his choice on methodological grounds. He wants different outcomes--in short, an ideological preference that he leaves implicit. If it is the environmental outcome that matters, New Deal policy remains one of the most important contributions, but one that was substantially reversed by the Truman administration.

NOTES

[1] Graham Allison, Essence of Decision: Explaining the Cuban Missile Crisis (Boston, 1971).

[2] Andrew Hacker, "Two 'New Classes' or None?" in B. Bruce-Biggs, ed., The New Class ? (New York, 1979).

[3] Sheridan Downey, They Would Rule the Valley (San Francisco, 1947).

[4] Professor Nash's invocation of C. Wright Mills, The Power Elite (New York, 1970) is misleading. Mills' "power elite" is not a government bureaucracy but a combination of "the political directorate, the corporate rich, and the ascendant military" (p. 296). He believes this triad of power developed during

World War II. In other words, Mills' formulation fits Professor Nash's Truman-era "pragmatists" more closely than it does the New Dealers. Although Mills notes that corporate managers eventually came to dominate the New Deal, he believes that for a time the New Deal represented a political power that "contested" and "supplemented" corporate power (p. 273). Mills explicitly contrasts the power elite with "a civil service that is linked with the world of knowledge and responsibility" (p. 361). How Professor Nash could so misconstrue Mills is unclear, unless, "like any author, he tends to find what he seeks."

ENVIRONMENTAL REFORM IN THE INDUSTRIAL CITIES: THE
CIVIC RESPONSE TO POLLUTION IN THE PROGRESSIVE ERA

Martin V. Melosi
Texas A&M University

The American nineteenth century produced Henry David Thoreau, George Perkins Marsh, John Muir and others, who encouraged their fellow citizens to develop an environmental consciousness. Not until the Progressive Era, however, was a concern for the physical environment widely publicized, popularized, and translated into government policy.[1] The nineteenth century was a time of disorder as the United States underwent a transition from a rural, agrarian to an urban, mechanized society. It was also a time of remaking. As the century came to a close, Jeffersonian notions of individualism and the pastoral life seemed inappropriate or at least unattainable. In confronting the impacts of industrialization and urbanization, Americans were forced to deal with threats to the nation's resources, to the natural landscape, to the city environment. They were also forced to contend with fundamental changes in the style and quality of their lives--whether they lived in cities or on farms. Implicit in the despoliation and exploitation of the environment were questions of values and ethics, which were difficult to articulate and even more difficult to answer.

The best known environmental response of the period was the conservation movement. To James Penick it was "the most ambitious and comprehensive program to evolve from [the] multidimensional attempt to make a bureaucratic response to industrialism." [2] Jeremy P. Felt argued that no problem "drew a more vocal and impassioned comment from the progressives than did that of the conservation of natural resources." [3] The conservation movement was, in the narrowest sense, an effort to conserve, preserve, manage or protect the nation's resources. In this way its goals transcended the era and provided a legacy for the modern ecology movement.

In a larger sense, the conservation movement was a critique on contemporary America, addressing concerns about the erosion of rural life, the expansion of industry, and the growth of cities. It

expressed criticism or even outright rejection of urbanization, manifest in attempts to revitalize agrarian society through the "back-to-the-land" concept, the Country Life Movement, and even the promotion of national parks. Yet it did not address the problems which the cities faced.[4]

An urban environmental movement was born in the Progressive Era which did address those problems, especially threats to the city due to pollution. While urban environmental reformers shared the conservationists' interest in resource management, they did not share a suspicion of city life. An urban environmental ethic emerged during the Progressive Era which decried pollution and unpalatable living conditions, but did not seek to undermine the process of urbanization. Urban environmental reformers accepted the growth and expansion of cities, not only because they had little choice, but because they believed that cities were worth preserving.

By the turn of the century, the industrial cities were already established as focal points of social, political, and economic life in the United States. They had emerged rapidly and dramatically in the nineteenth century, becoming the dominant urban form between 1870 and 1920. The urban population had increased from 1.8 million (10.8 percent of the population) in 1840 to more than 54 million (51 percent) in 1920. Urban population growth per decade was no less than 29 percent, and as much as 92 percent in the 1840s. The number of urban areas also increased dramatically from 131 in 1840 to more than 2,700 in 1920. Relatively new cities, such as Cleveland, Pittsburgh, and Milwaukee experienced impressive population growth and economic prosperity, shaping them into industrial cities. Industrialization also transformed many older commercial cities, such as Boston, Baltimore, Philadelphia, and New York.[5] As early as 1870 industrial concentration and specialization of production were immutably linked to urban growth.[6]

American cities in the industrial age were hardly Edenic, more closely resembling Charles Dickens' "Coketown" than the Victorian dream of "Hygeia." Crowded slums, congested streets, poor sanitation, smoky skies, and bone-rattling noise characterized the cities at their core, while even

the burgeoning suburbs did not escape environmental threats posed by inadequate city services, tainted water supplies, and industrial pollution.[7] Industrial cities--the products of economic determinism, rapid demographic change, and non-planning--presented an image which understandably led many people to conclude that the only way to deal with urban life was to escape it.

However, the industrial city, in the words of Theodore Dreiser, was "the magnet attracting." While posing many dangers, the industrial city offered opportunity and diversion as well. It was at once the point of convergence for hordes of immigrants crowded into slums, but also the visible sign of American material progress--the home of corporate giants and entrepreneurial legends. It reeked with the despair of the poor, but also flaunted the success and power of the rich and the expectations of the great middle. It was a fertile breeding ground for political ideas--liberalism, democracy--and the battleground for others--bossism, home rule. While the industrial city could be an environmentalist's nightmare, it was also a consumer's paradise. It was the good life and the bad, but it was most of all the future of a modernizing culture.

Urban environmental reformers, as defenders of city life, recognized something more confounding than repulsive in the image of the industrial city. Ultimately, they sought to identify and eliminate physical threats to the city and its people without remaking the urban environment itself or tampering with its benefits. They were not the first to confront threats to the American urban environment, but they were the first to do so through organized environmental reform. Prior to the Progressive Era, pollution and other threats were dealt with on a case by case basis. By the 1890s, however, the scale of urban growth was such that environmental problems affected the whole city rather than individuals or neighborhoods. The means to combat various forms of pollution and physical debilitation were also becoming known or available, in the form of increased technical expertise or scientific discoveries. And reformers were encouraged by changing attitudes of policymakers within municipal government, who were willing to give higher priority to environmental problems because of their community-wide implications.

Municipal protest over environmental issues was legitimized through its association with progressivism. Since progressive reforms of several types were rooted in the industrial cities, urban environmentalists had little trouble identifying themselves with the prevailing reform spirit. In some cases, environmental reformers were urban protesters who accepted the progressive ideology to identify what they were confronting; in other cases, those who called themselves progressives took an interest in urban environmental issues. In any event, they shared basic assumptions, most notably a desire to bring order out of the chaos induced by the economic revolution of the nineteenth century. They shared a faith in humankind and an environmental determinism, which led them to expect that the good in people would prevail if the evils produced by imperfect social, political, and physical circumstances were eliminated. They also placed their faith in an expert elite and scientific method to find solutions to society's problems. Moralistic, and often paternalistic in their goals, they decried poverty, injustice, corruption, and disease. Progressivism, therefore, offered a fortuitous rhetorical framework for urban environmentalism, but also a set of concepts and values applicable to the fight against pollution.[8]

Urban environmental reform has generally eluded historians not because it was an obscure aspect of the reform ethos of the time, but because it operated within the larger context of the Progressive Movement and was not seen as separate from it. In reality, urban environmentalism was articulated and promoted by two distinctive, but not totally independent groups. One was composed of professionals with a techno-scientific/organizational bent, who worked within the municipal bureaucracy as administrators, employees or consultants. They were primarily engineers, efficiency experts, and public health officials. Their primary role in environmental reform involved developing systems to combat various health hazards and pollutants, compiling statistical information, and monitoring and regulating community health and sanitation standards. Sanitary engineers (a term used during the period to denote municipal engineers who dealt with environmental problems) developed strategies for street cleaning and collection and disposal of refuse, designed sewers

and drainage systems, and devised new methods of ventilating buildings. Efficiency experts established cost-accounting systems, gathered statistics on pollution problems, and organized personnel-management programs. Public health officers promoted environmental sanitation and epidemic control. As a group, the techno-scientific/organizational reformers provided expertise on a scale never before available to municipal government.[9]

While the expert elite in the urban environmental movement effectively transmitted their ideas to municipal policy-makers and through their professional organizations, they were largely ineffective in publicizing and popularizing a concern for the environment among the public. A second group of urban environmental reforms filled the vacuum. They were laymen with a strong civic/aesthetic emphasis, who operated primarily outside of municipal government, generating influence through organized protest, citizen appeal, or public education. Lacking the expertise to implement most changes themselves, they supported the efforts of the engineers, efficiency experts and public health officials, and acted as a conduit for promoting environmental consciousness among the people. As a result, they were central to the development of an urban environmental ethic during the Progressive Era.

The composition of the civic/aesthetic group guaranteed certain emphases as well as clear limits to urban environmental reform in the period. Civic environmentalists came primarily from one of two sources: (1) voluntary citizens' associations, reform clubs, civic organizations, whose interest in urban life was broad and varied; and (2) environmental pressure groups--smoke and noise abatement leagues, sanitation groups--whose interest in city problems was very specialized. The membership for all of these groups came primarily from the middle and upper-middle classes. Economically solvent and insulated from the worst environmental threats, their environmentalism was based primarily on a general concern for civic improvement.

The Progressive Era was an age of civic group activity. Civic groups increased from fewer than

fifty in early 1894 to more than 180 by the end of the year. By 1896 every large city and many smaller ones had at least one reform organization. By 1909 there were more than 100 periodicals dealing primarily with urban affairs, many of which grew out of the civic organizations. National networks of civic groups were also established by the mid-1890s. The National Municipal League and the League of American Municipalities represented a vast array of reform interests throughout the country. These groups were responding to the myriad problems and concerns raised by the growth and expansion of industrial cities, and by the economic dislocations of the era (most notably the Panic of 1893).[10]

An examination of the charters and by-laws of many of these organizations indicates a strong interest in environmental issues, especially sanitation, public health, housing, pure water and sewerage, and several other sources of pollution. For example, the Advance Club, organized to promote "the business and material interests" of the city of Providence, Rhode Island, listed as one of its ten departments "Water, Sewerage, and Sanitary Conditions." The Municipal League of Grand Rapids had an interest in city water-supply, drainage, public health, and street-paving. New York's Committee of Seventy took an active interest in garbage removal and disposal. And the Municipal Improvement Association of Kansas City studied problems of street-cleaning and sanitation, water and gas service, and sewerage.[11]

Among the civic organizations and voluntary associations, none were more active or more influential in environmental reform than women's groups. It is no surprise that women were central to the civic/aesthetic aspect of environmental reform. As housewives and mothers, they were among the most convincing speakers for good health, sanitation, and public cleanliness. Since many of the pollution problems--dirty streets, refuse, impure water, smoke, noise--were perceived as the natural extension of problems women faced in the home, men were not threatened by women's advocacy of environmental reform.[12]

Women played a vital role in all phases of environmental reform in the period. The Ladies' Health Protective Association of New York, the

Woman's Municipal League of New York, and similar groups were important promoters of civic cleanliness--or "municipal housekeeping" as it was called. Women such as Caroline Bartlett Crane, Mary McDowell, and even Jane Addams were leaders in the sanitation movement. Ellen Swallow Richards was an instructor of sanitary chemistry at MIT and a pioneer ecologist. Julia Bartlett Rice, a New York physician, was the driving force behind the Society for the Suppression of Unnecessary Noise--the most important organization of its type in the nation. In Chicago, Mrs. Charles Sergel was elected president of the city's Anti-Smoke League; while in Pittsburgh, the Ladies' Health Association fought for and obtained passage of a major anti-smoke ordinance. Several women served as smoke and sanitation inspectors, ward supervisors for sanitation, public health officers, and members of health and sanitation commissions.[13]

The clearest indication of the public awareness of pollution problems during the Progressive Era was the formation of municipal organizations formed to combat specific problems. Cities such as Pittsburgh, St. Louis, Cleveland, and Chicago, with particularly alarming smoke problems caused by the burning of bituminous coal, had strong anti-smoke groups. The most tangible success of these organizations were the enactment of smoke abatement laws in almost every city by 1912.[14] In the anti-noise campaign, the Society for the Suppression of Unnecessary Noise in New York City was a model for several other similar groups throughout the country.[15] Sanitation and public health groups took many forms and were found in most major cities. In some cases, children were enlisted as informal sanitary inspectors and promoters of good health. George E. Waring, Jr., the Street Cleaning Commissioner of New York City from 1895 to 1898, organized the Juvenile Street Cleaning League (1896), the first of several children's sanitation organizations throughout the country. By using children, civic reformers hope to indoctrinate a whole generation of young urbanites as well as transmit sanitation practices to the children's parents.[16]

What these groups (and individuals) shared by way of values and beliefs in addressing the various forms of pollution constitutes a primitive, yet emphatic, urban environmental ethic in the

Progressive Era. The civic reformers' acceptance of progressivism is not sufficient, however, to understand the exact nature of that environmental ethic. More specifically, it was built around two major concepts--urbanism and consumerism--which incorporated several interlocking ideas about the environment.

As the industrial cities grew larger, compounding the environmental and social problems of a previous time, many people looked with dismay on urban America. James Bryce, Henry George, and others warned of the dangers of cities as great evils. Historian John C. Burnham argued that one type of "revulsion that set the stage for a new vision of American life" was revulsion against the "image of the city." "Even within urban areas themselves," he stated, "large numbers of Americans were still seeking the virtues of rural communities that they had known as children." [17]

The urbanism of the civic reformers rejected that notion, however. Although they were far from pleased with the state of the city, it does not follow that they rejected the urban lifestyle as untenable. Quite the contrary, they responded to the physical (and social) deprivations with an alternative image of city life as a positive good. This attitude grew out of an optimism which stressed that the unacceptable conditions were merely temporary. In other words, civic reformers were critical of current environmental conditions, not city life itself. Writing in 1896, Thomas Devlin stated:

The magical growth of cities has been the pride of the people. The metropolis of each state is sort of Mecca for its people. The cities have become a gigantic power in the political and social life of the nation . . . within them are all the allurements and excitements of modern life . . . This movement is necessarily attended by many evils, and much has been said and written to counteract the crowding of cities. Such efforts are useless. The present population of cities is permanent. The evils which have been incidental to their rapid growth must be eliminated. Living in

cities must be desirable.[18]

There is a sort of resignation in Devlin's words, but also an environmental determinism which suggested that change was possible. Jane Addams' biographer, Daniel Levine, sensed the same emphasis among reformers of the period: ". . . in the city the natural environment almost disappeared. The entire environment was man-made. Many Americans missed the difference and transferred their environmentalism from nature to the city, assumed that both were immutable and that individuals must simply adapt, whether they lived in wilderness Kentucky or south Chicago." He went on to say that "those who noticed the difference between the two [the natural and the man-made environments] argued that since the new environment was man-made, men could make whatever they chose." [19]

The flaws of urban society, therefore, did not lead to despair or outright rejection, but to a desire to eliminate those flaws. This was the central role of pollution-fighting. Pollution was a tangible (at least in the minds of the reformers) by-product of industrialization and urbanization which had to be confronted. Less elusive than social problems or political ideology, it could be dealt with and defeated through direct means. This, of course, was a simplistic notion of pollution and its eradication, but it made the battle against environmental problems appear resolvable.

As environmental determinism provided a rationale for turning the imperfect into the more-perfect, so did a perception of the city as organism add to the prevailing view that the city was not only salvageable, but worth saving. Roy Lubove has made a strong case about urban reformers' perception of the city as an organism "which, if properly directed, would enable men to attain the good life." He argued that the "organic city, devoted to the service of all the people, would restore the social harmony once guaranteed by the invisible hand of Providence." [20] It was the sense of group responsibility, a corporate view of society, a sense that urbanites had common problems to address, which reinforced an organic view of city life and was expressed in the battle against pollution. As Frederick C. Wilkes concluded in an article on Pittsburgh's street problems:

Is there not presented in this matter a topic well worthy of the most serious consideration from every business man, and every citizen having in his heart the least degree of interest in his home and the welfare of this community? It is well established as an immutable law, that environment is what makes the character of men. Cleanliness of man makes a good man. Cleanliness of a city makes a good city. It elevates its moral atmosphere, and tends to encourage all that is good in humanity.[21]

The methods civic groups employed to deal with pollution demonstrate a faith in group participation. Anti-smoke, anti-noise, anti-litter ordinances were promoted as means of establishing community-wide pollution standards. Clean-up and paint-up campaigns--which almost every city instituted by the 1910s--sought to involve everyone in the community in sanitation.[22] Training children through juvenile street cleaning leagues or junior smoke abatement leagues were part of an educational program meant to instill a sense of civic responsibility among the young. Publicity programs, from distributing leaflets to organizing public demonstrations, brought the problem of pollution directly to the people. All of these events and activities were staged for the benefit of an apathetic public and a disinterested municipal government to express the need for community action. Reliance on experts to find technical and scientific solutions to pollution was necessary, but civic involvement was also essential in an organic society. In many ways, therefore, civic reformers acted as environmental revivalists.

The urbanism of the environmental reformers expressed a faith in the future of the city, if not its present. Yet, environmental reformers were not bent upon remaking, restyling or transforming the essential economic characteristics of the industrial cities. In addressing the problem of pollution, they sought to eliminate the pollutants, not their causes. An adherence to material progress through industrial production and economic growth were not abandoned for the sake of a cleansed environment. The civic reformers' response to pollution was conservative in the sense that they wanted to improve the physical

setting without impeding the opportunity for upward mobility made possible through economic activity.

One way to avoid the conclusion that industrial activity was intrinsically responsible for despoiling the environment was to deal with pollution as a result of wasteful and inefficient production techniques. Smoke abatement advocates, for example, charged that air pollution graphically demonstrated the squandering of natural resources through inefficient burning. It would behoove industry to reduce smoke, they contended, for the sake of efficiency. Why let dollars spent on fuel go up the smokestack? Richard Watrous, the secretary of the American Civic Federation, made a similar point in discussing the smoke problem:

Almost as persistent a campaign has been waged against the smoke nuisance, although this effort had involved the careful investigation of preventive measures which, while they would lessen the flow of black smoke from factories and locomotives, would not entail financial hardship on manufacturers or railroads, but would on the contrary secure greater efficiency with less waste.[23]

To many, the production of smoke meant economic activity, which meant progress. Reformers chose to emphasize greater efficiency and greater effectiveness of operation, rather than question the industrial process itself.[24]

Anti-noise advocates employed a similar approach. Noisy machinery was inefficient. When the racket from the machinery threatened the hearing of employees, it was important not only to stress the health hazards attendant, but also the impact of such health hazards on the productivity of the workers. As Raymond Smilor suggested: "Noise was a liability in business; it cost money. Although it failed to appear on the balance sheet, noise showed in the profit-and-loss statement as an unrealized economy." [25] The economic argument was not simply a tactic employed by the reformers to gain support, it was a widely held belief which influenced the limits of urban environmentalism in the era.

The urbanism of the civic reformers gave impetus

to the fight against pollution, but their consumerism suggested how they defined that problem. In his writings on the anti-noise campaign, Raymond Smilor borrowed from the work of David P. Thelen, who suggested that progressive reformers were consumer activists. As applied to the anti-noise campaign, Smilor argues: "The anti-noise campaign reveals the development of an early consumer activism. Noise was a problem that affected everyone intimately, part of the common experience that all people shared. Men and women were consumers not only of high prices and defective products but also of a polluted environment. Their roles as consumers cut across social barriers and led them to join forces for environmental change." [26]

Consumerism was the first line of contact with pollution, and it was primarily sensory. Smoke made you cough and sputter, garbage had a stench, water could be discolored and taste bad, noise pierced the ears. While scientists were developing some effective tools for determining levels of pollution during the period--chemical tests for water pollution, audiometers for measuring decibel levels, and so forth--civic reformers still relied primarily on their senses to explain the impact of pollution. Response to environmental problems, therefore, induced a threat-reaction. And environmental threats were perceived primarily as health hazards, and to a lesser degree, as defilements of the aesthetic qualities of the urban setting.

Environmental reform had matured in the Progressive Era, nonetheless. Until the late nineteenth century, pollution was generally regarded as a nuisance and nothing more, that is, aggravation with little inherent danger. This suggests a stronger emphasis on aesthetics and a lesser emphasis on health. Environmental reformers reversed that emphasis in the 1890s by recognizing the relatively obvious relationship between wastes and disease, but also the not-so-obvious relationship between smoke, water, and noise pollution and disease. Physicians and other health experts were suggesting that some forms of pollution not only had physiological impacts, but emotional and psychological impacts as well. For example, excessive noise made people more irritable and prone to be more irrational in dealing with others. [27]

Environmental reformers in the Progressive Era benefited from the increased scientific knowledge made public in the late nineteenth century. Until the 1880s or 1890s, the miasmatic (or filth) theory of disease dominated American thinking. British sanitation practices and theories in the mid-nineteenth century introduced the notion that disease was caused by environmental factors; that putrefying wastes emitted stenches or miasmas which caused illness.[28] The proper response to disease, therefore, was environmental sanitation--civic cleanliness, proper drainage and sewerage, adequate ventilation of buildings, and removal of refuse. Because these practices often provided some relief from epidemics and various diseases, they were accepted virtually without question as a solution to health problems in the cities. However, the discovery of specific pathogenic organisms--bacteria--in the 1880s enabled public health officials and sanitarians to understand the actual causes of many contagious diseases for the first time. The "germ theory" eventually replaced the older notions about the relationship between filth and disease, and offered environmental reformers more ammunition in their fight against pollution.[29]

While the bacteriological revolution increased the scientific knowledge about disease, programs in environmental sanitation were not abandoned. Part of the reason was the lingering debate between contagionists (defenders of the germ theory) and anti-contagionists (defenders of the filth theory) over the reliability of their information. But another reason for the continuation of environmental sanitation to combat disease had little to do with scientific arguments. From the perspective of the civic reformers, environmental sanitation offered direct participation in the improvement of health conditions in the cities. Although it could not, in and of itself, control the spread of disease, civic reformers realized--and rightly--that civic housekeeping aided in the overall sanitation of the community. Yet clean-up campaigns, promotion of hygiene in the schools, and support of water- and waste-carriage systems also fit into the reformers' sensory perspective of pollution. In a large sense, to abandon environmental sanitation would have been tantamount with questioning their threat-oriented view of environmental problems in the city.[30]

This is not to say that urban environmental reformers were scientific Luddites. It only suggests that, as laymen, their perspective of pollution was guided by a more generalized and non-specific response to pollution than was true of engineers or public health officials. Although often simplistic, and in some cases wrongheaded, the focus on pollution as a health hazard was the strongest and most dramatic case to present to a disinterested or skeptical public, who might be more inclined to accept pollution as a natural and acceptable consequence of industrialization and urbanization. Pollution as a health hazard also fit into a more general environmental perception held by civic reformers: Poor sanitation and health were signs of backwardness and barbarity; civilized societies were pristine and sanitary. Filth bred chaos, cleanliness bred order.

The civic reformers' promotion of good health, sanitation, and pollution-control also had strong aesthetic overtones. Appearances were important; cities that were pleasing to the eye were good places to live. In light of the strong sensory orientation of civic reformers, something which looked clean was clean, something that was new and beautiful was also healthy. Civic pride was associated with civic beauty--pollution undermined civic pride by attacking civic beauty. The emergence of the City Beautiful Movement, which swept the nation in the 1890s, provided the rhetoric for equating the elimination of pollution with an idealized City Aesthetic. The visual impact of the Chicago World's Fair (1893) offered dramatic impetus for an aesthetic revival in American cities. Virtually overnight numerous beautification projects were begun, especially two major redevelopments in Chicago and Washington, D.C. City Beautiful helped to give civic improvement a loftier purpose, and gave environmental reformers another tangible issue to present to the public as a reason for eliminating pollution.[31] Caroline Bartlett Crane, a well-known health expert and civic reformer, stated: "We gladly hear much to-day of the movement for civic art; but it is well to remember that civic art without civic cleanliness is a diamond ring on dirty hands. The adornments of a dirty city do but emphasize its dirtiness, while cleanliness has not only a virtue but a beauty of its own." [32]

Environmental consumerism helps to explain why

pollution problems, while recognized as having a general negative affect on human health and civic beauty, were treated as individual blights by reformers. Since urban environmental reformers were threat-oriented, they tended to address the various forms of pollution individually. While correct in assessing water, air, refuse, and noise pollution as unique, they rarely viewed them as having similar root causes, nor did they attempt to evaluate their cumulative impact on the urban environment. Without access to ecological science and theory, they confronted pollution problems separately according to the apparent impact on the city.

There is a clear progression, from the most obvious to the least obvious form of pollution, in the way reformers confronted specific pollution problems in the late nineteenth and early twentieth centuries. Almost simultaneously with the advent of the industrial cities came demands for pure water and improved sewerage. The growing populations were utterly dependent on safe and plentiful sources of water as well as effective waste-carriage systems. There was little debate over the need for pure water and adequate sewerage, only over the means of obtaining them.[33] However, in the case of refuse pollution, no major organized protests against street cleaning practices or collection and disposal methods were mounted until the early 1890s when refuse came to be viewed as something more than a nuisance. As the piles of garbage and refuse engulfed the cities and as the incidences of disease were on the rise, refuse reform gained a following.[34] In the case of smoke, demands for abatement mounted as the use of bituminous coal rapidly increased in the 1890s, especially in cities with large-scale industrial facilities such as Pittsburgh and St. Louis. Not surprisingly, noise was the last major pollutant of the period to gain much public attention, largely because noise was much more elusive than other forms of pollution. Abatement efforts did not get under way until the mid-1890s.[35] The hierarchy of pollution recognition says a great deal about the environmentalism of the era.

While it might be suggestive to state what urban environmental reform was not during the Progressive Era, this would do little to elucidate the contributions of the civic/aesthetic group to the development of an environmental ethic in the United

States. Given the context of the late nineteenth and early twentieth centuries--the limits of scientific evidence and the conflict between growth and quality of life in particular--they contributed substantially to the future ecology movement and addressed questions which conservationists only touched upon lightly. Most significantly, they adhered to the notion that urban life, with proper adjustments, could not only be tolerable but desirable. In accepting this notion they were accepting the dramatic changes brought on by the industrial revolution. In this sense, they were more radical than conservative. They accepted the inevitability of change and tried to accommodate themselves to it rather than to resist it or turn back the clock. That they resigned themselves to accept a concept of economic growth which could threaten the urban environment made them conservative in the sense that they confronted the results rather than the broader causes of pollution. In essence, urban environmental reformers of the Progressive Era, directed by their urbanism and consumerism, asserted that pollution was an undesirable and unnecessary by-product of the urban/industrial process. The environmental vision which the civic reformers helped to shape at the very least provided a departure point for a more sophisticated view in the future, but one grounded in the inevitable trade-off between a pristine environment and economic prosperity.

ENDNOTES

[1] For the purposes of this paper, "Progressive Era" will refer to the period roughly between 1890 and 1920, when contemporary reformers used the appellation "progressive" to identify their responses to problems associated with the urban/industrial transformation.

[2] James Penick, Jr., "The Progressives and the Environment," in Lewis L. Gould, ed., The Progressive Era (Syracuse, 1974), p. 119.

[3] Jeremy P. Felt, "The Progressive Era in America: 1900--1917," Societas 3 (1973): 108.

[4] For information on conservation ideology, see Samuel P. Hays, Conservation and the Gospel of Efficiency (New York, 1972; orig. pub., 1959);

Richard M. Abrams, "The Failure of Progressivism," in Richard M. Abrams and Lawrence W. Levine, eds., The Shaping of Twentieth-Century America (Boston, 1971; second ed.), p. 210; Joseph M. Petulla, American Environmental History (San Francisco, 1977), pp. 217-285; Penick, "The Progressives and the Environment," pp. 115-131. For a more comprehensive listing of works dealing with conservation, see Roderick Nash, ed., The American Environment: Readings in the History of Conservation (Reading, Mass., 1976; second ed.).

[5] U.S., Bureau of the Census, Characteristics of the Population, vol. 1 of Census of Population: 1960 (Washington, D.C., 1961), Part A, 1-14, 1-15, Table 8; Sam Bass Warner, Jr., The Urban Wilderness: A History of the American City (New York, 1972), pp. 55-112; Maury Klein and Harvey A. Kantor, Prisoners of Progress: American Industrial Cities, 1850-1920 (New York, 1976), pp. 68-108.

[6] Harold U. Faulkner, The Decline of Laissez Faire, 1897-1917 (New York, 1951), p. 135; Robert R. Russel, A History of the American Economic System (New York, 1964), pp. 195ff, 370ff; Klein and Kantor, Prisoners of Progress, pp. 101-102.

[7] Martin V. Melosi, "Environmental Crisis in the City: The relationship between Industrialization and Urban Pollution," in Martin V. Melosi, ed., Pollution and Reform in American Cities, 1870-1930 (Austin; 1980), pp. 3-17.

[8] For good bibliographic treatments of progressivism, see William M. Leary, Jr., and Arthur S. Link, eds., The Progressive Era and the Great War, 1896-1920 (Arlington Heights, Ill., 1978; second ed.); David M. Kennedy, ed., Progressivism: The Critical Issues (Boston, 1971); Gould, ed., The Progressive Era; Michael H. Ebner and Eugene M. Tobin, eds., The Age of Urban Reform: New Perspectives on the Progressive Era (Port Washington, N.Y., 1977).

[9] See Barbara Gutmann Rosenkrantz, "Cart Before Horse: Theory, Practice and Professional Image in American Public Health, 1870-1920," Journal of the History of Medicine 29 (January, 1974): 55-73; James G. Burrow, Organized Medicine in the Progressive Era (Baltimore, 1977), pp. 88-102; John Duffy, "The

American Medicial Profession and Public Health: From Support to Ambivalence," Bulletin of the History of Medicine 53 (Spring, 1979): 1-22; Jon A. Peterson, "The Impact of Sanitary Reform upon American Urban Planning, 1840-1890," Journal of Social History 13 (Fall, 1979): 83-103; Stanley K. Schultz and Clay McShane, "To Engineer the Metropolis: Sewers, Sanitation, and City Planning in Late-Nineteenth-Century America," Journal of American History 65 (September, 1978): 389-411; Martin V. Melosi, Garbage in the Cities: Refuse, Reform, and the Environment, 1880-1980 (College Station, Texas, 1981), pp. 79-104; Joel A. Tarr, Terry Yosie and James McCurley, "Disputes over Water Quality Policy: Professional Cultures in Conflict, 1900-1917," American Journal of Public Health 70 (April, 1980): 427-435; John F. Bauman, "Disinfecting the Industrial City: The Philadelphia Housing Commission and Scientific Efficiency, 1909-1916," in Ebner and Tobin, eds., The Age of Urban Reform, pp. 117-130.

[10] Melvin G. Holli, "Urban Reform in the Progressive Era," in Gould, ed., The Progressive Era, pp. 133-141; Ernest S. Griffith, A History of American City Government: The Progressive Years and Their Aftermath, 1900-1920 (New York, 1974), pp. 118-119, 158-160; Clifford Patton, Battle for Municipal Reform (Washington, D.C., 1940), pp. 34-35.

[11] See William Howe Tolman, Municipal Reform Movements in the United States (New York, 1895); Griffith, A History of American City Government, pp. 117-119; Clinton Rogers Woodruff, "The Movement for Municipal Reform," North American Review 167 (October, 1898): 410-417; W. J. Donald, "The Functions of City Clubs in Municipal Life," American City 17 (November, 1917): 407-415.

[12] Lois W. Banner, Women in Modern America (New York, 1974), pp. 47, 87-99; Suellen M. Hoy, "'Municipal Hosekeeping': The Role of Women in Improving Urban Sanitation Practices, 1880-1917," in Melosi, ed., Pollution and Reform in American Cities, pp. 174. See also the summary of the work of club women in American City 6 (June, 1912): 823-845.

[13] Mary E. Trautmann, "Women's Health Protective

Association," Municipal Affairs 2 (September, 1898): 439-443; New York City, Woman's Municipal League, "Campaign Bulletin" (November, 1903): 12; New York City, Woman's Municipal League, Yearbook, 1911-1914; Clinton Rogers Woodruff, "Woman and Her Larger Home," Good Housekeeping 48 (January, 1909): 3-10; Mabel Potter Daggett, "Women: The Larger Housekeeping," World's Work 24 (October, 1912): 664-670; Mrs. T. J. Bowlker, "Woman's Home-Making Function Applied to the Municipality," American City 6 (June, 1912): 863-869; Mary Ritter Beard, Women's Work in Municipalities (New York, 1916; orig., 1915), pp. 88-90; Suellen M. Hoy, "Caroline Bartlett Crane," APWA Reporter 45 (June, 1978): 4-5; Jane Addams, Twenty Years at Hull-House (New York, 1961; orig. 1910), pp. 200-205; Robert Clarke, Ellen Swallow: The Woman Who Founded Ecology (Chicago, 1973); Mildred Chadsey, "A Woman Chief of Sanitary Police," American City 6 (June, 1912): 871-873; Raymond W. Smilor, "Toward an Environmental Perspective: the Anti-Noise Campaign, 1893-1932," in Melosi, ed., Pollution and Reform in American Cities, pp. 141-142; R. Dale Grinder, "The Battle for Clean Air: The Smoke Problem in Post-Civil War America," in Melosi, ed., Pollution and Reform in American Cities, p. 89.

[14] See R. Dale Grinder, "The Anti-Smoke Crusades: Early Attempts to Reform the Urban Environment, 1893-1918" (Ph.D. dissertation, University of Missouri-Columbia, 1973).

[15] Raymond W. Smilor, "Cacophony at 34th and 6th: The Noise Problem in America, 1900-1980," American Studies 28 (Spring, 1977): 31-36; Imogen B. Oakley, "The Protest Against Noise," Outlook 90 (October 17, 1908): 351-355; "A Crusade for Quiet," Outlook 102 (September 28, 1912): 157-158; Carl Henry Mote, "The Effort to Control Municipal Noise," American City 10 (February, 1914): 147-149.

[16] Reuben S. Simons, "The Juvenile Street Cleaning Leagues of New York," (Part I), American City 3 (October, 1910): 163-166; (Part II), American City 3 (November, 1910): 239-243.

[17] John D. Buenker, John C. Burnham, Robert M. Crunden, Progressivism (Cambridge, Mass., 1977), p. 8. See also John W. Chambers II, The Tyranny of Change: America in the Progressive Era, 1900-1917

(New York, 1980), pp. 91-92.

[18] Thomas C. Devlin, Municipal Reform in the United States (New York, 1896), pp. 39-40. See also Delos F. Wilcox, The American City: A Problem in Democracy (New York, 1904), p. 91; Frederic C. Howe, The City: The Hope of Democracy (Seattle, 1967; orig. 1905), pp. 1ff; Horatio M. Pollock, Modern Cities: Progress of the Awakening for Their Betterment Here and in Europe (New York, 1913), pp. 13-14; "The Municipal Problem: The Ideal City," Outlook 93 (September 25, 1909): 141-142.

[19] Daniel Levine, Jane Addams and the Liberal Tradition (Madison, Wisc., 1971), p. 112. See also Robert H. Wiebe, "The Progressive Years, 1900-1917," in William H. Cartwright and Richard C. Watson, eds., The Reinterpretation of American History and Culture (Washington, D.C., 1973), pp. 425-429.

[20] Roy Lubove, "The Twentieth Century City: The Progressive as Municipal Reformer," Mid-America 41 (October, 1959): 195-203.

[21] Frederick C. Wilkes, "Cleanliness and Economy; How Pittsburg Might be Cleaned," Bulletin of the League of American Municipalities 4 (November, 1905): 154.

[22] William Parr Capes and Jeanne Daniels Carpenter, Municipal Housecleaning (New York, 1918), pp. 214-232.

[23] Richard B. Watrous, "The American Civic Association," American City 1 (October, 1909): 62.

[24] Grinder, "The Battle for Clean Air," pp. 83-103.

[25] Smilor, "Cacophony at 34th and 6th," p. 8.

[26] Smilor, "Toward an Environmental Perspective," p. 135; See also David P. Thelen, The New Citizenship: Origins of Progressivism in Wisconsin, 1885-1890 (Columbia, Mo., 1972), pp. 57-85.

[27] On noise, see Smilor, "Cacophony at 34th and 6th," pp. 25-35. See also Raymond W. Smilor, "Confronting the Industrial Environment: The Noise

Problem in America, 1893-1932," (Unpublished Ph.D. dissertation, University of Texas, 1978); John H. Girdner, "Noise and Health," Munsey's Magazine 25 (June, 1901): 323-326; Imogen B. Oakley, "Public Health Versus the Noise Nuisance," National Municipal Review 4 (April, 1915): 231-237; Hollis Godfrey, "The City's Noise," Atlantic Monthly 104 (November, 1909): 601-610; Mrs. Isaac L. Rice, "Our Most Abused Sense -- the Sense of Hearing," Forum 38 (April, 1907): 559-572. On smoke, see Grinder, "The Battle for Clean Air," pp. 85-88. See Also "Smoke Abatement," Bulletin of the League of American Municipalities 7 (January 1907): 7-11; Robert Hessler, "The Smoke Investigations of Mellon Institute: A Review," Survey 33 (March 13, 1915): 648-650; Lewis Edwin Theiss, "The High Cost of Smoke," Outlook 109 (February 24, 1915): 445-450; John O'Connor, Jr., "Four Points in the Indictment of the Smoke Nuisance," Popular Science Monthly 87 (September, 1915): 244-249; Herbert M. Wilson, "Smoke Worse Than Fire," American City 4 (May, 1911): 210-212.

[28] Howard D. Kramer, "The Germ Theory and the Public Health Program in the United States," Bulletin of the History of Medicine 22 (May/June, 1948): 233-247.

[29] Ibid. ; James H. Cassedy, Charles V. Chapin and the Public Health Movement (Cambridge, 1962), pp. 39-61; John Duffy, A History of Public Health in New York City, 1866-1966 (New York, 1974), pp. 91-111; George Rosen, A History of Public Health (New York, 1958), pp. 233-250.

[30] See Melosi, Garbage in the Cities, pp. 105-133.

[31] Jon A. Peterson, "The City Beautiful Movement: Forgotten Origins and Lost Meanings," Journal of Urban History 2 (August, 1970): 416-430; David R. Goldfield and Blaine A. Brownell, Urban America: From Downtown to No Town (Boston, 1979), pp. 214-217. See also David F. Burg, Chicago's White City of 1893 (Lexington, Kentucky, 1976).

[32] Caroline Bartlett Crane, "The Work for Clean Streets," Bulletin of the Women's Municipal League of New York City 5 (August, 1906): 1.

[33] See Joel A. Tarr and F. C. McMichael, "The Evolution of Wastewater Technology and the Development of State Regulations," in Joel A. Tarr, ed., Retrospective Technology Assessment (San Francisco, 1977); Tarr and McMichael, "Historical Decisions about Wastewater Technology, 1800-1932," Journal of Water Resources Planning and Management 103 (May, 1977): 47-61; Nelson M. Blake, Water for the Cities: A History of the Water Supply Problem in the United States (Syracuse, 1956); Stuart Galishoff, "Triumph and Failure: The American Response to the Urban Water Supply Problem, 1860-1923," in Melosi, ed., Pollution and Reform in American Cities, pp. 35-57.

[34] See Melosi, Garbage in the Cities.

[35] See citations throughout the footnotes on smoke and noise abatement, especially those by Grinder and Smilor.

THE SEARCH FOR THE ULTIMATE SINK: URBAN AIR, LAND AND WATER POLLUTION IN HISTORICAL PERSPECTIVE

Joel A. Tarr
Carnegie-Mellon University

Introduction

Some years ago the noted sanitary engineer Abel Wolman wrote an influential essay entitled, "The Metabolism of Cities." In the article Wolman described the metabolic requirements of the city as consisting of all the materials and commodities required to sustain the life processes of the city's inhabitants. The metabolic cycle, he said, was not completed "until the wastes and residues of daily life had been removed and disposed of with a minimum of nuisance and hazard." [1] Wolman's model of the city as a metabolic entity has historical as well as contemporary relevance. The processes by which pollutants have been generated have altered over time but so have the definitions of what pollution actually is. The meaning of the terms "nuisance and hazard" are time and culture specific and their definition depends upon many elements both within the urban container and within the larger society.

Urban pollution, therefore, at any time, can be understood as the product of the interaction between technology, scientific knowledge, human culture and values, and the environment. Environmental policy and control technology is a further element that must be added to the model, for at various times it has both reduced and exacerbated pollution problems or resulted in their transfer to different locales or media. The purpose of this paper is to examine three cases of urban air, land, and water pollution in order to explore the interactions between the above variables. More specifically, it will examine three larger and over-arching themes or questions:

- How solutions for one pollution problem often generated new pollution problems in different localities or in different media.

- How both values and scientific knowledge were involved with society's perceptions of the environment and

influenced policy to deal with pollution problems.

- How our perceptions of risk and hazard in regard to the urban environment affected our willingness to support policy to deal with these pollution problems (agenda setting).

The cases that will be examined are not necessarily unknown to students of environmental history, but I hope to focus on elements within each that will advance our understanding of the interactive nature of the problems of the urban environment.

I. The Water: Supply, Waste Disposal and Pollution

The problems of supplying an adequate and potable supply of water to urban inhabitants, and of disposing of both human wastes and wastewater, are the first situations where American society--in this case, cities--attempted to deal with pollution using a technological solution or technological fix. These questions of supply and disposal are interrelated and the solution to one often played a significant role in creating health and sanitary difficulties for other cities. Changing values in regard to the public health and water use have also been important in the society's attempt to deal with these problems over time and have generated new policy initiatives. The search for solutions to the problems of waste disposal and water pollution clearly illustrates the difficulty in finding a sink for wastes once they have been generated without causing further damage to the environment in other locales.

The water supply and human waste and wastewater disposal systems utilized in most cities during the 18th and much of the 19th century were characterized by a local focus. Water supplies were obtained from local sources such as wells and pumps drawing on ground water, from nearby ponds and streams, and from rainwater cisterns.[2] Used water (wastewater) and human wastes were usually disposed of in cesspools and privy vaults although occasionally they were thrown on the street or in vacant lots. Cesspools and privy vaults were essentially holes in the ground, sometimes lined, from which wastes often

leached (deliberately and accidentally) into the surrounding soil.[3] The land thus became the primary sink for both wastewater and for human wastes. In some cities human wastes were collected from privy vaults by scavengers (night soil men) or farmers with occasional regularity. These wastes were often recycled on the land as fertilizer or dumped in land depots or nearby waterways.[4] Before the 1850s no city had sewers for human waste removal and it was not until after 1880 that most municipalities constructed sewerage systems. Those sewers that existed were largely for storm water collection, and in some cities ordinances forbade citizens to deposit wastes in them.[5]

This system of local water supply and waste collection could operate without excessive nuisance or sanitary hazard when city populations were small and densities low, but as urban population and density increased in the late 18th and early 19th century, it became increasingly ineffective. The first part of the system to break down was the water supply. Various studies of city water supplies and public health in the first decades of the 19th century document the growing pollution of the local ponds and wells that served the population of cities such as Boston, New York, and Philadelphia and the problems that developed from inadequate supply.[6] Cleaner and more copious water supplies were needed for normal household functions such as drinking and washing, for fire fighting in crowded urban neighborhoods, for industrial purposes, and to flush the streets at times of epidemics. Associated with the demand for cleaner water supplies were concerns over the health effects of polluted water and dirty streets, and a growing realization that clean water and freedom from epidemic disease bore a relationship.[7]

Philadelphia was the first city to respond to the inadequacy of local water supplies and constructed the Fairmount Water Works in 1802 to bring potable water into the city from the Schuylkill River. Cities such as New York, Boston, Detroit, and Cincinnati followed Philadelphia's lead, and by 1860 the sixteen largest cities in the nation had waterworks, with a total of 136 systems in the country; by 1880 this number had increased to 598.[8]

As piped-in water became available, the more affluent urban households installed water-using fixtures. In 1848, for instance, Boston opened the Cochituate Aqueduct and by 1853 31,750 water-using fixtures of various types were in operation; by 1863 the number had increased to 81,726, of which over 13,000 were water closets. The availability of a constant household supply of water caused a rapid expansion in the number of users and in the volume of use. Chicago, for instance, went from 33 gallons per capita per day in 1856 to 144 in 1882; Cleveland increased from 8 gallons per capita per day in 1857 to 55 in 1872; and Detroit went from 55 gallons per capita per day in 1856 to 149 in 1882. These figures include industrial and other nonhousehold uses but they are still symbolic of a great increase in water consumption over a relatively short period of time as demand interacted with supply.[9]

But while hundreds of cities and towns installed water works in the first three quarters of the 19th century, no city simultaneously constructed a sewer system to remove the water. In most cities with piped-in water, wastewater was initially diverted into existing cesspools or occasionally into stormwater sewers or street gutters. The introduction of large volumes of water into cesspools designed to accommodate much smaller amounts unbalanced the system and caused serious flooding and disposal problems. This situation was exacerbated by the widespread adoption of the water closet, which greatly increased the problems of nuisance and of sanitary hazard in wastewater disposal by adding "black" water to "grey." Cesspool overflows caused the soil to become saturated, cellars to be "flooded with stagnant and offensive fluids," and made cleaning "nearly futile." [10]

Public health officials, especially if they believed in the anti-contagionist "filth theory" of disease, viewed overflowing cesspools with water-closet connections as a particularly dangerous threat to a healthful environment. As late as 1894 the secretary of the Pennsylvania State Board of Health, Benjamin Lee, complained that householders persisted in installing water closets in towns without sewers and connecting them to "leaching" cesspools. "Copious water supplies," warned Lee, "constitute a means of distributing fecal pollution over immense areas and no water closet should ever be

allowed to be constructed until provision has been made for the disposition of its effluent in such a manner that it shall not constitute a nuisance prejudicial to the public health." [11]

The health and sanitary nuisance problems caused in cities by running water and wastewater disposal generated a search for ways to modify the system or for new, alternative methods of disposal. Driving this search was the Sanitary Movement. The Sanitary Movement had begun in Great Britain in the 1840s and 1850s with the work of Sir Edwin Chadwick and his followers. [12] It spread to the United States by the 1850s and received some impetus from the work of the Sanitary Commission during the Civil War. [13] The Sanitary Movement was a social/cultural movement that essentially aimed at changing people's ideas about their own personal habits of cleanliness and conditions within the environment around them. At the heart of the Sanitary Movement was the belief in the environmental causes of disease, or what public health specialist Charles V. Chapin called "the filth theory of disease." This anti-contagionist theory maintained that disease sprang de novo from putrefying organic matter or gave rise to disease-carrying miasmas. [14]

The Sanitary Movement was propagated through a great wave of publicity. Its institutional and organizational embodiments were the American Public Health Association, the National Board of Health, and the multitude of local and state boards of health that appeared in the late-19th century. [15] The movement gave a tremendous impetus to organized public health and the physical cleaning of cities. In addition, the value change that caused people to perceive over-flowing cesspools and privy vaults as both unpleasant and as a health hazard that could be eliminated rather than as a natural nuisance to be tolerated, also stimulated a search for technologies to deal with the waste problem. [16]

Among the approaches tried were the pail system, the earth closet, and the "odorless excavator." The pail system and the earth closet were designed as substitutes for the water closet and the privy vault and permitted recycling of human wastes. Although each had their advocates, their inconvenience and labor intensive qualities compared to the water closet resulted in only limited adoption. [17] The

technology that secured the most proponents among engineers, sanitarians, and city officials, was the capital intensive water carriage system.

Water-carriage technology was designed to utilize the running water in the household as the medium of transport for wastes. Wastes were carried through a system of pipes to a place of disposal outside the immediate locale. The so-called sewerage system therefore offered a complete replacement for the previous system of cesspools and privy vaults. The model for the earliest American sewerage systems was London, which had constructed a system of brick combined sewers (stormwater and household wastewater in the same pipe) in the 1850s.[18] Brooklyn and Chicago both built sewerage systems before the Civil War, and many other municipalities followed in the last quarter of the century. By 1890, American cities with over 10,000 population had 8,199 miles of sewers and by 1909 cities with more than 30,000 population had 24,972 miles.

The water-carriage system of human waste disposal aroused controversy in many cities because of its costs and concerns over its health impacts. In numerous municipalities debates over adoption of the system, as well as its design, went on for a period of years.[19] Eventually, sewerage systems were constructed in all major American cities (Baltimore was the last, 1911) because their perceived benefits outweighed the costs--the technology promised health and sanitation improvements with minimal costs of disposal. Disposal was accomplished most simply by utilizing adjacent waterways, therefore shifting the sink for the wastes from the land to the water. Warnings by a few chemists and engineers of the potential hazards resulting from the disposal of sewage in streams or lakes were often dismissed with the argument that "running water purifies itself." Up until the 1890s, this hypothesis seemed confirmed by existing methods of chemical analysis of water quality. In 1909, 88 per cent of the wastewater produced by the urban sewered population was disposed of untreated in waterways, and the percentage was probably higher a decade before.[20]

Municipal construction of sewerage systems did greatly improve local sanitary conditions and, in many cases, reduced bacterial ailments such as infant

diarrhea and typhus. However, soaring morbidity and mortality rates from infectious disease such as typhoid in downstream and lake cities that drew their water supplies from waterways in which other cities disposed of raw sewage raised serious questions about the validity of the disposal hypothesis. The high health costs of sewage disposal in streams spurred research in bacterial science and in the epidemiology of water-borne infectious disease. Early in the 1890s, chemists and sanitary engineers at the Massachusetts Lawrence Experiment Station identified sewage polluted water as the carrier for infectious disease and confirmed the dangers of disposal of raw sewage in waterways used for drinking water supplies.[21] Thus, urban sewerage systems had shifted the sink for human wastes and wastewater from the land to the water and transferred the health and sanitary costs of disposal to downstream cities. Ironically, many of the cities that suffered most severely from sewage polluted water had themselves spent millions of dollars on sewerage systems to improve local conditions.[22]

Eventually, in the first decades of the 20th century, researchers in sanitary engineering solved the problem of sewage polluted drinking water with the development of other retrofits--water filtration and chlorination.[23] These technologies dramatically reduced the incidence of waterborne disease but did not improve water quality in terms of other potential waterway uses. Cities with older systems plus cities with newly constructed sewerage systems continued the practice of disposing of their untreated wastes in nearby waterways. Except for specific localities with severe nuisance problems from sewage disposal, municipalities resisted installing sewage treatment facilities that promised to provide direct benefits only to downstream cities and relied instead upon dilution to dispel the worst concentrations of pollutants.[24] Hence, by 1930, there was a large deficit between that population served by water treatment facilities and that served by sewage treatment plants. During the 1930s, a number of sewage treatment plants were constructed by the WPA but significant progress in improving water quality was not made until the post-war decades. During these years, federal dollars were added to local resources in attempts to control both municipal and industrial pollutants. At the same time, however, new toxic and other industrially based

pollutants, new analytic capabilities that made possible the identification of formerly unsuspected health hazards, and problems with controlling more traditional municipal wastes, caused increased public and professional concern over water quality.[25]

In the 1960s and 70s, a widespread public conviction developed that waterways should be limited in the extent to which they should serve as sinks for both municipal and industrial wastes. This belief culminated in the passage of the Clean Water Act in 1972 (PL 92-500) and the call for zero effluent by 1985. It is clear that this goal will not be reached, in spite of the development of some innovative treatment methodologies. Waterways will continue to serve as sinks for the various wastes generated in our urban areas for the foreseeable future for, as the 1980 Report of the Council on Environmental Quality noted, "cleaning up the nation's water takes a long time." [26]

II. The Air as a Sink: Coal, Smoke Control, and Acid Rain

The first air quality problem dealt with by American society involved smoke pollution in industrial cities. The problem of smoke was the result of a conjunction between the factors of urbanization, industrialization, and the utilization for fuel of high volatile bituminous coal. The fuel was the input into the metabolic cycle of the city, and smoke, as well as other air pollutants such as fly ash, were the outputs. Like human wastes in cesspools and privy vaults or polluted wells, it presented primarily a local pollution problem. A concern with smoke pollution reached back almost as far as did concerns with water supply, human waste disposal and water pollution, but substantive and successful action to control smoke came later than it did in regard to the latter. The lower place of smoke on the environmental agenda can be explained by the fact that smoke pollution presented a somewhat different type of problem than did water supply, human waste disposal and water pollution. These differences involved questions of impacts, control technology, and values.

1. Impacts:

Smoke had primarily nuisance impacts on both

people and property, causing discomfort and higher cleaning expenses in the city. Physicians suspected that smoke was responsible for many health problems but could not specify health impacts.[27] In contrast, water pollution had more immediate and observable health effects and bacterial science made it possible to show cause and effect scientifically.

2. Control Technologies:

While there were hundreds of patents issued in the 19th century for technologies to control smoke, there was no single technology that had clear cost and efficiency advantages or that demonstrated a consistent series of successes.[28] This contrasted with the record in regard to water supply, waste disposal, and water pollution, which were successively dealt with by the technological fixes and retrofits of water supply technology, water-carriage systems, and water filtration and chlorination. The substitution of a cleaner manufactured fuel for bituminous coal was suggested in the late 19th century but the idea was rejected as prohibitively expensive. District heating was a technology with some of the characteristics of sewerage systems that could have reduced smoke pollution considerably, but, because of considerations such as lower urban densities, the technology never became as popular in the United States as in Europe.[29]

3. Values and Perceptions:

Smoke had positive value connotations and was often equated with prosperity, production, growth and jobs.[30] In contrast, dirty or polluted water had no such positive value implications.

Attempts to control smoke in American cities actually began in the middle of the 19th century. Some cities banned bituminous coal burning locomotives from their streets while Pittsburgh attempted to forbid the construction of beehive coke ovens within the city boundaries in 1869. The Progressive Period saw a rash of municipal attempts to regulate smoke, and by 1912 twenty-three of the twenty-eight cities with a population over 200,000 had smoke control ordinances. These ordinances were aimed at visible smoke from industrial, commercial, and transport sources no city except Los Angeles had

regulations controlling smoke from domestic fires.[31] Most cities utilized the Ringelmann Chart, a visual method of measuring smoke density, to determine violations of their ordinances. While these smoke control efforts had some limited and sporadic successes in reducing dense smoke from industrial and transportation sources, they basically failed to make substantive inroads into the problem.[32]

The 1920s and 30s were a period of self-examination and re-analysis of the smoke question by the various professional groups, such as the Smoke Control Association of America and the Fuels Division of the American Society of Mechanical Engineers, involved in control efforts. Smoke reduction concerns through the 1920s had focused on industries, utilities and railroads, and professionals generally agreed that these interests had made advances in the elimination of dense smoke because of a desire to economize on fuel. The smoke problem persisted, most professionals agreed, because of a failure to control domestic sources. They considered smoke from household chimneys objectionable because "the amount of black smoke produced by a pound of coal is greatest when fired in a domestic furnace and that domestic smoke is dirtier and far more harmful than industrial smoke." [33]

In order to control domestic smoke, the experts argued, the same approach utilized to solve drinking water pollution--control at the source before distribution--would have to be followed. This strategy required ordinances that mandated the use of smokeless fuels or of equipment to burn dirty coal smokelessly. Securing support for such legislation, however, required a massive educational effort to change people's fuel using behavior in cities where cheap bituminous coal was heavily utilized.

Successful efforts to make control of domestic sources of smoke politically acceptable occurred in two cities before World War II--St. Louis and Pittsburgh. In both cities the statutes resulted from intensive media campaigns accompanied by the strong support of organized community, labor and business groups and important public figures. St. Louis was first to enforce against homeowners, as well as industry and railroads, acting in 1940.[34] The visible signs of its success in reducing smoke

inspired Pittsburgh groups to push for a similar ordinance which was passed in 1941. The Pittsburgh action is especially notable not only because of the municipality's reputation as the "Smoky City," but also because the soft coal mining industry had a strong base in the Pittsburgh region.

The 1941 Pittsburgh Smoke Control Ordinance was the strongest smoke control law passed by any city to that time. It had as its policy goal the elimination of dense smoke as well as other components of air pollution such as fly ash. Consumers would have to burn either smokeless fuel or use smokeless technology if they were using bituminous coal. The ordinance set emission standards for domestic fuel consumers as well as for industrial, commercial and transportation sources, and it created a Bureau of Smoke Prevention for enforcement.*[35]

[*One of the keys to the ordinance's passage was that the campaign managers were able to convince most Pittsburghers that the benefits of smoke control would outweigh the costs and that the policy would have minimal distributional effects. Two groups whose combined opposition might have blocked or delayed the law's passage--organized labor and the coal industry--were co-opted by involving them in the decision-making process and by the argument that smokeless fuel could be produced from local bituminous coal, thereby expanding coal production and jobs for miners.]

The Second World War delayed the ordinance's implementation and the city suffered extremely bad air quality conditions during the war because of the use of inferior fuels and old equipment. Convinced that the future of the city depended on smoke control, a coalition of key business leaders (the Allegheny Conference on Community Development) and the newly elected Democratic mayor (David L. Lawrence) united to promote implementation. Beginning in the 1947-48 winter, the Bureau of Smoke Prevention successfully enforced the law by regulating the supply of high volatile coal available to homeowners and forcing them to burn smokeless fuels (including smokeless coal) or use smokeless combustion equipment.[36]

In spite of initial difficulties with fuel supply, Pittsburgh air improved considerably in the

years after the initial implementation. Heavy smoke nearly disappeared from the Pittsburgh atmosphere. In 1955, for instance, the Bureau of Smoke Prevention reported only 10 hours of "heavy" smoke and 113 hours of "moderate" smoke as compared with 298 hours of "heavy" smoke and 1,005 hours of "moderate" smoke in 1946. Pittsburgh experienced benefits in terms of improved air quality, more sunshine, and improved health, as well as savings on cleaning costs, laundry bills, and injury to vegetation. A county law passed in 1949 provided the advantages of smoke-free air to the larger geographical area.[37] Pittsburgh decision makers had clearly decided that there were constraints on the extent to which they would allow the air to be utilized as a sink, in spite of the importance of coal to the region.

While the managers of the Pittsburgh Smoke Control movement had originally believed that smoke elimination would occur through the utilization of smokeless coal produced from local bituminous, natural gas soon became the dominant home heating fuel in the Pittsburgh region. In the post-World War II period, cheap natural gas from the southwest was piped into Pittsburgh and, because of cost and convenience factors, replaced coal. The rates of change for the city are striking. In 1940, 81% of Pittsburgh households burned coal and 17.4% natural gas (from Appalachian fields); by 1950, the figures were 31.6% for coal and 66% for natural gas.[38] This represented a change in fuel type and combustion equipment by almost half the city's households. Most of the transition took place after 1945 and was accelerated by the smoke control ordinance.

Throughout the nation in the 1940s and 1950s, natural gas and oil replaced coal not only for domestic heating but also for other industrial, commercial, and transport uses. By 1955, bituminous coal furnished only 27.2% of the nation's aggregate energy consumption, compared to 44.8% in 1945. During the same years, natural gas increased its percentage from 11.8% to 22.1% and oil from 29.4% to 40%. The most significant changes involved the substitution of natural gas for bituminous coal for domestic heating and other household uses and the replacement of the steam locomotive by the diesel electric. The percentage of consumers using natural gas for househeating increased from 35.5% in 1949 to 68.4% in 1960.[39] During the same period, the

number of coal-burning steam locomotives decreased from 30,344 to 374.[40] Coal thus lost a number of its traditional markets, and by 1954 the U.S. production of bituminous had reached 391,706,300 tons, the lowest tonnage of any year since 1909 except for the 1931-35 depression years.[41]

The increased substitution of cleaner fuels for coal in the post-war years had a marked impact on air quality in a number of cities, especially in regard to the reduction of visible smoke as a pollutant.[42] Simultaneous with the air quality improvements generated by technology was an increase in the number of communities and states enacting air pollution control regulations. A 1962 survey by the National Coal Association showed that of 216 urban areas east of the Mississippi River (the largest coal burning area), 140 had ordinances. Most communities (107) would respond to citizen complaint over air pollution while seven cities with over 200,000 population maintained enforcement bureaus. The ordinances varied in terms of the standards created and the enforcement provided, and usually depended upon the simple Ringelmann chart, providing for visual grading of smoke to determine violations.[43] While air pollution specialists warned of problems from other pollutants such as dust, fumes, and sulphur dioxide, the primary criterion of an air pollution nuisance was based on perceptible ground level effects.[44]

Since air pollution was primarily conceived of as a local problem, a technology that diluted ground level contaminants--tall stacks--was advocated by a number of air pollution experts in the 1950s and 1960s. These stacks were a method of forcing a pollution plume into the higher levels of the atmosphere, and they spread the pollutants over a much wider downwind area in order to prevent ground level concentrations. The concept used here resembled that followed in dispersing water pollution in a body of water--that of dilution. The air continued to be a sink, as had the water, but it was believed that natural processes would prevent overly objectionable or dangerous concentrations of pollutants.[45]

The tall stack technology was increasingly utilized by the ore smelting and electrical utility industries as a means of avoiding pollutant concentrations that would violate local air pollution

ordinances. The electrical power industry, which was located primarily in urban areas, was especially significant. Electrical utilities were expanding rapidly in the post-war generations, and had replaced the railroads as the coal industry's largest customer. In 1964, for instance, the electric utility industry consumed 46% of the 486,998,000 tons of bituminous coal mined.[46] A "dirty" fuel--bituminous coal--produced a "clean" form of power--electricity--and the tall stacks would use natural processes to dilute the pollutants.

By 1963, some utility stacks had reached the 700 foot level and predictions were made that they would climb to 1,000 feet in the near future. Books on air pollution control methodology advocated the tall stack technology as a means of diluting local concentrations of pollutants, although not without warning of possible "downstream" dangers. In 1965, for instance, the Air Conservation Commission of the American Association for the Advancement of Science reported that the tall stack approach had "considerable merit." The report also warned, however, that sulfur dioxide emitted in bituminous coal consumption oxidized to form sulfuric acid mist, and that while there appeared to be little danger, the global effects were unknown. The report recommended further study of the question.[47]

During the 1960s and 1970s, as the public became more environmentally conscious and concerned about the health effects and nuisances created by air pollution, stricter legislation appeared on the local, state, and national levels.* [*Concern over pollution from gasoline burning internal combustion engines, of course, was very important in stimulating tougher laws.] The Clean Air Act (1970) marked a high point of legislative effort to mandate clean air, and brought ambient concentrations of criteria pollutants under the control of national standards within 247 air quality control regions. Controls were to be imposed on pollution sources within each region, thus still emphasizing the locality. In order to meet the increasingly stringent standards on local emissions, many utilities and industries accelerated their construction of tall stacks to disperse their effluents. Between 1970-1979, for instance, 178 stacks of over 500 feet were constructed, almost entirely by electric utilities.[48]

In the early 1970's, concern surfaced over the phenomenon of acid rain, which had been observed in some localities as early as the mid-1950s. Researchers held that acid rain was largely a product of increased fossil fuel combustion. Tall stacks were critical to the processes resulting in the formation of acid rain because they permitted pollutants (sulfur oxides and nitrogen oxides) to remain aloft. In the upper air levels, photochemistry, water vapor, and trace metals transformed fossil fuel pollutants into sulfates and nitrates, which then reacted with moisture in the air to form acids. Among the observed effects of acid rain have been the acidification of lakes, the destruction of fish and the release of toxic metals into the environment.[49] Concern over the long-range transport of air pollutants resulted in the inclusion of provisions in the 1977 amendments to the Clean Air Act directing the Environmental Protection Agency to propose regulations governing stack heights. The tall stacks, however, still remain, as evidence mounts that the burning of fossil fuels are producing acid rain conditions in parts of the world far distant from the coal burning facilities.[50] Thus, as in the case of water-carriage systems and water pollution, a technology that had reduced a local problem had transferred the adverse effects to a different locality and, in this case, to a different medium.

III. The Land: Industrial and Municipal Waste Disposal

Of the three media utilized over time for waste disposal, the least attention has been paid by the public, by government at all levels, and by researchers, to the land. The prime reasons for this lack of notice are that land deposited wastes created neither the health hazards of water pollution nor had the visibility of smoke pollution. Dumps for garbage and refuse and for industrial wastes of different kinds had always existed on city fringes or vacant lots, but they were largely viewed as a nuisance and an eyesore rather than as a health hazard. Rats, flies and odors associated with garbage dumps were obviously disagreeable, but they generated neither epidemics nor smoke blankets that blotted out the sun. In addition, until recently, land utilized as a waste depository did not appear to possess the

transport qualities or cross media pollution capabilities of air or water.

While land has historically been regarded as an acceptable sink, it has also been utilized more intensively in recent times because surface waters and the air were no longer acceptable sinks for the disposal of some wastes. The 1979 Report of the Council on Environmental Quality noted, for instance, that "the increasing tempo of the cleanup of lakes and streams is literally driving pollution underground." [51] That this would occur, however, could have been predicted from past experience. In the 1940s, for instance, when the Pennsylvania Sanitary Water Board began enforcing the Clean Streams Act, numbers of small industrial plants turned to the use of earthen lagoons on plant property as a means of avoiding controls. These lagoons, many of which were poorly constructed and unlined, ultimately threatened ground water supplies, posed nuisances, and even created air pollution problems. [52]

Deep well injection is another method of industrial waste disposal using the land that expanded because of regulations restricting disposal in surface waters. The chemical and petroleum industries, facing disposal problems, developed this technique in the 1930s, and its use expanded in the post-war years. In 1960 there were about 30 deep wells throughout the country, but in that decade, because of enforcement of water and air pollution statutes by the various levels of government, the number increased to 110. The concept behind a properly designed deep well was that it would take the "effluent out of the human environment and bury it forever," but many firms located the wells in strata that posed a threat to underground aquifers and drinking water supplies. [53]

Industries have, over the years, punched or dug thousands of holes in the ground, usually on their own property, to dispose of wastes. More closely related to the everyday life of the cities, however, has been the disposal of municipal solid wastes. Solid wastes are defined as refuse of different kinds such as packaging and food wastes. Up until World War II, ashes made up a large component of the solid wastes of urban dwellers. In 1910, for instance, about three-quarters of a pound of garbage and

rubbish and about four pounds of ashes were collected from each New York urban dweller. By 1960, with ashes now a negligible ingredient, the average urban dweller generated a little over 2.5 lbs. of solid waste a day; by 1979 the figure was up to 3.8 lbs. The largest percentage of this total was still nonfood materials such as packaging and glass.[54]

Before World War II, cities disposed of solid wastes using one or a combination of the following methods:

- (1) Open dumps on the city's fringe
- (2) Pig farms, where garbage was fed to hogs
- (3) Ocean dumping (coastal cities)
- (4) Incineration
- (5) Garbage Reduction
- (6) Composting

The first four methods were used most frequently, with open dumping and pig farms the commonest. A fair amount of recycling of urban wastes actually occurred in the late-19th and early 20th centuries. Pig farms provided a way to recycle garbage into pork; composted or milled garbage served as fertilizer; reduction plants provided usable fats; refuse was burned to produce electricity; ashes were used to fill in swamps and low-lying areas; and wastes were sorted to reclaim usable metals, glass, and rags.[55]

All of the above methods, however, whether involving recycling or not, became increasingly unpopular in the interwar years and especially after World War II. Recycling methods disappeared because they required costly source separation or, as in the case of hog farming, they transmitted disease (trichinosis). Hog farms were also badly affected by outbreaks of the epidemic vesicular exantema. Other garbage disposal techniques, such as reduction and incineration, were not only costly but also productive of nuisances such as odors and smoke. Incineration plants, for instance, often violated local smoke control ordinances. Ocean dumping of garbage was banned by the Supreme Court in 1934. Finally, open dumps on the city fringe produced nuisances, fires and public health hazards that became more noticeable and objectionable as suburbs expanded in the post-war years.[56]

Increasingly, as existing methods of urban solid waste disposal developed costs and problems, sanitary engineers and public health officials advocated a technique of waste disposal known as sanitary landfill. Sanitary landfill was a method of solid waste disposal that involved the filling of depressions or trenches in the ground with refuse, utilizing a technology such as a bulldozer or a bull clam shovel to dig the trench and compact the fill. Each day's deposit was sealed into an individual refuse cell. When the fill reached the desired level, it was covered with earth and again compacted.[57] When the fill was completed, the created land was often used for recreational or even building purposes.

Sanitary landfill bore a resemblance to the technique of garbage burial which had been used by cities such as New York, Seattle and Boston in the 19th century, often to fill in areas around the waterfront. During the first decade of the 20th century, Champaign, Illinois and Columbus, Ohio, both compacted their refuse. Great Britain was actually the pioneer in the use of sanitary landfill, calling the technique, controlled tipping. The British developed the method in World War I and by 1935, 44.5% of all English refuse was being deposited in tips.[58] San Francisco constructed a sanitary landfill in 1926 as a replacement for incineration, using the refuse to fill in wetlands along the bay. Two of the most important early sanitary landfill experiments occurred in Fresno, California and New York City in the late 1930s. In Fresno, the Public Works Director, Jean Vincenz, supposedly coined the term, "sanitary landfill;" New York City built sanitary fills in Long Island and advocated the technique as both a low cost method of garbage disposal and a way of reclaiming swampy land.[59]

Public works officials, public health professionals, and municipal engineers responded to sanitary landfill technology in a manner similar to that with which they had greeted other technologies (such as water-carriage) touted as providing solutions to urban waste disposal problems. They were convinced by the technology's advocates that it offered tremendous advantages over the previous techniques, and focused on the benefits while overlooking or down-playing the possible hazards. In the case of sanitary landfill, risk perception was

also conditioned by the certification by a panel of "experts" of the technology's acceptability on health grounds.

In 1938, discovering that its incinerators were both expensive and productive of nuisances, the New York City Sanitation Department announced plans to build a sanitary landfill on the shores of Jamaica Bay. A group of Queens citizens who lived near the bay, however, protested that the landfill would produce odors, vermin and gas, and cause real estate values to fall. The Borough of Queens sued to halt the building of the landfill and two New York City Commissioners were arrested at the proposed landfill site. Eventually, in an early example of the use of the science court concept, the courts persuaded the citizens and the city to agree to allow a board of public health physicians and sanitary engineers to examine the sanitary landfill technique to determine whether or not it presented a public health hazard. The committee was headed by Dr. Thomas Parran, Surgeon General of the United States.

The Parran commission found the sanitary landfill technique to be free of dangers to the public health or safety. The sanitary landfill, it said, was a large health improvement over the open dump, eliminated undesirable marsh and swamp land (today called "wet lands") that harbored rats and mosquitoes, and provided a benefit in terms of filled-in ground. The Commission considered several possible landfill hazards such as fires and low weight-bearing values, but maintained that proper precautions could control them. It did not, however, mention other possible dangers, such as those from leachate runoff or ground water pollution, or the possibility of long term health hazards. Most of the commission's discussion of risk was in terms of nuisances rather than health dangers. The report enumerated fifteen, mostly operational, rules for the safe conduct of sanitary landfill operations.[60]

New York City officials greeted the Parran Report with enthusiasm. The New York commissioner and Deputy Commissioner of Health, for instance, published an article in the American Journal of Public Health, extolling sanitary landfill as "a program of disposal of rubbish and garbage under sanitary, scientific control, that would be truly economical--cheaper than incineration." [61] The

Parran report had vindicated the importance of public health considerations in garbage disposal, said the commissioners. New York City proceeded to incorporate its recommendations for landfill operations directly into the municipal sanitary code.[62]

The Parran Report, combined with a favorable experience by the army with sanitary landfills at its American camps during World War II (Fresno's Jean Vincenz directed the army operation), gave the technique wide-appeal in the post-war period.[63] Public works officials and public health professionals strongly endorsed it as a method of waste disposal and as a preferred replacement for the open dump. Between 1945 and 1960, according to one survey, the number of fills increased from 100 to 1,400, and articles boosting the virtues of the sanitary fill appeared in practitioner journals such as the American City and Public Works. The advantages most commonly cited were those listed by the Parran Commission: the elimination of the nuisances and health hazards associated with open dumps; the filling in of marshes and swamps and elimination of rats and mosquitoes; and the creation of land for buildings, parks and recreational areas. In the 1950s, however, a few articles also appeared that noted hazards at operating landfills, such as methane fires, ground water pollution, and low-bearing capabilities that restricted building. Occasionally, these pieces appeared simultaneously with articles describing new landfill operations that ignored the dangers described in the same issue.[64]

In 1961 the Sanitary Engineering Division of the American Society of Civil Engineers published a survey of sanitary landfill practice that examined 250 sites. Of the fills surveyed, 12% were less than 250 feet from the nearest dwelling. Completed landfills were most commonly used for recreational and industrial purposes, although some fills were used for homesites and schools. The article noted that while landfill ground water pollution was a "critical item," in general site planning there had been a minimum concern with ground water in site planning; 79% of the sample was within 20 feet of ground water and 27% was at or near ground water. Only 9.3% of the sites reported that operators made test ground borings prior to fill operations, and

only 14% had specially engineered drainage devices. The survey reported that in spite of the purported safety of landfills, citizens often opposed having them located near their residences.[65]

The 1961 survey also noted that over 70% of the landfills examined operated under some sort of city or county regulations. During the 1950s, as landfills became more common, cities issued sanitary landfill regulations, states such as California and Illinois suggested operational guidelines, and professional groups, especially the American Public Works Association, the Sanitary Engineering Division of the American Society of Civil Engineers, and the U.S. Public Health Service, conducted investigations on standards to avoid undue risk.[66] By the time of the ASCE survey, professional groups involved in solid waste questions agreed that while sanitary landfills reduced disposal costs and were superior to the open dump, they still presented dangers in regard to leachate seepage, ground water pollution, poor load bearing, methane, and nuisances such as rats, vermin and blowing paper. A lack of research, however, restricted the availability of technical information on these hazards that could be used to refine practice.[67]

In 1963, in an attempt to generate interest and research in the solid waste area, the U.S. Public Health Service and the American Public Works Association sponsored the first National Conference on Solid Waste Research. In his keynote address, Professor J. E. McKee of the California Institute of Technology commented on the lack of research and offered four explanations for its absence. First, McKee noted that there was no demand for information on solid waste hazards from either cities, regulatory agencies, or the public. Second, there had been no public health crises in regard to solid wastes equivalent to those in air and water pollution that would have generated such a demand. Third, there was minimal federal and state involvement. And, fourth, the majority of those concerned with solid waste disposal considered it an economic and political rather than a scientific or engineering problem.[68] All of these factors applied to the sanitary landfill technique as well as to solid wastes in general. Landfills, did not hold an especially prominent place at the conference and neither the papers on sanitary landfill nor the discussions following their delivery

emphasized possible hazards. Concern for the land as a sink for pollutants did not yet have the urgency associated with it that was beginning to characterize the air and the water mediums in the 1960s.

Conferences such as that sponsored in 1963 by the Public Health Service and the American Public Works Association, however, did highlight the deficiencies in solid waste research. In a sense, therefore, they created their own demand for legislation. In addition, solid waste collection and disposal was growing more expensive, and powerful local politicians such as Chicago's Mayor Richard Daley pushed for a federal role to lighten the burden on cities. In 1965, after President Lyndon B. Johnson had spoken of the need for "better solutions to the disposal of solid waste," and called for federal legislation, the U.S. Congress passed the Solid Waste Disposal Act. This act created the Office of Solid Wastes and provided the Federal government with a more formal role in regard to municipal wastes.[69]

The Solid Waste Disposal Act provided funds for research, investigations, and demonstration in the area of solid waste and for technical and financial assistance to state and local governments and interstate agencies in "the planning, development and conduct" of disposal programs. The most important impacts of the program were in stimulating research and inspiring state government activity in the solid-waste area. In 1965, for instance, there was no state-level solid waste agency in the country but by 1970 forty-four states had developed programs.[70] During the 1970s, however, the focus of federal legislation turned away from research into conventional methods of solid waste disposal and focused on the re-use and recycling of resources. This was reflected in the passage of the Resource Conservation Act of 1970 in the form of amendments to the 1965 legislation.[71]

Section 212 of the 1970 Solid Waste Act required that the U.S. Environmental Protection Agency undertake a comprehensive investigation of the storage and disposal of hazardous wastes. This led to a report to Congress in 1974 on the disposal of hazardous wastes and eventually, in 1976, to Congress's passage of the Resource Conservation and Recovery Act. The act attempted to fill the

regulatory gaps in the disposal of hazardous wastes left by the states, and early in 1980, acting under the requirements of RCRA, the EPA announced new regulations implementing cradle-to-grave controls for handling hazardous wastes.[72] The use of the land as a sink was now to be severely curtailed.

The various acts passed from 1965 on, and investigations conducted under their authority, caused a convergence of the different streams of research concerning municipal wastes on the one hand and industrial hazardous wastes on the other. The point of convergence was landfill type operations, with special concern over site construction and hazards and ground water pollution.

The exact number of active landfills in existence today is uncertain, although surveys estimate approximately 75,000 industrial and 16,000 municipal sanitary landfills, with no sound information on the number that have been abandoned or closed. Many of these landfills, both active and inactive and municipal and industrial, contain potentially hazardous wastes.

These landfills often pose a serious threat to ground water supplies. Ground water furnishes drinking water for about one-half of all U.S. residents and constitutes about twenty-five percent of all fresh water used in the country. The degree of threat to ground water depends on the material underlying the surface site and existing hydrological and geologic conditions. Ground water moves very slowly and it may take decades for a source polluted in one location to contaminate a water supply elsewhere, but the transport possibilities often exist.[74] As in the cases of surface waters and the air, the use of the land as a sink has transferred pollution problems to different locales and to a different medium.

A widespread awareness of the danger posed by landfill leachate to ground water purity is very recent, although isolated warnings about this hazard occurred as far back as the 1930s.[75] In the post-war years several state departments of health issued statements about potential chemical pollution of ground water from sanitary fills, but in the general enthusiasm for the approach, the warnings tended to be ignored.[76] When landfill research

accelerated during the 1960s, so did warnings about possible ground water pollution. By 1970, many states had regulations requiring field investigations of ground water location in the siting of new municipal and industrial landfills. Problems, however, usually centered around older sites that had been developed without adequate investigation of the risk of possible ground water contamination.

There are several different reasons why the potential for ground water contamination from landfills was ignored. One was the lack of research in the area of solid waste disposal in general and sanitary landfills in particular, which led to a basic ignorance about underground processes. A 1972 article on landfill leachate, for instance, noted that "before 1965 very few people were aware of the fact that water passing through refuse in a landfill would become highly contaminated. . . few cases were noted where leachate had caused harm to someone." [77] In addition, there was a lack of analytical instrumentation necessary to trace certain contaminants from landfills or to detect extremely low levels of potentially hazardous substances. Before 1965 (the Solid Waste Act) there was no incentive system to spur research in either analytical chemistry in regard to ground water processes or ground water-leachate-soil exchanges. [78]

Another important factor is the absence of a clear hazard or crisis in regard to ground water pollution from solid waste. As one sanitary engineer noted in 1968, a "major obstacle to the solution of solid waste problems is the lack of an awareness on the part of governmental decision-makers that the problem even exists. This lack of awareness exists at all levels." [79] Up to 1970, few incidents of the pollution of ground water drinking supplies had been reported and municipalities ignored the potential problem. Rather than spend money on expensive testing and monitoring, municipalities put their dollars in areas where need appeared more immediate. [80] But the caveats about the limitations of technical knowledge and crises notwithstanding, in the postwar decades some municipal governments and consulting sanitary engineers in the post-war decades carried on landfill siting and operations with a disregard for the state of the art and knowledge then available.

In the late 1970s, public agencies and environmental groups began to direct their attention towards the pollution of drinking water supplies drawn from ground water, as new analytic techniques revealed many incidents of ground water contamination from toxic organic chemicals. By 1980, every state had one or more laws pertaining to ground water pollution, and both the Environmental Protection Agency and many state agencies had projects underway to identify extremely hazardous situations.[81] In 1980 and 1981, the EPA moved to suggest guidelines for preserving ground water purity under the authority given it by the various environmental control acts passed during the 1970s, such as the Clean Water Act (1972), the Safe Drinking Water Act (1974), and the Toxic Substances Control Act (1976). The proposed new regulations for ground water, when taken in combination with the restrictions on disposal of hazardous wastes in landfills imposed in the Resource Conservation and Recovery Act (1976), meant that another sink--the land--would in all likelihood be severely restricted as a disposal site for society's wastes.[82]

Conclusions:

This paper has focused on the metabolism of the city and the use of air, land, and water as sinks for wastes. The three cases examined illustrate how our society has used technology to improve the local environment and to provide for growth without fully considering the possible problems created by effluents for downstream or downwind cities. Thus, technologies such as sewers, tall stacks, and sanitary landfill helped reduce pollution problems in one city, only to transfer them to another locale. In addition, policies developed to deal with pollution in one media often resulted in the transfer of contaminants to another, less regulated media. To deal with the different negative effects, we have usually utilized other technologies, thereby involving the society in loops of retrofits and technological fixes.

Cities, as well as the state and federal governments, have responded to environmental problems with policies utilizing a rough benefit/cost calculus based on health and nuisance considerations. Thus, the environmental agenda featured action against

dirty water and human waste pollution first, dirty air second, and land and ground water pollution last. Any action taken was conditioned by costs, contemporary social values, and existing levels of analytical instrumentation. Thus, for example, in the late-19th and early 20th century, Pittsburgh could have reduced its smoke problem by building (as Andrew Carnegie suggested) a huge coal gasification plant; or, as some public health authorities maintained, water quality could have been improved by forcing cities to construct sewage treatment plants. The costs, however, would have been large compared to benefits, and there was no incentive structure to generate such actions. From the perspective of the time, it was cheaper to burn smoky bituminous coal or to dispose of raw sewage in streams than to invest in control technologies. In the economists' terminology, air and water were regarded as free goods available to absorb the externalities of the industrial city.[83]

Problem transfer or the ignoring of ill effects was not always a willful act on the part of the producer of the effluents. An environmental hypothesis such as "running water purifies itself" gave sanction to cities that wanted to dispose of their sewage in nearby streams, while chemical analysis seemingly provided a "scientific" stamp of approval. Ringlemann charts supplied a method of grading smoke but did not identify other insidious but invisible air pollutants. Sanitary and industrial landfills produced leachates that contaminated ground water used for drinking water supplies, but monitoring and detection capabilities were limited. Research in these areas often only developed after the occurrence of crisis situations and as a result of specific public policies, not before. But even after research had pinpointed the mechanisms by which capital technologies such as sewers or tall stacks or landfills produced negative effects, it was difficult to persuade the operators of these technologies, be they private or public, to cease using the polluting technology or to stop building new systems having the same results.[84]

A new era of environmental consciousness generated by changing values has resulted in a series of laws that seek to close-off the traditional sinks for pollutants and to force cities and industries to think in terms of recycling and conservation. In a

historical reversal, the society has begun focusing on the costs of new technologies rather than only the benefits. Public attention is now occupied with the risks and hazards associated with technology rather than its potential for progress.[85] This concern with technological risk, however, should not obscure the important role that technology must play if we are to cope with our environmental problems. In the past technology helped us achieve short-term objectives in coping with environmental difficulties but the problems were often only displaced or delayed in their effects. The question facing our society today is how to protect the environment most effectively on a long-term basis given a range of uncertainties. We need mechanisms and institutions for environmental priorities that will prevent us from using new sinks for effluents that may offer temporary solutions but in the end create long-term and disastrous hazards.[86]

Acknowledgements

Grants from the National Science Foundation and from the Andrew W. Mellon Foundation supported various sections of the research from which this paper was drawn. The author, however, is solely responsible for the opinions expressed. The author would like to thank his colleagues Steven Klepper, Francis C. McMichael and M. Granger Morgan for their useful comments.

ENDNOTES

[1] Abel Wolman, "The Metabolism of Cities," Cities: A Scientific American Book (New York: Knopf, 1968), pp. 156-174. See also, Brian J. L. Berry, et. al., Land Use, Urban Form and Environmental Quality, University of Chicago Department of Geography Research Paper No. 155, 1974.

[2] Joel A. Tarr and Francis C. McMichael, "The Evolution of Wastewater Technology and the Development of State Regulation: A Retrospective Assessment," in Joel A. Tarr (ed.), Retrospective

Technology Assessment (San Francisco: San Francisco Press, 1977), pp. 165-190.

[3] B. A. Segur, "Privy-Vaults and Cesspools," Papers and Reports of the American Public Health Association (1876) V. 3, pp. 185-187; Mansfield Merriman, Elements of Sanitary Engineering (New York: Wiley & Sons, 1906), pp. 139-142.

[4] Joel A. Tarr, "From City to Farm: Urban Wastes and the American Farmer," Agricultural History (Oct., 1975), V. 49, pp. 598-612.

[5] Jon A. Peterson, "The Impact of Sanitary Reform Upon American Urban Planning, 1840-1890," Journal of Social History (Fall, 1979), V. 13, p. 83-101.

[6] Nelson M. Blake, Water for the Cities (Syracuse: University of Syracuse Press, 1956); John Duffy, A History of Public Health in New York City, 1625-1866 (New York: Russell Sage Foundation, 1968).

[7] See Blake, Water for the Cities, pp. 3-247. There is a good description of the New York situation in Eugene P. Moehring, "Public Works and the Patterns of Urban Real Estate Growth in Manhattan, 1835-1894," (unpublished Ph.D. dissertation, City University of New York, 1976), pp. 42-85.

[8] "Ownership of American Water Works," Engineering News (January 23, 1892) V. 27, pp. 83-86.

[9] Tarr and McMichael, "The Evolution of Wastewater Technology," p. 170.

[10] Ibid., pp. 170-173; Moehring, "Public Works and the Patterns of Urban Real Estate Growth in Manhattan," p. 139.

[11] Benjamin Lee, "The Cart Before the Horse," Papers and Reports of the American Public Health Association (1895) V. 20, pp. 34-36.

[12] Francis Sheppard, London 1808-1870: The Infernal Wen (Berkeley: University of California Press, 1971), pp. 253-358.

[13] George M. Fredrickson, "The Sanitary Elite:

The Organized Response to Suffering," The Inner Civil War (New York: Harper, 1965), pp. 104-105.

[14] Richard L. Schoenwald, "Training Urban Man: A Hypothesis About the Sanitary Movement," H. J. Dyos and Michael Wolff (eds.), The Victorian City (London, 1973, 2 vols.) V. 2, pp. 675-682. C. V. Chapin, "The End of the Filth Theory of Disease," Popular Science Monthly (1902) V. 60, pp. 234-239.

[15] Howard D. Kramer, "Agitation for Public Health Reform in the 1870s," Pts. 1-11, Journal of the History of Medicine (Autumn, 1948, Winter, 1949) Vols. 3-4, pp. 473-488, 75-89.

[16] Joel A. Tarr, et. al., "Values and the Technology," Retrospective Assessment of Wastewater Technology in the United States, 1800-1972, A Report to the National Science Foundation (Washington: National Technical Information Service, 1978, PB 275 272/3/s), Chap. VI.

[17] Tarr and McMichael, "Evolution of Wastewater Technology," pp. 171-173.

[18] Sheppard, London 1808-1870, pp. 253-258.

[19] For a discussion of these debates, see Tarr and McMichael, "Evolution of Wastewater Technology," pp. 173-179 and Joel A. Tarr, "The Separate vs. Combined Sewer Problem: A Case Study in Urban Technology Design Choice," Journal of Urban History (May, 1979) V. 5, pp. 308-339.

[20] William T. Sedgwick, Principles of Sanitary Science and the Public Health (New York: Macmillan, 1918), pp. 231-237; Jay Slater, "The Self-Purification of Rivers and Streams," Synthesis (Autumn, 1974) V. 2, pp. 41-45.

[21] Tarr, "Separate vs. Combined Sewer Problem," pp. 330-332.

[22] For a comparison between sewer construction and typhoid fever mortality rates in 15 cities in the 1888-1915 period, see Tarr, et. al., Retrospective Assessment of Wastewater Technology, 1-26a.

[23] Allen Hazen, Clean Water and How to Get It (New York, 1907), pp. 8-75; George C. Whipple, "Fifty

Years of Water Purification," Mazyck P. Ravenal (ed.), A Half-Century of Public Health (New York: American Public Health Association, 1921), pp. 161-180.

[24] The policy issue of deciding between water filtration and sewage treatment is dealt with in Joel A. Tarr, et. al., "Disputes Over Water Quality Policy: Professional Cultures in Conflict, 1900-1917," American Journal of Public Health (April, 1980) V. 70, pp. 427-435.

[25] Tarr, et. al., "The Development of a Federal Role in Water Pollution Control," Retrospective Assessment of Wastewater Technology, Chap. VII.

[26] Council on Environmental Quality, (hereafter cited as CEQ), Environmental Quality-1980, pp. 81-138.

[27] W. C. White, "What is Known About the Effect of Smoke on Health," Mechanical Engineering (June, 1927) V. 49, pp. 655-657; Dr. I. H. Alexander, "Smoke and Health," Proceedings, 35th Annual Convention, Smoke Prevention Association of America (1941), pp. 66-75.

[28] Carlos Flick, "The Movement for Smoke Abatement in 19th-Century Britain," Technology and Culture (January, 1980) V. 21, pp. 29-50.

[29] See District Heating in American Housing, National Building Studies (London: His Majesty's Stationary Office, 1949).

[30] Joel A. Tarr and Bill C. Lamperes, "Changing Fuel Use Behavior and Energy Transitions: The Pittsburgh Smoke Control Movement, 1940-1950," Journal of Social History (Summer, 1981) V. 14, p. 563.

[31] Samuel B. Flagg, City Smoke Ordinances and Smoke Abatement, Bureau of Mines, Bulletin 49 (Washington: GPO, 1912).

[32] Victor J. Azbe, "Rationalizing Smoke Abatement," Proceedings of the Third International Conference on Bituminous Coal (Pittsburgh, 1931) V. 2, pp. 593-645.

[33] Ibid., p. 603; See the papers on smoke abatement presented at the Fuels Division Session of the American Society of Mechanical Engineers, 1926 annual convention, and printed in Mechanical Engineering, (Mid-Nov., 1926), V. 48.

[34] "Cities Fight Smoke," Business Week (April 6, 1940), pp. 33-34; Oscar H. Allison, "Raymond R. Tucker: The Smoke Elimination Years, 1934-1950," (unpublished dissertation, St. Louis University, 1978).

[35] See Tarr and Lamperes, "Changing Fuel Use Behavior and Energy Transitions," pp. 563-570.

[36] Ibid., pp. 570-575.

[37] Ibid., p. 575.

[38] Ibid., p. 576.

[39] For energy consumption see Sam H. Schurr and Bruce C. Netschert, Energy in the American Economy, 1850-1875: An Economic Study of Its History and Prospects (Baltimore: Johns Hopkins University Press, 1960), p. 36. For the use of natural gas for househeating, see American Gas Association, Gas Facts 1958 (New York: AGA, 1958), p. 140; AGA, Historical Statistics of the Gas Industry (New York: AGA, 1956) p. 239.

[40] U.S. Bureau of the Census, Historical Statistics of the United States Colonial Times to 1970 (Washington: GPO, 1975) Part II, pp. 728-729.

[41] National Coal Association, Bituminous Coal Facts 1962 (Washington: NCA, 1963), p. 61.

[42] W.C.L. Hemeon, "Review of Latest Developments in Outdoor Air Pollution," American Industrial Hygiene Foundation, Bulletin No. 22, 1952, pp. 60-64.

[43] Harry C. Ballman and Thomas J. Fitzmorris, "Local Air Pollution Control Programs--A Survey and Analysis," Journal of the Air Pollution Control Association (Nov., 1963) V. 13, no. 19, pp. 386-491. Samuel M. Rogers, "A Review and Appraisal of Air Pollution Legislation in the United States," Ibid.

(Feb., 1957) V. 7, No. 4, pp. 308-315.

[44] W.C.L. Hemeon, "Current Conceptions on Air Pollution," American Iron and Steel Institute, 1954, p. 10; Arthur C. Stern (ed.), Air Pollution (New York: Academic Press, 1962) 2 vols.

[45] See, for instance, Arthur C. Stern and Leonard Greenburg, "Air Pollution--The Status Today," American Journal of Public Health (January, 1951) V. 41, pp. 27-37. The authors noted, "As we learn more and more about micrometeorology, it serves to emphasize the importance of high stacks as a primary means for achieving ground level dilution of contaminants to within acceptable safe limits." (p. 31); Air Pollution Control Association, The Electric Utility Industry, Technical Manual No. 4, (Pittsburgh, 1968), p. 13.

[46] National Coal Association, Bituminous Coal Facts 1966 (Washington: NCA, 1966), p. 85.

[47] American Association for the Advancement of Science, Air Conservation (Washington: AAAS, 1965), pp. 37, 67, "There is a time and place for everything. The time and place to pollute air is downwind." (p. 294).

[48] CEQ, Environmental Quality-1980 (Washington: GPO, 1980), pp. 173-177.

[49] Ibid. CEQ, Environmental Quality-1979 (Washington: GPO, 1980), pp. 70-71; U.S. Environmental Protection Agency (hereafter cited as EPA), Acid Rain (Washington: EPA, July, 1980); National Research Council, Atmosphere-Biosphere Interactions: Toward a Better Understanding of the Ecological Consequences of Fossil Fuel Combustion (Washington: National Academy Press, 1981).

[50] CEQ, Environmental Quality-1980, pp. 175-177; Richard A. Kerr, "Pollution of the Arctic Atmosphere Confirmed," Science (May 29, 1981) V. 212, pp. 1013-1014; Bette Hileman, "Acid Precipitation," Environmental Science and Technology (Oct., 1981) V. 15, pp. 1119-1124.

[51] CEQ, Environmental Quality-1979, p. 110.

[52] Donald A. Lazarchik, "Pennsylvania's Pollution

Incident Prevention Program," Proceedings of the 25th Annual Purdue Industrial Waste Conference (1970), pp. 528. See, also, Sheppard T. Powell, "Industrial Wastes," Industrial and Engineering Chemistry (Sept., 1954) V. 46, 95A-96A, 98A.

[53] "Speed-up for Deep-Well Waste Disposal," Chemical Engineering (Jan. 15, 1968), pp. 89-90; William R. Walker and Ronald C. Stewart, "Deep-Well Disposal of Wastes," Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers (Oct., 1968) V. 94, pp. 945-968.

[54] Martin V. Melosi, Garbage in the Cities: Refuse, Reform, and the Environment, 1880-1980 (College Station: Texas A&M University Press, 1981), pp. 192-194. Melosi's volume is the best survey of methods of refuse disposal before World War II.

[55] Ibid. See, also, American Public Works Association, Municipal Refuse Disposal (Chicago, 1960).

[56] Melosi, Garbage in the Cities, pp. 189-231.

[57] American Public Works Association, Municipal Refuse Disposal (Chicago: Public Administration Service, 1966, 2nd, ed.), Chap. 4.

[58] Rudolph Hering and Samuel A. Greeley, Collection and Disposal of Municipal Refuse (New York: McGraw Hill, 1921), pp. 243-257; A. L. Thomson, "What European Cities Are Doing in Handling Refuse," Municipal Sanitation (Dec., 1935) pp. 365-368.

[59] "Sanitary-Fill Refuse Disposal at San Francisco," Engineering News-Record (hereafter cited as ENR), (Feb. 27, 1936), pp. 314-316; APWA, Municipal Refuse Disposal, pp. 89-90; E. J. Cleary, "Landfills for Refuse Disposal," ENR, Sept. 1, 1938, pp. 270-271. But also see Harrison P. Eddy, Jr., "Caution Regarding Landfill Disposal," Ibid., (Dec. 15, 1938), V. 12, pp. 766-767.

[60] "Health Experts Endorse Landfills and Recommend Best Practice," ENR (Mar. 28, 1940) pp. 54-55; "Board Reports on New York Landfills," American City (hereafter cited as AC) (July, 1940) V. 55, p. 11;

Rolf Eliassen and Albert J. Lizee, "Sanitary Land Fills in New York City," Civil Engineering (Sept., 1942) V. 12, pp. 483-486.

[61] John L. Rice and Sol Pincus, "Health Aspects of Land-Fills," American Journal of Public Health (Dec., 1940) V. 30, pp. 1391-1398.

[62] Richard Fenton, "Landfills and Inspection," Bureau of Sanitary Engineering, Department of Health, New York City, May, 1947.

[63] Rolf Eliassen, "War Conditions Favor Landfill Refuse Disposal," ENR (June 4, 1942) V. 122, pp. 912-914. "Where and How to Use the Sanitary Fill: Based on Experience Gained from Army and U.S. Public Health Sources," AC (Jan., 1944), pp. 56-57.

[64] Booster articles for the sanitary landfill can be found in the following issues of the American City: June, 1956 (Fort Worth, Texas); Dec., 1947; May, 1948; Sept., 1948 (Baltimore); March, 1949 (Kansas City); Dec., 1949 (New Orleans); Oct., 1951 (Pennsylvania); Dec., 1952 (San Francisco); Oct., 1953, (New Orleans); Nov., 1953 (St. Louis County, Missouri); and May, 1956, May, 1961, June, 1962. For articles containing warnings, see the following issues of the American City: Feb., 1951, May, 1951, Apr., 1956.

[65] Committee on Sanitary Engineering Research, American Society of Civil Engineers, "A Survey of Sanitary Landfill Practices," Journal of the Sanitary Engineering Division, Proceedings of the ASCE (July, 1961) V. 87, pp. 65-83.

[66] "Sanitary Fill Standards," AC (Feb., 1951) V. 66, pp. 104-105; William S. Foster, "The Elements of Refuse Collection and Disposal," AC (May, 1951) V. 66, p. 125; Wilbur C. Webb, "Limitations in the Use of Sanitary Landfill as a Method of Solid Trash Disposal," Ninth Annual Purdue Conference on Industrial Wastes (1954), pp. 138-146; Robert C. Merz, et. al. Leaching of a Sanitary Landfill, California State Water Pollution Control Board Publication No. 10, 1954; Committee on Sanitary Landfill Practice of the Sanitary Engineering Division, "Sanitary Landfill," American Society of Civil Engineers, Manual of Engineering Practice, No. 30, (New York: ASCE, 1959); U.S. Public Health

Service, Recommended Standards for Sanitary Landfill Operations (Washington: GPO, Sept. 1961).

[67] American Public Works Association, Solid Wastes Research Needs (Chicago: APWA, May, 1962).

[68] APWA, Proceedings: National Conference on Solid Waste Research (Chicago: APWA, Dec., 1963), pp. 1-7.

[69] "Solid Waste Disposal Gets Federal Effort," Chemical and Engineering News (Dec. 12, 1966), pp. 50-54; Melosi, Garbage in the Cities, pp. 199-200.

[70] Ibid., pp. 202-203.

[71] Ibid., pp. 201-202.

[72] CEQ, Environmental Quality-1979 (Washington: GPO, 1980), pp. 174-188; CEQ, Environmental Quality-1980 (Washington: GPO, 1981), pp. 214-222. See the Federal Register, June 30, 1980 (Solid Waste) V. 45, No. 127, p. 44126, and April 27, 1981 (Hazardous Wastes, RCRA), V. 46, No. 80, p. 23722.

[73] CEQ, Environmental Quality-1980, pp. 88-89. In 1979, the CEQ reported an EPA estimate of 32,000-50,000 disposal sites containing hazardous wastes. See, Environmental Quality-1979, p. 1974. Estimates of the number of active and inactive dumps vary widely.

[74] CEQ, Environmental Quality-1980, pp. 83-85.

[75] See, for instance, "Sanitary-fill Refuse Disposal at San Francisco," ENR (Feb. 27, 1936), pp. 314-317; Eddy, "Cautions Regarding Land-Fill Disposal," pp. 766-767. See, also, David Keith Todd and Daniel E. Orren McNulty, Polluted Groundwater: A Review of the Significant Literature (Huntington, N.Y.: Water Information Center, 1976).

[76] G. W. McDermott, Pollution Characteristics of Landfill Drainage, Activity Report No. 3, R. A. Taft Sanitary Engineering Center, U.S. Public Health Service, Jan.-Mar., 1950; C. W. Klassen, "Sanitary Fill Standards," AC (Feb., 1951) V. 66, pp. 104-105; Mertz, et. al., Leaching of a Sanitary Landfill, pp. 123-127; California State Water

Pollution Control Board, Effects of Refuse Dumps on Ground Water Quality, Publication 24, 1961.

[77] W. C. Boyle and R. K. Ham, "Treatability of Leachate from Sanitary Landfills," Proceedings of the 27th Annual Purdue Conference on Industrial Wastes (1972), pp. 687-691.

[78] Harvey Brooks, "Science Indicators and Science Priorities," Science, Technology & Human Values (Winter, 1982) No. 38, p. 17.

[79] Harvey F. Ludwig and Ralph J. Black, "Report on the Solid Waste Problem," Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers (April, 1968), p. 368.

[80] "Sanitary Landfills: The Latest Thinking," Civil Engineering (March, 1973), p. 69.

[81] CEQ, Environmental Quality-1980, pp. 81-92.

[82] EPA, Proposed Ground Water Protection Strategy (Washington: EPA, Office of Drinking Water, Nov., 1980) and EPA, Groundwater Protection (Washington: EPA, Office of Solid Waste, Nov., 1980).

[83] See, for instance, Allen V. Kneese and Charles L. Schultze, Pollution, Prices, and Public Policy (Washington: The Brookings Institution, 1975).

[84] Many new sewer systems were constructed, in the 1920s, for instance, that discharged untreated sewage into waterways utilized by downstream cities as sources of water supply. The same sort of adherence to a technology, even after serious questions have been raised about its production of negative externalities, appears to be present in regard to tall stacks and acid rain. See, R. Jeffrey Smith, "Administration Views on Acid Rain Assailed," Science (Oct., 1981) V. 214, p. 38.

[85] See Brooks, "Science Indicators and Science Priorities," pp. 17, 28-29; Robert C. Harris, Christopher Hohenemser and Robert W. Kates, "Our Hazardous Environment," Environment (Sept., 1978) V. 20, pp. 38-39; and, Aaron Wildavsky, "No Risk is the Highest Risk of All," American Scientist (Nov. 1979) V. 67, pp. 32-37.

[86] See, William C. Clark, "Witches, Floods, and Wonder Drugs: Historical Perspectives on Risk Management," Richard C. Schwing and Walter A. Albers, Jr., Societal Risk Assessment: How Safe is Safe Enough? (New York: Plenum, 1981), pp. 287-318, for perceptive analysis and suggestions.

THE BRITISH EMPIRE AS A PRODUCT OF CONTINENTAL DRIFT

Alfred W. Crosby

The University of Texas at Austin

Demographically, the 18th and 19th centuries are among the most amazing of all centuries. The number of people in the world soared, with, for most of that period, the white populations of the British colonies of settlement--Canada, including New France; the Thirteen Colonies, which became the United States of America; Australia and New Zealand--leading the way, swollen by vast migrations from Europe and by amazing rates of natural increase. Rates of natural increase (the excess by births over deaths) as high as two or three percent and even higher, extremely rare in the Old World, were the rule for scores of years in the Neo-Britains across the great oceans from the British Isles.[1]

These population explosions had negative counterparts in population crashes among the indigenes of the Neo-Britains. The native peoples decreased as fast or, often, faster than the whites increased, until at the end of the 19th century whites and indigenes, as well, commonly believed that the latter were literally dying out. The words "vanishing race" became a normal way of referring to American Indians, as did equivalently dismal appellations for Australian Aborigines and New Zealand Maori.[2]

This actual replacement of one race by another is something rare. Tweedle Dum has always conquered Tweedle Dee and been conquered in return--Napoleon marches to Berlin and then Bismark follows his footsteps back to Paris--but this phenomenon of runaway immigrant increase and precipitous indigene decrease on a large scale and in several widely separated locations around the world was unprecedented in history.

At the turn of the 19th century the Reverend Thomas Malthus interpreted the surge in the numbers of whites in the northern colonies of British America--"a rapidity of increase probably without parallel in history"--as the measure of just how fast

all humans would reproduce if, God forbid, they all had enough to eat. As for the decline of Indian numbers, he chalked that up to liquor, infanticide, war, mistreatment of women, imported epidemics and, of course, to hunger and the threat of hunger.[3]

A generation later Charles Darwin pronounced the general success of colonial whites--specifically the success of those in the United States--as "the results of natural selection; for the more energetic, restless and courageous men from all parts of Europe have emigrated during the last ten or twelve generations to that great country, and have there succeeded best." He blamed the decline of the indigenes on disease primarily, and on famine, violence and other factors triggered by contact with the civilized Europeans. But why, he wondered, had not the tribes of ancient Europe succumbed similarly in the presence of the civilized Greeks and Romans?[4]

Social Darwinists, armchair theorists and popularizers who in the last half of that great biologist's century simplified his mighty generalities and applied them to society (something he did only rarely and offhandedly, as above), found no mystery in the advance of the colonial whites and the ebb of the indigenes: racial superiority on the part of the former and inferiority on that of the latter.

The racist explanation seems to have come particularly easily to the Social Darwinists who claimed Anglo-Saxon genes; and some of them were as sure of their future as of the past. John Fisk, in the late Victorian decades one of the most respected and popular historians and lecturers in both Great Britain and his homeland, the United States, traced the lines of Anglo-Saxon triumph on the graph of the past, extended them into the future, and was rendered silly by what he thought he saw. If Anglo-Saxons had so easily conquered North America, Australia and New Zealand militarily and, more important, demographically, then why wouldn't the process go on and on, to the vast enrichment of all the world? Who could doubt, for instance, that Africa would in two or three centuries be "a mighty nation of English descent"? By 1980, he predicted, the United States would have 600 million people, Australia and New Zealand 150 million, and much of the rest of the

world would be populated by legions of ferociously fertile Anglo-Saxons. "The day is at hand when four-fifths of the human race will trace its pedigree to English forefathers...."[5]

Fisk was an inaccurate prophet not because of ignorance of history but because of his naive interpretation of that history. The success of European imperialism nearly everywhere and, in addition, the magnitude of the British demographic victories in North America and Australasia seemed too enormous to merely be a matter of guns vs. spears, especially after the indigenes got their own guns, as they often did. There had to be something more profound involved, something, perhaps, having to do with Laws of Nature. What could it be?

His answer to that question was racist, but can we let that persuade us to pass over the question itself? Isn't it still worth asking, worth speculating about? Doesn't ignoring it leave a silence in which the only sound is the mumbling echo of old rathskeller talk about master races?

Let us ask the question about the white takeover in the Neo-Britains again but this time in terms more scientific and less self-serving than those used by Fisk and company a hundred years ago. Did European colonists in North America, Australia and New Zealand ally themselves, probably by chance, with some natural condition which worked in their favor and against the indigenous peoples?

This condition was, if it existed at all, no doubt one of many factors; but let us consider just one--geographical location--and see where that consideration takes us. The British Isles lie within sight of continental Europe, the western extreme of Eurasia, the largest single piece of land on the globe, which is connected or nearly connected with Africa, the second largest piece, at Gibraltar and the Sinai Peninsula, and separated elsewhere by easily navigated seas. This world island of Eurasia-Africa, known to most as the Old World, contains humanity's original homeland somewhere within its tropics, probably Africa. It contains, as well, all the early centers of dense human population and civilization, except those of Meso and Andean America.

The Neo-Britains of North America and Australasia are remote from the Old World and separated from it by major oceans. These lands were never home to Homo sapiens's ancestors or close relatives, the anthropoid apes. In fact, they are quite different from Great Britain, specifically, and the Old World, generally, in their fauna and in their flora, as well.

North America and Western Europe have the fewest differences, but these are significant. Oak, ash, elm, beech, birch, maple, poplar, willow, linden and holly are much the same on both sides of the North Atlantic, but the Europeans who came to America had never seen hickory nor pecan before; nor many of the American pines because Western Europe has very few pines. Many of the animals were familiar--deer, fox, wolf, black bears--but Europeans found wapiti, grey squirrels and o'possoms and humming birds startlingly new.[6] Many species and certainly genera are shared between the two areas, but there are enough contrasts to persuade botanists and zoologists to classify the two as separate biological realms.[7]

The floras and faunas of Australia and New Zealand differ wildly from Britain's, Europe's and the Old World's. Australian plants and animals are distinctive, almost unique on this planet, as a comparison of what is perhaps the Old World's most wide spread browser, the deer, and Australia's, the kangaroo, suggests. Australia's fauna is dominated by marsupials; the Old World's and America's by placental mammals. New Zealand has stunningly distinctive flora and fauna: the fact that the latter was dominated not by any kind of mammals at all but by giant birds when the humans first arrived is a measure of that country's uniqueness.[8]

The Neo-Britains are so different because they are so remote from most of the other lands of the world--so remote, in fact, that they were the last habitable areas to be settled by humanity, excepting certain islands. Humans reached America and Australia only when, during the Ice Age, the heaping up of much of the world's water in the form of continental glaciers lowered the oceans, and hunters and gatherers were able, by short boat trips or on foot, to escape Eurasia-Africa and enter the lesser continents. This took place between 10,000 and 50,000 years ago, very recently in terms of the time

that the genus Homo has lived on this planet. The continental glaciers melted back to approximately their present locations and the oceans rose again some 10,000 years ago isolating the Stone Age pioneers from further significant contact with Eurasia-Africa before humanity built its first cities, cultivated its first crops and tamed its first animals, excepting man's oldest friend, the dog.[9]

The story of the first people to reach New Zealand is different from that of the first pioneers to America and Australia, but in general outline similar. The first New Zealanders, the Maori, were one branch of that family of agriculturalists called Polynesians whose ancestors had set off island-hopping into the Pacific vastness from the Asian mainland five or so millenia ago. The Maori arrived in New Zealand only a thousand years ago, bringing with them the sweet potato, a few other cultigens and one domesticated animal, the dog. (They also brought the Polynesian Rat, if the reader wishes to call that animal domesticated). Sporadic contact with other Polynesian islanders, weeks and weeks away by canoe, continued for a few hundred years, and then ceased. Thereafter, the most important single influence on the Maori, as on all the forms of life living in New Zealand, was the hermetic remoteness of their homeland.[10]

The Europeans, starting a few centuries ago, changed oceanic navigation from an art--the level at which the Polynesians had left it--to a science, and changed the oceans from barriers into canals. This Eurasian people brought the Neo-Britains into the biological mainstream of this planet almost as effectively as if the white mariners had attached cables and towed them to the shoal waters of the Old World. Many organisms from the latter gained access to the Neo-Britains for the first time. Neo-Britons, themselves, enjoyed population booms, as we have seen. So did other exotic species, and their histories may help to illuminate the reasons for the immigrant humans' success.

Old World cultigens went ashore with the first European settlers to the Neo-Britains. There, after what the settlers felt was a period of adjustment that was long and difficult but which the Portuguese in Brazil and Angola, for instance, would have called

sweetly brief, European crops--wheat, oats, peas, turnips, peaches, cherries, flax, etc., sprouted, came to fruit and seed, sprang up again the following spring, sometimes spontaneously, and created a plenty. North American whites shifted from European grains to maize for their staple for a couple centuries, and that Indian plant also played a vital role in feeding Australia's early white pioneers, but by and large the diets of the Neo-Britons differed from those of the old Britons more in being superior in quality and quantity than in kind.[11]

Within a decade or so of first settlement most of Britain's North American colonies were producing surpluses of Old World foodstuffs--New York, Pennsylvania and New Jersey were nicknamed the Bread Colonies--and exporting them to every market in the Atlantic Basin permitted them by British mercantilism and to a number of forbidden ones. The southern mainland settlements did the same--rice, in fact, became South Carolina's chief export--but are better and more properly remembered for their enormous exports of such non-foods as tobacco, indigo, and, in the 19th century, cotton.

Most of the Australian and New Zealand settlements also produced food surpluses soon after their founding, but the distance between them and their chief markets in Europe tended to restrict their exports to sheep's wool, a product resistant to spoilage and of high value relative to its bulk, until the invention of refrigerator ships toward the end of the 19th century. But in the last hundred years mutton, beef, wheat, honey, etc.--an avalanche of food stuffs of Old World origin--have streamed from Australasia to Europe and the world.

Wheat provides a good example of the "Europeanization" of agriculture in the Neo-Britains. The Neo-Britons cultivated it from their earliest years in their new homes, and where these settlers spread into regions similar to eastern Europe's steppes--the Great Plains of the United States and Canada, the fertile country inland of Australia's Great Dividing and Darling Ranges, and the Canterbury Plain of New Zealand--wheat became the chief crop. In our century wheat has become the most important food in the world's export trade, and the Neo-Britains provide more than half the world's exported wheat.[12]

The story of Eurasian domesticated animals in Britain's colonies of settlement indicates even more clearly than does that of her cultigens the special affinity of many Old World life forms had for the new environments. European animals grew to full size more rapidly, became bigger and brawnier, and reproduced more often than at home. They provided unquestionable proof of their liking for the colonies by successfully casting off human guidance and protection, by going wild in multitudes and often initiating the Europeanization of the local ecosystems before the immigrant frontiersmen and women even arrived.

Pigs went ashore in the Gulf of Mexico area of what is now the United States with Hernando DeSoto in the 1540s and, unlike their master, prospered and founded families. These Spanish swine are probably the earliest American ancestors of the feral razorback hogs of southeastern United States. English swine also disembarked on the east coast with the early white settlers, also went feral, and soon did "swarm like vermaine upon the Earth." [13]

By the early 18th century Spanish cattle, ancestors of the famous Texas longhorns, were grazing in feral multitudes in the northern reaches of Mexico, a region to become the southern reaches of the United States a bit more than a hundred years later; and a cattle frontier of feral or, at most, semi-domesticated cattle was moving into Indian territory from the east coast colonies. One Briton observed droves of cattle on the South Carolina and Georgia frontier "under the auspices of cowpen keepers, which move (like unto the ancient patriarch or the modern Bedowin in Arabia) from forest to forest as the grass wears out or the planters approach." [14]

Mustangs run away or rustled from Mexico were moving north into the grasslands of the future United States long before the English crossed the Appalachians, and by the middle of the 18th century had reached Alberta. Horses came from the east, as well; within less than a century of the founding of Jamestown horses running wild in Virginia's frontier counties were in sufficient number for that colony's young gentlemen to find it good sport to hunt them. (It was, however, for the "pleasure of the hunt"

alone because the animals were so fast and the pursuit so long the "when they are taken, 'tis odds but their grease is melted or else being old, they are so sullen that they can't be tamed.") [15]

The first corner of Australia to be settled by Europeans, New South Wales, is half a world away from Virginia, but swine, cattle and horses did about as well in the former as in the latter. Swine, come ashore with the white settlers, were soon fending for themselves in the bush, where they reproduced into multitudes of thousands and tens of thousands, flowing across the coastal plain to and through the mountains. Some of them became as lean and fast as their American cousins, and were also called razorbacks. [16] Within a few months of the settlers' arrival in 1788 two bulls and four cows (of South African rather than Eurasian origin) strayed off, and by 1804 the feral herds (or "mobs", to be properly Australasian) numbered three to five thousand head. Imported cattle went feral again and again in Australia: in 1836, for instance, the explorer Thomas Mitchell came upon cattle trails "resembling roads" near the Murrumbidgee River, "and at length the welcome sight of the cattle themselves delighted our longing eyes, not to mention our stomachs...." Wild horses (they are called Brumbies, not mustangs, down under) prospered and propagated as extravagantly in Australia as in North America. They became "a very weed among animals" in the 19th century, and as late as 1967 still existed in the tens of thousands. [17]

The story of European livestock in New Zealand is complicated in detail, but simple in general terms. Seemingly every animal, particularly mammal, the Europeans brought to New Zealand which could adapt to a cool damp climate went feral. Pigs, brought first by Captain Cook, swarmed there long before British annexation in 1840. The islands' rough terrain and dense forests hindered the formation of herds (mobs) of cattle and horses as large as those of America and Australia, but, for all of that, no European colony, with the possible exception of those on small islands, was ever so Europeanized in its fauna, especially in its mammalia, as was New Zealand. Even sheep, which usually are able to find some carnivore to eat them or some cliff to walk off, successfully went wild. New Zealand was and is so suitable for sheep that

today she has nearly sixty million of them, as compared with just over three million people.[18]

The most spectacularly and immediately successful of all the Old World's emigrants to the Neo-Britains were pathogens, the micro-life that cause disease and death. Maladies which had come to ancient and medieval Britain one at a time over the centuries from the more densely populated Mediterranean Europe and Middle East arrived in the Americas and Oceania in a rush of a few decades, creating a series of pandemics probably unprecedented in previous world and certainly in previous Neo-British history, about which more later.

Of course, the triumph of Old World organisms was not total. Many failed to obtain so much as a toehold, and others no more than that, and there are few examples of invaders totally replacing native species. Immigrants did drive the passenger pigeon and the Tasmanian human into extinction, but the invaders' victory was much more often no more than getting ashore and spreading widely. They often drove the native life forms back into the odd corners of the environment, but the majority of local species survived and, in some cases, such as that of the striped skunk of North America, even prospered under the new regime. The eucalyptus still rules in Australia and generations of grass-loving shepherds have not been able to eradicate the New Zealand bush. Even so, we must recognize that the success of the invaders from humans to rabbits to house flies, has been astonishing, and requires more explanation than a reference to mere chance.

The immigrant life forms often found few strong indigenous rivals for the eco-niches they coveted in the Neo-Britains. The horse, to cite an obvious example, found no competitors for its specific niche whatsoever in the Neo-Britains. Pigs found only weak rivals for the food supply of the mast and roots of vast forests of the Neo-Britains, and reproduced for many generations before their numbers began to press on the carrying capacity of those environments.

In the Neo-Britains many immigrant life forms found few predators, parasites or diseases. It is a rule of a naturalist's thumb that organisms usually flourish best away from their points of origin, given a salubrious climate, because the life forms, macro

and micro, of their new homes have had a shorter time to adapt to feeding on, upon and in them, and therefore do so less effectively than equivalents had in the old homes.[19]

Neo-British examples of this rule of thumb are many. For instance, Spanish longhorns, descendent of animals who for millenia had survived the appetites and hunting skills of carnivores at least equal to and often superior to American flesh eaters, found the latter no great challenge and rapidly and hugely increased in numbers. In Australia the most troublesome predator when the whites came was the dingo, the dog which the Aborigines probably had brought with them from the islands to the north and northwest. This canine has killed multitudes of sheep and cattle and other livestock, but is no rival to the wolf. Captain Watkin Tench of the first white settlement described the dingo, which stands about two feet high at the shoulder, as resembling "the fox dog of England." [20] It is not surprising that on the nineteenth century Australian frontier single shepherds successfully cared for mobs of thousands of animal wandering over vast spreads of grassland.

New Zealand had no lions, tigers, wolves, coyotes or dingos when the whites arrived with their livestock--in fact, no predators at all, according to the standards of the continents. Europeans have unintentionally created predators by importing dogs and cats and allowing them to go wild, but have come up with only one native one, and then only by exercise of imagination. The large New Zealand parrot, the kea, is supposed by some to swoop down on sheep, fix itself in the fleece at a spot which the poor animal cannot defend, and then to peck and tear the creature to death. Most experts doubt that this ever happened more than a very few times, and then only with disabled sheep; and even the most credulous must agree that a flock of the fiercest keas cannot compare with a pack of ravening Eurasian wolves.[21]

A low incidence of pests, parasites and disease was crucial to the success of Old World organisms in the Neo-Britains. North America's first wheat belt was flourishing along the Delaware River in the 18th century before the Hessian Fly, one of wheat's old pests, followed the grain across the Atlantic and began to spread.[22] Rabies, an ancient disease of

dogs, cats, bats and wild rodents in the Old World, also did not reach America until the mid-18th century, and has never established itself in Australasia.[23] Rinderpest, long established in Eurasia, slaughtered millions of domestic and wild ungulates in southern Africa and, indirectly, thousands of humans dependent upon them when it arrived there in the late 19th century, but has never gained a foothold in the Neo-Britains.[24] Foot-and-mouth disease, an established scourge in most major livestock producing countries, has appeared a number of times in the Neo-Britains, but has always been eradicated.[25]

The cycle of population explosion of immigrant organisms in the Neo-Britains and of the tardy arrival of their parasites is still going on. Soybeans, a Far Eastern cultigen, first arrived in North America generations ago, but was not cultivated in quantity until the 20th century. As late as 1922 United States production amounted to only four million bushels, but has soared since, especially after World War II. In 1979 the United States produced 2.3 billion bushels, over half the world's entire production; and Canada produced nearly 25 million bushels.[26]

This "soybean explosion" in North America was, among other things, the product of the absence of several of the plant's ancient Far Eastern parasites, specifically the soybean cyst nematode. It did finally appear in North America in 1954 and has, despite quarantines and the ministrations of agricultural scientists and the chemical industry, spread widely since.[27]

Immigrant Europeans, as well as immigrant plants and animals, had population explosions in the Neo-Britains, and for many of the same reasons. The lack of man eaters in the Neo-Britains was not important because for many thousands of years Homo sapiens have been the eaters, not the eaten, in all climes and locations. The fact that most of the white settlers in the Neo-Britains were young adults, a group which characteristically has a lower death rate and higher birth rate than children and the old, is important. The improvement of diet that these settlers often enjoyed after arrival in their new homes surely helped lengthen lives and produce quantities of healthy mothers and babies. The

general improvement of future prospects for the immigrants, who, being humans, could to some extent adjust their birth rates in accordance with those prospects, may also have boosted the population increase.[28]

The sparseness of population in the Neo-Britains, the distances between settlements, and between them and the Old World slowed the spread of disease. In many cases epidemics of infectious disease burned themselves out for lack of fresh fuel. Smallpox, for instance, never became an endemic disease in colonial North America nor in Australia until scores of years after the arrival of the colonists simply because of the shortage of victims for the disease to feed on.[29]

Smallpox was not native to New Zealand, Australia nor America, nor to any other lands outside of Eurasia-Africa, nor were, in all probability, many other of humanity's dangerous infections: measles, whooping cough, chicken pox, bubonic plague, malaria, diphtheria, amoebic dysentery, influenza and a variety of helminthic infestations.[30]

The second wave of humans to the Neo-Britains, the Europeans, often suffered initial periods of high mortality, caused by malnutrition and exposure, but then prospered and multiplied. In Virginia the troubled initial period lasted for a generation, and that colony and the other southern mainland colonies in North America, all of them tropical in the summers and only briefly cold in the winters, suffered chronically from warm climate fevers and parasites; but even so, the natural increase of the white populations was considerable.[31]

The colonies to the north of Virginia profited from the same stream of immigration and high birth rate as did the southern settlements, and in addition had a very low death rate. It was these colonies, growing at a rate that doubled their populations every thirty years or less--even after subtracting the number of fresh immigrants from Europe--that so impressed Malthus with humanity's maximum capacity for reproduction. The Yankees vaguely credited much of their good fortune to their climate, praising "the very wholesomeness of the Aire, altering, digesting and drying up the cold and crude humours of the Body," and recommended "all cold complexions to take

Physick in New England; for a sup of New-England's aire is better than a whole draught of old England's Ale." [32]

In 1790, after two years in Australia, Governor Arthur Phillips reported that "a finer and more healthy climate is not to be found in any part of the world." Of the 1,030 people who had disembarked with him, many suffering from scurvy and half of them convicts from Britain's malnourished lower classes, only seventy-two had died, "and by the surgeon's returns, it appears that twenty-six of those died from disorders of long standing, and which it is more than probable would have carried them off much sooner in England." [33]

Thirty odd years later Peter Cunningham, in a book written to persuade British emigrants to go to New South Wales, rather than to North America, noted that yellow fever and malaria had, albeit tardily, arrived in the latter region, but that Australia had neither, "nor indeed any fever but the rum fever--while measles, hooping cough, smallpox, and all your similar European pests are alike strangers to our soil--the most common and fatal disease being dysentery, which is seldom productive of danger to any but the imprudent and intemperate." He exaggerated in calling the European pests strangers--several, like tuberculosis, had established permanent beachheads, and others, like smallpox, had made visits--but we must give Cunningham his proper due: few of the Old World's infectious diseases had yet come to stay. Australia was a very healthy place for white people. [34]

New Zealand was the healthiest of all colonies for Britons: so said Arthur S. Thompson, M.D., Surgeon, 58th Regiment, in 1850, and he produced the statistics to prove it. In Great Britain the number of deaths annually from all diseases per thousand British soldiers was fourteen; in New Zealand 8.25. The data pertaining to lung diseases, including tuberculosis, one of the century's most prevalent killers in Europe, were even more lopsidedly in favor of the colony. The yearly mortality rate per thousand soldiers in Britain suffering with "pectoral complaints" was 148; in New Zealand sixty. Dr. Thompson recommended the North Island, where he was stationed, as a convalescent center for Europeans fallen ill elsewhere in the Empire. He also noted

the paradox that New Zealand, so salubrious for whites, was becoming increasingly unhealthy for its native race, the Maori.[35]

The European explorers and very first settlers in the Neo-Britains almost always remarked on the glowing good health of the indigenes, but the whites who followed had an entirely different story to tell. For example, at the beginning of the 18th century John Lawson, a traveler in Carolina, British North America, called the Indians of that region "a People very apt to catch any Distemper they are afflicted withal. . . ." A century later Thomas Malthus, musing over the case of all American Indians, concluded that "The diseases to which man is subject to in the savage state, though fewer in number, are more violent and fatal than those which prevail in civilised society." A few years later Charles Darwin considered the fate of the American Indians, Australian aborigines, Maori and peoples of other remote lands, like Tahiti, and wrote, "Wherever the European had trod, death seems to pursue the aboriginal." [36] The soybean cyst nematode caught up with soybeans in America in the 1950s. The human diseases of the Old World caught up with the first wave of Homo sapiens to the Neo-Britains when the second wave, the Europeans, arrived and settled.

The deadliest of all the imported diseases of the Neo-Britains--or, at least the most spectacular--was smallpox. It made the first of its many recorded sweeps through North America in the 1630s, but had probably made sorties north from Spanish Mexico during the previous century. Wherever it broke out, it hit the Indians much harder than the whites, to the great advantage of the latter. Examples are legion; Increase Mather cites one in his description of the year 1633 in New England: "The Indians began to be quarrelsome touching the Bounds of the Land which they had sold to the English, but God ended the Controversy by sending Smallpox amongst the Indians of Saugust who were before that time exceedingly numerous. Whole Towns of them were swept away, in some not so much as one soul escaped Destruction." [37]

This disease, or something very much like it, ravaged the aborigines of New South Wales in 1789, just a bit more than a year after the initial British settlement there and at a time when the Aborigines

were beginning to actively resist the invasion. In May the new settlers made a chilling discovery: the corpses of two of their own people in the bush, one with four spears in him. But the expected sequels of accelerating violence did not follow. Within a month an epidemic of a pustular disease struck the indigenes, halving their number and raging far into the interior.[38]

Smallpox was an extremely effective pathogen in eliminating native resistance, but by no means the only nor the indispensable exterminator. By the time that disease came ashore in New Zealand at least two-thirds of the Maori had been vaccinated against it, yet this did not save them from steep population decline. Like the indigenes of other Neo-Britains, they underwent devastating sieges of dysenteric diseases, measles, pneumonia, influenza, whooping cough, etc., etc. Venereal disease, which so often became chronic among the conquered peoples of the European empires, killed some Maori and destroyed the reproductive powers of more, vastly diminishing their capability of recovering demographically.[39]

Tuberculosis was, above all, the enemy of the Maori. Dr. Arthur S. Thompson stated flatly in the mid-19th century, by which time the Maori had probably plunged halfway to utter extinction, that scrofula, tuberculosis of the lymph nodes and skin, was the chief threat to the Maori, predisposing children to marasmus, fevers and bowel complaints, "and adults to "consumption [pulmonary tuberculosis], spinal diseases, ulcers, and various other maladies." He called scrofula "the curse of the New Zealand race." [40]

Disease made indigene resistance to the new order of things in America and Australasia useless. In 1906 Maui Pomare, then a Maori Health Officer, despairing of the future of his people, told them they must take up the ways of the Europeans, of the Pakeha, or accept extinction:[41]

Was not this way uttered by the mouth of a dying chief many generations ago: Kei muri i te awa kapara he tangata ke, mana te ao, he ma ("Shadowed behind the tattooed face, a stranger stands, he who owns the earth and he is white.")

Today European whites amount to eighty, ninety and even higher percentages of the populations of the Neo-Britains, and the indigenes are small minorities in their ancient homelands. Many forces were involved in producing this remarkable phenomenon, not the least of which was the superiority of the Europeans in economic and political organization and, above all, in technology relative to the indigenes. Of greater importance, however, was the ecological advantage of the European invaders over the indigenes. The whites' demographic takeover was but one part of the general success of Old World immigrant organisms. The phenomenon can be best understood if one views the Old World onslaught as a whole, i.e. not, for instance, as Englishmen vs. Algonkians on the east coast of North America but as Englishmen plus smallpox, cattle, horses, wheat, etc. vs. Algonkians. The latter were probably capable of pushing the first white colonists into the sea--certainly of making their lives so dangerous and unprofitable as to discourage further waves of immigrants from Europe--but the Indians had no allies to match smallpox and the rest.

We must extend the theories of the Social Darwinists to include explanations for the triumphs of European plants and animals, as well as European people, and, a la comte de Buffon, talk about some sort of general Old World superiority; or we must ask again what were the natural conditions that so favored the invaders as to tempt the Social Darwinists to extravagant speculation a century ago.

The chief advantages of the invaders fall neatly into two groups. One, the Neo-Britains or, at least, large parts of them, have climates roughly similar to that of the British Isles and Western Europe. Wladimir Koppen, the famed geographer and climatologist, places the British Isles, north-western Europe and most of the most heavily populated parts of the Neo-Britains in what he calls the Humid Temperate category. All these areas lie approximately the same distance from the Equator, some to the north and some to the south, and the effects of what differences there are in their latitudes are moderated by benign currents and winds. For instance, Australia may be one third in the tropics and in large part a desert continent, but the average annual temperature and rainfall of its

southern coastal regions are much like Britain's or no more different than, say, Mediterranean Europe's. Organisms which will "work" in the British Isles will, generally speaking, do the same in large parts of the areas of South and Western Australia that face poleward, and in New South Wales, Victoria and Tasmania.[42]

Two, the floras, faunas and peoples of the Neo-Britains which were in part or whole displaced by the invading Old World organisms were peculiarly vulnerable to such displacement because of the vagaries of evolution. Geological theorists attribute these vagaries to a phenomenon they, with a stoney indifference to nuance, call Continental Drift. Two hundred million years ago all the continents, i.e. all the land masses with granitic bases, were parts of one giant continent called Pangaea or lay near its shores. At that time the climates, floras and faunas of the areas of that vast slab destined to become the British Isles and the Neo-Britains were more alike than at any time since. Then Pangaea began to split along lines of tectonic activity, into which the oceans advanced. For the scores upon scores of millions of years since the pieces of Pangaea have drifted independently (occasional collisions like that of India and Asia need not concern us) and life forms on each have evolved independently and divergently, one piece producing elk (wapiti) and humming birds, another kangaroos, another kiwis, another the genus Homo and the ancestors on our cattle, sheep, measles viruses and so on.[43]

The section that produced humans, cattle and measles is the chipped core of Pangaea, Eurasia-Africa, the largest contiguous piece of land in the world. There the number of species is greatest, therefore the competition between them fiercest, and the winners, in one way and another, obviously among the world's toughest competitors. More important for our purposes, the old core of Pangaea is the homeland of humanity and of most of our civilizations. Old World plants, animals and micro life, which had evolved symbiotically with the genus Homo and with practitioners of the Old World cultures, were better adapted to living with humans, in general, and with Neo-British colonists, in particular, than the life forms of America or Australasia. In turn, the human immigrants from the

Old World were better adapted in many ways--culturally, for certain, and also by immunological experience--to live with the other immigrant life forms than were the indigenous humans, the descendents of the first human pioneers to reach these lands.

The demographic takeover by Europeans in North America, Australia and New Zealand was one aspect of a large scale successful invasion by a number of species, only one of which, despite the theories of John Fisk et al, was Homo Britannicus. In fact, it was not necessary for Britons to participate at all. The first people from temperate Eurasia,* whatever their race or culture, who crossed the oceans to the Neo-Britains in large enough numbers, along with their symbiotic macro and micro life, to create the ecologist's equivalent of the atomic physicists' "critical mass" were likely, perhaps even certain, to triumph demographically.

The bulk of eastern China has a climate similar to Western Europe's and the Neo-Britains', and the plants, animals and micro-organisms of the Yangtse and Yellow River valleys have lived symbiotically with civilized humans for much longer than those of the Thames and Humber valleys. It is an accident of history that New England, New South Wales and New Zealand are not New Kiangsu, New Chekiang and New Fukien, and that some Asian counterpart of John Fisk did not explain the demographic miracles of the colonial Chinese by inventing a theory about the genetic superiority of the eastern Chinese subdivision of the Chinese division of the Mongoloid people of the human race.

* The tip of South Africa also lies in a Temperate Zone, but is so far from the centers of Old World civilization that its native people were primitive and lacking many of the ingredients of that civilization.

ENDNOTES

[1] McEvedy, Colin and Richard Jones, Atlas of World Population History (Harmondsworth: Penguin Books, 1978), 348-49; Potter, J., "The Growth of Population in America, 1700-1860," in Population in

History, Essays in Historical Demography, eds. C. V. Glass and D.E.C. Eversley (London: Edward Arnold, 1965), 631-38; Smith, Daniel "The Demographic History of colonial New England," Journal of Economic History, XXXII (March 1972), 165-83; McLintock, A. H., ed. An Encyclopedia of New Zealand (Wellington: R.E. Owen, Government Printer, 196), II, 823; Prichard, M. F. Lloyd, An Economic History of New Zealand to 1939 (Auckland: Collins, 1970), 97, 142, 144; Borrie, W. D., Population Trends and Policies, A Study of Australian and World Demography (Sydney: Australasian Publishing Co., 1948), 37-40.

[2] Encyclopedia of New Zealand, II, 431, 455; Rowley, C. D., The Destruction of Aboriginal Society (Harmondsworth; Penguin Books, 1972), 383; Devevan, William M., ed., The Native Population of the Americas in 1492 (Madison: University of Wisconsin Press, 1976), 2-4.

[3] Malthus, Thomas R., First Essay on Population (New York: Sentry Press, 1965), 105-07, 126-27; An Essay on Population by the Rev. T. R. Malthus, 7th ed. (London: J. M. Dent and Sons, n. d.), I, 26-43; II, 74. Malthus was demonstrably influenced by Benjamin Franklin's 1751 essay, "Observations Concerning the Increase of Mankind, Peopling of Countries, &c.", The Papers of Benjamin Franklin, Leonard W. Labaree, ed. (New Haven: Yale University Press, 1961), IV, 225-34, in which the American predicted that there would be more Englishmen on the western than the eastern side of the Atlantic in the century's time.

[4] Darwin, Charles, The Voyage of the Beagle (Garden City: Anchor Books, 1962), 433-34; Darwin, The Origin of the Species and the Descent of Man (New York: Modern Library, n. d.), 508, 542-43.

[5] Fisk, John, Political Ideas Viewed from the Standpoint of Universal History (New York: Harper and Brothers, 1903), 141, 143, 145, 152.

[6] Sauer, Carl O., "The Settlement of the Humid East," Climate and Man, Yearbook of Agriculture, 1941 (Washington, D.C.: United States Department of Agriculture, 1941), 159.

[7] Darlington, Phillip J., Zoogeography: the Geographical Distribution of Animals (New York:

John Wiley and Sons, 1957), 427, 472-73; Good, Ronald, The Geography of Flowering Plants (New York: John Wiley and Sons, 1964), 30-31.

[8] Burton, Maurice, Systematic Dictionary of Mammals of the World (New York: Thomas Y. Crowell Co., 1962), 36-37; Stevens, Graeme R., New Zealand Adrift, The Theory of Continental Drift in a New Zealand Setting (Wellington: A. H. & A. W. Reed, 1980), 244-69.

[9] Jennings, Jesse D., Prehistory of North America (New York: McGraw-Hill Book Co., 1974), 47-70; Thorne, A. G., "The Arrival and Adaptation of Australian Aborigines," Ecological Biogeography of Australia, ed. Allen Keast (The Hague: Dr. W. Junk bv Publishers, 1981), III, Part 6, 1751-60.

[10] Bellwood, P. S., "The Peopling of the Pacific," Scientific American, CCXLIII (Nov. 1980), 178-79.

[11] Bedwell, Percy W. and John I. Falconer, History of Agriculture in the Northern United States, 1620-1860 (Washington, D.C.: Carnegie Institution of Washington, 1925), 9-17, 42-45; Sauer, "Settlement of Humid East," Climate and Man, 157-66; Dunsdorfs, Edgars, The Australian Wheat-Growing Industry (Melbourne: The University Press, 1956), 47.

[12] Dunsdorfs, Australian Wheat-Growing Industry, 114, 115, 167, 185-86; The World Almanac of Facts, 1981, 217; Thornthwaite, C. Warren, "Climate and Settlement of the Great Plains," Climate and Man, Year Book of Agriculture, 1941 (Washington, D.C.: United States Department of Agriculture, 1941), 177-87; Malenbaum, Wilfred, The World's Wheat Economy, 1885-1939 (Cambridge: Harvard University Press, 1953), 127-53, 227; Food and Agricultural Organization of the United Nations, World Grain Statistics, 1965 (Rome: Food and Agricultural Organization of the United Nations, 1966), 13.

[13] Bidwell and Falconer, History of Agriculture in Northern U.S., 18, 31; Sauer, Carl O., Sixteenth Century North America (Berkeley: University of California Press, 1969), 301; Beverley, Robert, The History of Virginia in Four Parts (Richmond: J. W. Randolph, 1855), 262.

[14] Dobie, J. Frank, "The First Cattle in Texas and

the Southwestern Progenitors of the Longhorns," Southwestern Historical Quarterly, XLII (Jan. 1939), 171-97; Owsley, Frank L., "The Pattern of Migration and Settlement on the Southern Frontier," Journal of Southern History, XI (May 1945), 151.

[15] Denhardt, Robert M., The Horse of the Americas (Norman: University of Oklahoma Press, 1975), 92; Beverley, History of Virginia, 257-58.

[16] Rolls, Eric C., They All Ran Wild, The Story of Pests on the Land in Australia (Sydney: Angus and Robertson, 1969), 336-37.

[17] Rolls, They All Ran Wild, 348-52; Commonwealth of Australia, Historical Records of Australia, Series I (Sydney: Library Committee of the Commonwealth Parliament, 1914-1925), I, 550; VII, 379-80; VIII, 150-51; IX, 349, 714, 831; X, 92, 280, 682; Mitchell, Thomas L., Expeditions into the Interior of Eastern Australia (London: T. and W. Bone, 1838), I, 306.

[18] New Zealand Pocket Digest of Statistics, 1978 (Wellington: E. C. Keating, Government Printer, 1978), 10, 20; Encyclopedia of New Zealand, II, 280-90; Wodzicki, K. A., Introduced Mammals of New Zealand, (Wellington: Department of Scientific and Industrial Research, 1950), passim; Clark, Andrew H., The Invasion of New Zealand by People, Plants and Animals (New Brunswick: Rutgers University Press, 1949), 190.

[19] Anderson, Edgar, Man and Life (Berkeley: University of California Press, 1967), 187.

[20] Tench, Watkin, Sydney's First Four Years (Sydney: Angus and Robertson, 1961), 49.

[21] Encyclopedia of New Zealand, II, 212-13.

[22] Bidwell and Falconer, History of Agriculture in Northern U.S., 93, 95-6; Jones, E. L., "Creative Disruption in American Agriculture, 1620-1830," Agricultural History, XLVIII (Oct. 1974), 523.

[23] The Merk Veterinary Manual (Rahway, N. J.: Merk and Co., 1972), 232; Henschen, Folke, The History and Geography of Diseases, trans. Joan Tate (New York: Delacorte Press, 1966), 41. For arrival

of rabies elsewhere, see Darwin, Beagle, 354-55.

[24] Merk Veterinary Manual, 263; Kjekshus, Helge, Ecology Control and Economic Development in East African History: the Case of Tanganyika, 1850-1950 (London: Heinemann, 1977), 126-32.

[25] United States Department of Agriculture, Animal Diseases, Yearbook of Agriculture, 1956 (Washington, D.C.: Government Printing Office, 1956), 186.

[26] Smith, Allan and Sidney J. Circle, eds. Soybeans: Chemistry and Technology (Westport, Conn.: Avi Publishing Co., 1978), I, 1; World Almanac, 1981, 217, 218; Dovring, Folke, "Soybeans," Scientific American, CCXXX (Feb. 1974), 14-20; Fornari, Harry, Bread Upon the Waters, A History of United States Grain Exports (Nashville: Aurora Publishers, 1972), 46.

[27] Markley, Klare S., ed. Soybeans and Soybean Products (New York: Interscience Publishers, 1950), I, 50; Westcott, Cynthia, Plant Disease Handbook (Princeton: D. Van Nostrand Co., 1960), 258; Coffman, Bob, "Soybean Cyst Nematode Invades Corn Belt," Farm Journal, C (Nov. 1976), 46.

[28] Benjamin Franklin credited the population explosion among Neo-Britons in North America to this latter factor. See his "Observations Concerning the Increase of Mankind," in The Papers of Benjamin Franklin, Leonard W. Labaree, ed. (New Haven: Yale University Press, 1961), IV, 227-34.

[29] Duffy, John, Epidemics in Colonial America, (Baton Rouge: Louisiana State University Press, 1971), 103, 107; Cumpston, History of Smallpox in Australia, 7.

[30] Woodrow Borah, after decades of work on the subject of the demography and diseases of the American, judges the above maladies to be non-American in origin. They are almost certainly non-Australasian, as well. Denevan, William M., ed. The Native Population of the Americas in 1492, 5.

[31] Morgan, Edmund S., American Slavery, American Freedom: The Ordeal of Colonial Virginia (New York: W. W. Norton and Co., 1975), 158-79, 405-10; Duffy, Epidemics in Colonial America, 138-63, 204-27.

[32] Smith, "Demographic History of Colonial New England," Journal of Economic History, XXXII (March 1972), 165-83; Lockridge, Kenneth A., "The Population of Dedham, Massachusetts, 1636-1736," Economic History Review, 2d Series, IXX (Aug. 1966), 326-28; Morgan, Edmund, ed. The Founding of Massachusetts, Historians and Documents (Indianapolis: Bobbs Merrill Co., 1964), 144-45.

[33] Historical Records of Australia, Series I, vol. I, 144.

[34] Cunningham, Peter, Two Years in New South Wales (London: Henry Colburn, 1828), I, 7.

[35] Thomson, A. S., "Observations of the Influence of the North Island of New Zealand in the Production and Prevention of Disease among Emigrants from Great Britain and Ireland," Irish University Press Series of British Parliamentary Papers: Colonies; New Zealand, VII, 51-55; "Observations on the Climate of the North Island of New Zealand," X, 290-97.

[36] Lawson, John, A New Voyage to Carolina (U.S.A.: Readex Microprint Corp., 1966) 10; Malthus, An Essay on Population, 7th ed., 30; Darwin, Beagle, 433-34. For further discussion, see Borah, Woodrow, "Estimating the Unknown," in Denevan, ed. The Native Population of the Americas in 1492, 4-7; McNeill, William H., Plagues and Peoples (Garden City: Anchor Press/Doubleday, 1976), 199-234; Crosby, Alfred W., The Columbian Exchange, Biological and Cultural Consequences of 1492 (Westport: Greenwood Press, 1972), 3-63; Crosby, "Virgin Soil Epidemics as a Factor in the Aboriginal Depopulation in America," William and Mary Quarterly, 3d Series, XXX (April 1976), 289-99.

[37] Duffy, John, "Smallpox and the Indians in the American Colonies," Bulletin of the History of Medicine, XXV (July-Aug. 1951), 327.

[38] Historical Records of Australia, Series I, vol. I, 47-48; Cumpston, History of Smallpox in Australia, 164-73.

[39] Pool, D. Ian, The Maori Population of New Zealand, 1769-1971 (Auckland: Auckland University Press, 1977), 93-97, 106-44.

[40] Ibid., 115; Thomson, Arthur S., The Story of New Zealand, Past and Present--Savage and Civilized (London: John Murray, 1859), I, 212, 214-19.

[41] Encyclopedia of New Zealand, II, 431.

[42] Espenshade, Edward B., Jr. and Joel L. Morrison, eds., Goode's World Atlas (Chicago: Rand McNally and Co., 1974), 12-15; Trewartha, Glenn T., An Introduction to Climate (New York: McGraw Hill Book Co., 1968), 394-95.

[43] Continents Adrift and Continents Aground (San Francisco: W. H. Freeman and Co., 1976), 34-35, 126-27, 176, 178; Stevens, New Zealand Adrift, 1-182.

THE GLOBAL ECONOMY AND FOREST CLEARANCE IN THE NINETEENTH CENTURY

Richard B. Tucker and John F. Richards
Oakland University and Duke University

The meeting of forests and industrial wealth has been a major factor in modern history, but the impact of the modern industrial nations on the natural resources and receding frontiers of the globe is still very poorly understood.[1] In the course of the long nineteenth century before the cataclysmic global changes initiated in 1914, the steeply rising demand for production of agricultural commodities exerted by the core or metropolitan societies of Europe, North America and Japan was the dominant cause of rapid depletion of world wood and forest resources. Powerful causal links developed among accelerating worldwide market demand for foodstuffs, fibres and raw materials, the clearing of land for expanded cash crop production, and accelerating depletion of forest cover. Much of the impetus for forest clearing came from forces outside forestry management itself, which after all was still in its infancy in most parts of the world.

In the century preceding the outbreak of World War I both political and technical changes combined to cause unprecedented integration of the world's economy. The imposition of formal colonial rule or indirect political and economic control by the industrialized nation states of western Europe and North America was well under way by mid-century. By the 1860s a global transport network consisting of railways, feeder roads, ports and harbors, and steamship lines was under construction. The transport revolution was soon buttressed by information flows speeded by the new postal union and by intercontinental cables. The opening of the Suez Canal in 1869 merely added a capstone to the structure, as did the Panama Canal several decades later.

Sharply enhanced demand for commodities in the metropolitan countries, for both industrial and domestic consumption, transmitted outward to the remainder of the globe as political and economic centralization proceeded. Thus, regions in eastern and southern Asia, the Middle East, Africa, Latin

America and even eastern Europe and Russia felt the invitation to intensify export commodity production. Demand from the core countries stretched across a wide and growing range of food crops, such as rice, sugar and wheat; industrial crops, such as indigo, jute and sisal; and narcotics such as coffee, tea and opium. European, North American, and toward the end of the period Japanese colonial regimes, or indigenous regimes subject to their economic and political pressure, made systematic efforts to increase incentives and to reduce barriers to export production of these commodities.

As a result, combined state and market pressure engendered land clearing on a massive scale in every world region before 1914. For each crop, whether indigenous or newly introduced, whether grown by peasant or sharecropper or directed by plantation owner, the primary means of increased production to meet the new market demand was the expansion of area under cultivation. Rarely were there sustained attempts to increase yields by more intensive labor or investment in more intensive land-use technology. One major result of global political and economic integration was the steady destruction of the world's woodlands and forests, especially in the regions which were being newly integrated into that economy.

Dramatic examples of forest cover depletion and expansion of cultivated area occurred in the virgin lands of the New World, Australasia and Siberia, the areas of European settler populations. Similar processes were at work in long-settled regions of Asia and Africa. The rapid expansion of monocrop commodity production in the nineteenth and early twentieth centuries in the world's colonies and dependencies is one of the primary reasons for today's dangerous imbalance between the "First World" and "Third World." While that process very likely brought increased real income to peasant-proprietors, estate owners and other groups in Third World societies, by 1920 the terms of production and trade became unfavorable, and opportunities for bringing new lands under cultivation there became increasingly limited. It is probable that present-day patterns of rapidly rising population and local needs for food production on depleted soils, characteristic of the Less Developed Countries, began a rapid acceleration from the end of World War I onwards.

The timber harvesting and marketing which transformed large parts of North America in the nineteenth century is relatively well understood. It is exemplified by the forty-year process of commercial lumbering of the white pine forests of northern Michigan, based on the technology and economy of an industrial age.[2] By contrast, in other regions the elimination of forests came about less because of lumbering for profit than it did because of land clearance for food and other marketable products, as in the small-farmer world of the oak-hickory forests of southern Michigan, Indiana and Ohio.[3] On the frontier of a rapidly expanding agricultural economy, the Ohio farmer cleared the land in order to grow first subsistence crops and only later cash crops. Small-scale sale of logs and rough boards was usually incidental to his work.

Timber operations on the northwest coast of North America saw similar economic forces at work, but in Oregon and Washington, timber famine was ultimately laid to rest by the transformation from natural mixed forests to monocropping of conifers.[4] There agriculture did not become dominant: neither aboriginal nor settler population could compete with a recovering timber economy in an ecological setting highly favorable to the harvest of forest resources.

On a very different agricultural frontier, plantation cropping and its related secondary farming in southeastern Brazil, European commodity demand on sub-tropical vegetation produced a prolonged assault on the primary rain forest which had once covered some 500,000 square kilometers south of Amazonia.[5] By the closing decades of the eighteenth century large-scale sugar plantations began to encroach inland on the forest. The land cleared for planting cane was extended as wood was harvested to meet the annual fuel needs of each processing plant. By the 1830s the accelerating planting of coffee trees on cleared forest land began to surpass the effects of sugar planting in southeastern Brazil. From its initial area around Rio de Janeiro coffee planting traveled as far as Sao Paulo in the 1840s. By the 1880s, after the abolition of slavery and the introduction of an immigrant European labor force, the growth of coffee intensified. Because of a pervasive belief that coffee grew well only in virgin soil, land clearing for coffee was far more extensive

and sustained than was probably necessary. Then, after 1890 the railways' linking of the forested interior of southeastern Brazil with the coast meant that coffee expansion continued until the 1930s. More and more land in swidden as well as in primary forest fell to the planter's land clearers.

Halfway around the globe the forces of the world system were powerful enough to impel millions of paddy-rice growing peasants in Southeast Asia into clearing virgin land for intensive cultivation of rice for export. After 1850 an export rice economy emerged in the deltaic zones of the Irrawaddy River in Burma, the Menam Chao Phraya River in Thailand, and the Mekong River in Vietnam. Between 1860 and 1914 export rice soared from a regional average of 700,000 tons per year to 4,200,000 tons per year. British conquests in Burma, French victories in Indochina, and British diplomatic pressure on Thailand swept away existing constraints on international trade imposed by the indigenous regimes. At the same time the world price of rice reflected the combined impact of a European consumption market and re-export market to the West Indies. Sugar planters depended upon a newly perfected method of parboiling, gelatinizing and shipping rice to feed their indentured Indian and Chinese laborers. The colonial and Thai governors invested public monies in railways, river control projects, ports and fiscal incentives for producers. Indian and Chinese middlemen provided capital for peasants anxious to respond to these incentives.

The peasantry of upper Burma moved with speed and energy into the virgin lands of the Lower Delta to clear new rice lands at the expense of primary forest.[6] In spite of a long catalogue of pioneer hardships, including tigers, malaria, and swamps, the Burmese peasants created a new landscape in Lower Burma in a few short decades. Inland, the evergreen rain forests fell to the axes and flooding techniques of the Burmese pioneers. By 1914 even the mangrove swamps on the coasts had succumbed to the drive for new rice lands.

The expansion of agriculture in western India shows a similar pattern of peasant energy and capital put into land clearing.[7] Rising international raw cotton demand, colonial enabling measures, and construction of cartable roads, railways, and Bombay

port facilities had a massive effect upon the peasants of the Bombay hinterland. The production of cotton, the leading cash crop, rose far faster than the total arable in this period. By 1920 one result was the clearing of virtually all accessible scrub, woodland and jungle from the waste lands, village woods and uncleared lands of the region. The dry deciduous monsoon forest survived only in isolated stands or in the government's Reserved Forests.

These and other studies give us insights into different stages of the ecological impact of Western colonialism or neo-colonialism. In Asia there was a full spectrum of Western penetration, from India, where Great Britain developed the most complex of all colonial regimes, through crumbling imperial China, where the West came to control the coast but penetrated inland only selectively, to Japan, which resisted Western overtures almost entirely until 1854 and then successfully contained those forces through the end of the century. China during the era of Western imperialism portrayed a landscape already severely degraded by previous centuries' human pressures, despite the fact that much of the Chinese landscape is so rugged and inaccessible to modern transport that it presented formidable obstacles to any sort of rural development.[8] Western political and economic forces remained primarily clustered on the coastal periphery until World War II. Ironically the timber which built the Treaty Port system came largely from the Pacific Northwest of North America, and when modern industrial forces began exploiting the remaining Manchurian forests,[9] it was the Japanese economy after the turn of the century which began building the requisite infrastructure. By 1914 the signs were becoming clear that the Pacific Basin would be one of the twentieth century's basic economic and ecological units.

Even mountain peripheries came under colonial developmental pressures during the nineteenth century. In India's western Himalayas, as in southwestern China and some other non-Western mountain regions before the present century, relative inaccessibility to transport and international markets gave some protection to the mountains' forest cover.[10] The portion of the Himalayas which came under British management was not primarily exploited for export production of either timber or alternative cash crops, such as tea. Yet the influence of the

British imperial economic system was as powerful, even at one remove. In order to find proper timber to build the railways necessary for military control and long-distance shipment of north India's gain, the British Raj initiated in the 1860s the colonial world's first and most sophisticated forestry service, whose personnel later replicated its work for many other colonies in Africa and Asia.

The mountains of the Himalayan system, like temperate and alpine mountains of Europe and North America, are paralleled for fragility only by the tropical rain forest, about which our understanding of the nineteenth century is still fragmentary. The most common impression is that the alarming depletion of the tropical forests has accelerated massively in the past thirty years or so. But most writers refer primarily to commercial timber harvesting, which was not the major source of forest clearance in the tropics until recently. Land clearance for export crops and the spread of shifting cultivation were far more important. Under Spanish rule in the nineteenth-century Philippines there was an intricate interplay of grasslands and forests in the intensification of land pressures on Luzon,[11] but this represented different trends from the much less known story of one twentieth-century crisis point, the Philippines' southern island of Mindanao, which is more truly tropical. The Irrawaddy river delta of Burma presents a closer parallel, in both commercial and biotic terms, to the other major river deltas of mainland Southeast Asia which were turning rapidly toward export production of rice as the century progressed. In the Dutch colonial administration of Indonesia, though formal forestry management began in 1857 and thirty-six logging firms were harvesting teak by 1880, timber work was minuscule in contrast with vast plantation cropping. The French colonial system' impact in Indochina was similar. Massive new rice and rubber planting in the lower Mekong basin and central Vietnam contrasted with the almost total absence of timber export or formal forestry management before 1914.

Tropical timber exploitation and its closely related phenomenon, modern forestry management, penetrated very little into the rain forests of Africa and Southeast Asia before World War I. One reason is purely botanical. Mixed dipterocarp forests are more diverse in their genetic pattern

than other types of forests, making it far more difficult for timber hunters to locate dense enough stands of commercially demanded hardwoods to make harvesting feasible. Further, factors of politics, transport and even disease meant that the European empires' penetration of the tropics was only tentative before 1920. The valuable forests of Ghana remained under the control of local authorities hostile to British interests. Railways there as in Nigeria began to roll only around 1900, after lengthy political maneuvers between Africans and Europeans. Furthermore, Europe's main source of timber remained as for centuries the cooler forests of the Baltic region. Specialized demand for tropical hardwoods for fine cabinetmaking was too limited to make major inroads on African forests before 1920. Reflecting and shaping these trends, professional forestry in British Africa began as a transplant from British India around the turn of the century, as did many of the most important timber trees: teak, sissoo and others.

In French Africa extensive tropical forests were found in the Ivory Coast, which became a French colony before the nineteenth century closed. Private concessionaires began arriving in these forests in the mid-1880s, but they faced severe problems of communications and available labor. Formal forest management there was initiated only in 1912; a French colonial forest service was begun eleven years later.

The great rain forest of central Africa, in the Congo river basin, came under Belgian control in the 1880s. The first sawmill appeared there in the early 1890s, but before the 1920s the Belgians' primary interest in the forest was to test possibilities for rubber production, which developed haltingly. Limba, the most valuable Congolese hardwood, was first harvested there only in 1920. Formal forestry management appeared only when the Forest Service was established there in 1936.

A fuller analysis of these twentieth-century tropical trends was on the agenda of a parallel conference entitled, "The World Economy and World Forests in the Twentieth Century," held at Duke University in April 1983.

ENDNOTES

[1] This report reflects the substance of a conference of the same title which was held on May 12-15, 1981 at Oakland University. Most of the papers from the conference, now revised, are published in Richard P. Tucker and J. F. Richards, Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

[2] Similar processes were occurring the more settled European heartland, as indicated by Arlette Brosselin, "The Evolution of the Woodlands and the Forest Economy of Nineteenth Century France: the Case of Burgundy"; and Heinrich Rubner, "Nineteenth Century Forest in Germany." (Unpublished papers presented at the Oakland Conference.)

[3] Michael Williams, "Ohio: Microcosm of Agricultural Clearing in the Mid-West," in Richard P. Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy Duke Press Policy Studies, Durham, NC 1983.

[4] Thomas Cox, "Trade Development and Environmental Change: The Utilization of North America's Pacific Coast Forests to 1914," in Richard P. Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

[5] Warren Dean, "Deforestation in Southeastern Brazil," in Richard P. Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

[6] Michael Adas, "Colonization, Commercial Agriculture and the Destruction of the Deltaic Rain Forests of British Burma in the Nineteenth Century." in Richard P. Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

[7] John F. Richards and Michelle B. McAlpin, "Cotton Cultivating and Land Clearing in the Bombay Deccan and Karnatak: 1818-1920." in Richard P.

Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

[8] Rhoads Murphey, "Deforestation in Modern China." in Richard P. Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

[9] Masako Osako, "Forest Preservation in Tokugawa Japan."

[10] Richard Tucker, "The British Colonial System and the Forests of the Western Himalayan, 1815-1914," in Richard P. Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

[11] Dennis Roth, "Philippine Forests and Forestry: 1565-1920." A contrasting interplay of forest and grassland is analyzed in James T. Thomson, "The Precolonial Woodstock in Sahelian West Africa: the Example of Central Niger (Damagaram, Damergu, Air)." in Richard P. Tucker and J. F. Richards, (eds.) Global Deforestation and the Nineteenth Century World Economy, Duke Press Policy Studies, Durham, NC 1983.

THE IMMUNOLOGICAL STATUS OF THE AMERICAN INDIAN IN
1492 AND THEREAFTER: ABSTRACT

Calvin Martin
Rutgers University

Serological studies suggest that American Indians are indeed more susceptible to certain pathological conditions than are, say, Caucasians. Furthermore, it would appear that their genetic apparatus controlling immune responsiveness may have been and may continue to be somewhat different from that of whites. Generations of interbreeding would tend to erase such differences, to be sure. It is conceivable that initial and even secondary exposure to European-imported pathogens were so destructive because this distinctive immune response genotype, having developed in isolation for millennia, may have been incapable of furnishing an adequate response, though it must be emphasized that this is only speculative. The devastation of European disease may be better correlated with its dosage coupled with what was oftentimes an inadequate diet. A high dosage and/or inadequate diet would have rendered the T-cell arm of the immune system and the reticuloendothelial system largely inoperative, resulting in a feeble primary response and precluding immunization. Under such inauspicious circumstances the body responded to microbial insult by elaborating immune interferon (in the case of viral infection), by activating what is called the properdin pathway, and by pitting its limited phagocytic resources, that is, macrophages, against the offending antigens.

THE IMPACT OF WESTERN EXPANSION ON WORLD ECOSYSTEMS: COMMENT

Thomas R. Cox
San Diego State University

Pulling together three such diverse articles in a single commentary is a challenging, but not impossible task. Not only do all three deal directly with the subject indicated in the session title--something not always true of papers delivered at gatherings such as this--but also they all share, it seems to me, a common weakness. I would like to comment briefly on each and then come back to the question of what they share.

Professor Martin's material on the mechanics of immunology is fresh for most non-scientists, but the disastrous impact of disease on the indigenous populations of the New World has long been familiar. Indeed, the effects of European diseases were more than physical. As Richard White and others have demonstrated, epidemics sometimes left groups so disrupted and dispirited that they lost their capacity to rebound even after the epidemics themselves had passed. Douglas Oliver, Richard Suggs, and others have shown a similar pattern in various Pacific Islands, most notably the Marquesas group. These social-psychological effects need to be considered along with the physical if we are to understand the full impact of European diseases on the peoples of newly-reached lands.

At the same time, one must be cautious not to attribute more to disease than is its due. The population study group at Cambridge University, and my late colleague Andrew B. Appleby, have done exciting work in recent years on the effects of disease and malnutrition in England in early modern times. They have found that prior to the eighteenth century, deaths that were attributed to disease were often in fact caused by starvation and that chronic malnutrition paved the way for the devastating epidemics that began in the fourteenth century. As transportation improved, allowing food to get from one area to another, the deaths declined. Professor Martin alludes to the inadequacies of some Indian diets, inadequacies that left Indians even less able to resist or recover from disease than would

otherwise have been the case, but in view of the intriguing results from recent studies on Europe, I would think that diet was rather more important than Professor Martin's paper seems to imply. Immunological differences can help us to understand the tragic impact of the coming of Europeans on New World peoples, but unless we consider other factors as well we are going to be left with the inexplicable anomaly of the presence and then decline of disastrous epidemics in Europe just a bit earlier. And, of course, plague--which may have killed as much as half of the population of western Europe in early modern times--is now endemic among rodents here in California, yet few cases occur among humans, either Indian or white. Clearly, more than immunological differences between the races are involved.

Turning to the presentation of John Richards and Richard Tucker, I must confess to feeling slightly incestuous. I was a participant in the conference at Oakland University that they summarize and at the World Forest Congress in Kyoto where Professor Tucker's plan for the study of the history of tropical forests and deforestation was approved. Under the circumstances, I intend to supply not so much a critique of their presentation as a gloss on it.

Implicit in much of what was said at the Oakland conference were the ideas of Immanuel Wallerstein--although I do not believe he was ever mentioned by name during the proceedings, just as he was not in the paper that we have heard here. To be sure, the focus on the conference was on a later period than that emphasized by Wallerstein, but his ideas were central nonetheless.

The conference included participants from a wide range of backgrounds, interests, and fields--but no economists or geographers who specialize in commodity flow or related matters. In light of the centrality of trade and economic development in much of what was discussed, these were unfortunate omissions. In particular, the ideas of Douglass C. North and other exponents of the export-base theory of economic development could have been as useful to the conference as those of Wallerstein, but they intruded only rarely and in minor ways.

Professors Richards and Tucker admittedly do not

touch upon all that was said and presented at the Oakland conference. By leaving out what they do, I fear they have created the impression that there was greater uniformity of thrust and findings than was in fact the case. As they note, the deforestation of China was largely a result of domestic forces predating the nineteenth-century integration of a world economy, but they fail to note that developments in Japan, where plantation forestry emerged during the Tokugawa period, were also the result of indigenous, rather than international factors. Similarly, although developments in France and Germany were a product in large part of industrialization, the industrialization that was primarily operative was internal to the two nations. While one may make a case for the colonial status of the American Far West--and various scholars have--describing Burgundy or the forested areas of Germany as colonial regions distorts more than it enlightens. Indeed, the shaping processes that Tucker and Richards describe seem, save in the case of the Himalayas, to be far more descriptive of and appropriate to tropical than temperate zone forests.

A variety of unexpected insights emerged from the collective efforts of those at the Oakland conference. The difficulties of transferring forestry techniques appropriate in temperate-zone forests to tropical forests were largely unforeseen during the nineteenth century; only slowly and haltingly did knowledge of tropical forestry emerge to furnish means of coping with the problems spawned by the expansion of timber clearing and harvesting into tropical areas. Also, while it appears at first glance that much of the early forest cutting in new areas was decidedly wasteful, in fact a kind of conservation was involved: those at work saved insofar as they could that which was in short supply, substituting that which was in excess. In practice, this usually meant that they strove to conserve labor and capital by using wood lavishly. To those living in an age of limited resources, the approach seems wrong--but only when we look at it through presentist glasses. The Asian Development Bank, viewing from a perspective different from that of most of us gathered here, recently decided that sustained-yield forestry is an approach appropriate for developed but not for developing nations. Such ideas, which emerged in embryonic form at the conference, need

further probing. A third thing that I, at least, had not anticipated prior to the gathering at Oakland University was the extent to which anthropological considerations entered into our discussions. In North America, where most of my own prior work had been centered, forest areas had been largely depopulated by disease and other means before lumbering or clearing commenced, but in many another location indigenous peoples remained in the forests and added complicating factors that frequently shaped the course of events and patterns of forest utilization. Clashes between peoples as well as between man and the environment are a part of the story of expanding forest clearing and harvest during the nineteenth century.

Two additional comments should be made about the Tucker-Richards presentation. First, most of the papers presented at Oakland, including my own, would have been strengthened by being made more analytical while reducing narrative. As work proceeds and ideas crystallize, much that was implicit in the papers at Oakland should become explicit--at least, I hope that proves to be the case. The work of the new IUFRO group on tropical forestry, which Professor Tucker heads, and the projected conference at Duke University should help to bring this to pass. Second, not all contained in the paper we have just heard was a part of the Oakland proceedings. Today's discussions of tropical forests in Nigeria, French West Africa, and the Belgian Congo, while consistent with what was said at Oakland, were a part of it only by inference or in passing.

Our final article, that of Alfred W. Crosby, presents an intriguing, but I fear badly flawed, hypothesis. His thesis is that colonizers from Britain, coming from the larger, more complex Eurasian-African land mass to isolated, smaller ones, brought with them a complex of biological organisms that overwhelmed the simpler, less resistant forms of the new worlds. Once Old World organisms had arrived in sufficient numbers in what he labels the Neo-Britains, the process of displacement became virtually inevitable. To that central idea I have two objections-by-example.

First, just to the north of the Neo-Britain that we now call the United States was, in colonial times, a Neo-France, and just to the south a Neo-Spain.

Although all three were established at roughly the same time, and although both of the others were the recipient of complex and sizable packages of transplanted Old World organisms, neither had the environmental impact in the New World that British settlements did. Clearly, more than biological competition-replacement was at work. Settlers brought with them not just biological but also cultural baggage. The cultures differed markedly from national group to national group, but the biological material transplanted was essentially the same. Thus, it seems to me that it is to the cultural, not the biological, that we must turn if we are to explain the vastly different environmental impacts of the French, British, and Spanish on their respective colonial areas.

Second, there was also an earlier European settlement in the New World, but one which had little effect. I refer to that of the Vikings. Professor Crosby may have intended to dispose of the Norsemen via his proviso that the processes of replacement begin once the invaders arrive "in sufficient numbers" to overwhelm native forms. I am not sure that such a qualification is defensible, but even if it were the Viking settlements deserve further attention. Examining the story of the abandonment of their settlements, it seems clear that a major factor was not biological, but technological. Unlike later invaders from Europe, the Vikings had no weaponry so markedly superior to that of indigenous peoples as to assure the survival and expansion of their footholds on the western side of the Atlantic. Lacking such superiority, they failed to persevere and conquer.

Taken together, the above points suggest that not just biological but also cultural and technological factors were involved in the triumph of Old World forms over those native to the areas being colonized. But that is not my only objection to Professor Crosby's paper. He begins with a discussion of Social Darwinism and the "racism" of John Fiske; this he uses as a springboard into a discussion of competition between Old World forms and those of the lands being colonized. It is a useful point of departure, but one that overlooks and distorts much in the racial thinking of the late nineteenth century. Racial terminology was used loosely by all sorts of people--Fiske included. But not all who spoke and wrote thus really accepted

racial analyses of human competition. Indeed, the central intellectual debate of the period was the heredity-environment, or nature-nurture, controversy. Although Theodore Roosevelt used racial terminology as readily as Fiske, he in fact represented a very different viewpoint. As correspondence between Roosevelt and Madison Grant and the former's Winning of the West (with its strong echoes of Frederick Jackson Turner) clearly demonstrate, Roosevelt sided with nurture over nature as the basic force shaping Americans. Put another way, his thinking was environmental, not racist (or hereditarian, if you prefer).

The inadequacies of Professor Crosby's treatment of Fiske and of late nineteenth century racial and Social Darwinist thinking do not impinge upon his central thesis. However, since he uses Fiske's thinking as a springboard into his larger topic, weaknesses there serve to undermine the persuasiveness of the whole.

Now, let us return to the question of the basic shortcoming that I believe the three presentations share, a question that I introduced at the beginning but left hanging. As I have already indicated, I think that both the Martin and Crosby articles are too narrowly biological; by omitting or truncating consideration of cultural factors, they have given us a distorted picture of the course of events and the factors involved in shaping them. The Richards-Tucker article also suffers from a failure to give adequate consideration to cultural factors, although what replaces them in their analysis is largely economic rather than biological. In their case, at least, this was readily avoidable. Although their summary touches on the paper of Dennis Roth on the Philippines, they fail to mention what to my mind is the most important insight to be gained from it. By implication, at least, Roth's paper showed the importance of cultural baggage in shaping activities of the Spanish in the Philippines; their agrarian/pastoral values apparently led them to virtually ignore, when they were not simply removing, the forest. George Perkins Marsh's comments about the proverbial Spanish hatred of trees echoed in what Roth wrote. And what he reported for the Philippines closely paralleled what I found during my own research on the Hispanic period in California, where serious tapping of the forests had to await the

coming of Anglos. In both places, Spanish cultural values led these Europeans to respond to the forests in the same ways--ways markedly different from those in English settlers. In spite of discussion of this at Oakland, if one were to rely solely on the Richards-Tucker article, one would be left with the impression that expanding world trade, plantation agriculture, and metropolitan power were almost solely responsible for what happened to the world's forests in the nineteenth century.

Biologists and economists, as surely as any one else, need to include social and cultural factors in their analyses of environmental use and misuse. Insofar as they do not, their influence and effectiveness are reduced. And insofar as the three articles before us have failed in this regard, they too fall short of what they might have been. Each is interesting and useful, but none is as satisfying as I had hoped it would be. That should come as no surprise; the perfect article has yet to be written in this, as in most other fields.

"THE COYOTE ITSELF": ECOLOGISTS AND THE VALUE OF PREDATORS, 1900-1972

Thomas R. Dunlap

Virginia Polytechnic Institute and State University

The last sixty years have seen great changes in the way in which Americans have looked at nature, and in few places have the changes been so striking as in regard to predatory animals. As late as the 1920s even ardent defenders of wildlife made an exception for the "bloodthirsty" creatures which killed other animals. Wardens at bird sanctuaries shot hawks and owls, and prominent figures in the fight for wildlife encouraged the killing of predators. No one quite advocated extermination, but there was little attempt to save predators, even, or perhaps especially, the large mammalian ones. Today organizations ranging from the National Wildlife Federation to local groups such as the Minnesota-based HOWL (Help Our Wolves Live) campaign for the reintroduction of even that arch-predator. Bounties have largely vanished, indiscriminate shooting is discouraged, and the federal government has stopped, since 1972, wholesale poisoning of coyotes. Predators are now widely accepted as beautiful and interesting creatures, essential parts of the scheme of nature, to be treated as other animals.[1]

A major, but neglected, element in this shift of attitudes and policy is science. Since 1885, when the USDA's then-new Office of Economic Ornithology and Mammalogy began to test poisons for rodents and carnivores, science has served as at least the theoretical underpinning of predator control, and both defenders and opponents of poisoning predators had appealed to scientific studies to justify their stand. Even groups interested in the humane treatment of animals have found it necessary to move to this ground to launch their attacks on the system.[2]

Science has also played an important role in shaping our perceptions of wildlife and our attitudes toward animals. Most of us, even if strongly interested in wildlife, have had little contact with large predators, and few could speak from experience about the effects of these animals on wild

populations of prey or domestic stock. Our main source of information is print, and animal stories and non-fiction articles have rested upon science since the late nineteenth century. The works of Ernest Thompson Seton and Charles G. D. Roberts, which enjoyed phenomenal popularity in the early part of the century, were grounded in natural history and animal psychology; indeed, both authors saw this dedication to science as the distinguishing mark of their fiction. The tradition of "scientific" nature writing continued, and scientists as well as popular writers sought to bring the latest scientific views on wildlife to the public.[3] While these views did not necessarily cause dramatic change in the minds of the public, they did buttress ideas already arrived at in other ways, and because of the prestige of science, shake the confidence of people on the other side.

In studying changing ideas about predators the place to begin is the early part of the twentieth century, when the government first undertook major responsibilities for managing wildlife, scientists began to criticize policy, and the first public debate over predator control took place. Then, in the 1930s, field studies of predators and their prey made major changes in our knowledge of predation and its place in the "economy of nature." Finally, public attitudes began to change in the post World War II period, leading to a major policy debate in the 1960s and dramatic changes in policy in the early 1970s. I would like to thank Dr. David Wake, Director of the Museum of Vertebrate Zoology, Berkeley, California, and the Museum Staff, Ms. Renee Jaussaud of the National Archives and Records Service, and the staff of the Conservation Center, Denver Public Library for their assistance. For financial support I would like to thank the History Department and the College of Arts and Sciences at Virginia Tech.

BEGINNINGS OF CHANGE, 1900-1930

Killing predators has been common practice in America since the first settlers arrived, full of ideas about the dangers of the dark forests; Massachusetts Bay and Virginia placed bounties on wolves in the 1630s. Later colonies followed suit and the bounty system for "vermin" was an almost universal feature of state statute books and a major

tool of "game management" and stock protection well into the twentieth century.[4] The federal government did not become directly involved in these efforts until 1905, when the Forest Service hired trappers to reduce predator populations on national forest grazing lands. In 1915, in response to the complaints of Western stockraisers, largely woolgrowers, Congress appropriated money for predator control in that area and directed the Bureau of Biological Survey (it had abandoned the name Office of Economic Ornithology and Mammalogy in 1896) to undertake the work, including the Forest Service's responsibilities in that area.[5]

The new program quickly developed into a semi-independent extermination company for Western ranchers. In 1918 the Survey began a system of cooperative funding. Ranchers in a state or county, or a livestock association, could request federal help in curbing predators in their area. If the Survey decided that they needed aid it would provide a hunter and his equipment. The cooperators (as they were called) would pay most of the cost of the operation, usually through a tax on livestock in the area. By the mid-1920s this outside funding accounted for about a quarter of the Survey's budget. Their direct contributions, and the presence of Western Congressmen on Congressional appropriations committees made the Survey responsive to the interests of the ranchers and largely independent of its nominal superiors in the Department of Agriculture.[6] By the time the program was transferred to the Department of the Interior in 1939 as part of the new Fish and Wildlife Service, the pattern was too well set to be easily disrupted, and the predator control office remained largely autonomous.

This situation aroused little public interest and no immediate protest, for no one championed predators or even thought them particularly desirable. Even those most interested in wildlife had few good words for predators. For example, Ernest Thompson Seton, a strong advocate for animals and an outstanding nature writer, portrayed wolves as ravenous, dangerous creatures. In "Bingo--the Story of a Dog" his faithful hound appears to save him when, trapped himself, he is about to be eaten by "the foe that I most despised." Even in "Lobo, King of the Currumpaw," in which the wolf is a sympathetic

figure, he is still an "outlaw king, the hero of a thousand lawless raids," and his death, though regrettable, is inevitable and necessary.[7] William Hornaday, a leader in the fight to protect and preserve wild species, had little charity for the predators. Peregrine falcons, he declared, looked best "in collections," the Great Horned Owl was an "aerial robber and murderer," and the wolf a "master of cunning and the acme of cruelty"--as well as being a coward. Cooper's and Sharp-shinned hawks should be shot on sight.[8] Biologists and wildlife managers shared many of these attitudes. There were few who objected to characterizations (in the Journal of Mammalogy) of predators as "criminals" and "murderers," and when Aldo Leopold was calling, in the early 1920s, for the total elimination of large predators from New Mexico, he found much support and no opposition.[9]

These common ideas rested on a simple picture of predators and of predation. Carnivores were ferocious, aggressive creatures motivated entirely by blood lust. Wolves killed cattle and sheep as weasels killed chickens, for the fun of it. Predation was a constant drain on a prey population, which survived by breeding faster than it was eaten. Therefore, to protect domestic stock, game and beautiful and harmless wildlife, predators had to be eliminated. They, particularly the larger ones, would survive only in areas set aside for them.[10]

These assumptions, and the limits of Americans' sympathy with predators in this period, are evident in the debate, between 1924 and 1931, over predator poisoning. The Survey had begun with traps, guns, poison, and dogs, but had increasingly come to rely on poison bait. Hunters spread small chunks of fat and left "bait stations" (a quarter or half a horse, staked down and left in an isolated area for the winter). In the early 1920s a small group of biologists, largely Westerners, began to object to this practice. They had been in the field, had seen the results of the program, and were alarmed at the effects of the poison on non-target wildlife.[11]

Dissatisfaction turned into open controversy at the 1924 meeting of the American Society of Mammalogists, when several members delivered papers attacking the use of poison. One of the Survey's senior biologists, E. A. Goldman, defended his

agency. The mammalogists charged that the Survey was not conducting a campaign of predator control but one of predator extermination, carried out in such a reckless way that it endangered other wildlife and caused needless harm and economic damage. As scientists, they thought the rapid extinction of predators was a serious blow to their work. Local populations and even subspecies were being wiped out and once the original populations were gone it would be impossible to reconstruct their place in the ecology of the area or their relation to other populations of the same species. There were other losses as well. Trapped in season predators yielded furs for sale, an important item in many areas of the West; poisoned, neither they nor the non-target animals which fell victim to the poison did any good for the local economy. Alive, predators curbed rodent and rabbit populations which competed with cattle and sheep for the grass. Finally, there was the possibility that the animals had other, as yet undiscovered uses; one speaker cited the discovery of insulin in sharks liver as an example of the unexpected good that might come from "vermin." [12]

Goldman said that the scientists need not be alarmed. Although predator control might, he admitted, cause "local extermination" the Survey did not intend to exterminate species and was not, in fact, doing so. In any case, even if large predators were eliminated from the United States, they would survive in Mexico and Canada. As for the small predators, particularly the coyote, they were in no danger at all. Science would not suffer, either, for the Survey was conducting, alongside its control operations, scientific investigations. His main argument, though, was that predator control was necessary. "Large predatory animals, destructive to livestock and game, no longer have a place in our advancing civilization." The Survey, he concluded, was also not responsible for the policy; it had simply taken over work that ranchers had been doing and was only hastening a process which had been underway for decades. [13]

For several years the dissident mammalogists waged a vigorous campaign against the poisoning, but to no avail. Two committees of the American Society of Mammalogists investigated the Survey's operations (and rendered unfavorable reports) while others wrote scientific papers, did field work, and talked with

their friends in the Survey.[14] In March 1930 one of the leaders of the group, A. Brazier Howell, gave the head of the Survey a petition signed by over a hundred scientists. Howell and other mammalogists testified before Congress that spring in an effort to stop the funding of a new, massive campaign to reduce predator populations in the West. They managed to delay action for a year, but in 1931 Congress passed the Animal Damage Control Act, giving the Secretary of Agriculture new power to conduct predator poisoning operations, and funded the plan put forward the year before. The mammalogists, discouraged and dismayed, ended their organized opposition.[15] One reason they failed to affect policy was that they misjudged the nature and strength of the opposition. The scientists had enjoyed close and productive relationships with their counterparts in government (and continued, for the most part, to do so); they assumed that the agency would be responsive to their needs and desires. The predator control program, though, had a clientele which the Survey's leaders could not afford to ignore. The woolgrowers paid the piper; the scientists did not. Political midjudgment, though, is hardly a complete explanation. More potent was the general belief, even by the scientists, that the program was basically sound. Everyone tacitly accepted the idea that predators, as wild, free-ranging species, would perish in the West and be preserved only in locations, like outside zoos, set aside for scientific study and public view. The animals "no longer had a place in our advancing civilization." [16] The scientists, as their complaints made clear, were only against the speed and thoroughness with which the program was being carried out, and were concerned about the side-effects. Such an equivocal attitude was hardly the stuff of a potent opposition.

The scientific evidence also provided too little support for the mammalogist. The disagreement over the role of coyotes in controlling rodent populations (the larger predators had been extirpated by this time and the mammalogists, in any case, did not defend them) was argued with little evidence on their side.[17] The theoretical discussion came abruptly down to earth in January 1927, when millions of mice, which had been breeding in the fallow fields of a dry lake bed in Kern County, California, overran the countryside. A slick coating of crushed mice covered

the roads; at one factory workers put out poison and then had to bury two tons of dead rodents; and stories circulated in the towns around of housewives who had not touched ground for a week, doing their housework by leaping from one piece of furniture to another. Biologists rushed to the scene, but their explanations were as diverse as the mouse traps. E. Raymond Hall, a zoologist with the Museum of Vertebrate Zoology at the University of California, Berkeley and a strong opponent of the Survey's program, blamed the lack of predators in the area. The Survey had poisoned and shot coyotes in Kern County in 1924-1925 and farmers shot, and continued to shoot, hawks and owls. The mice, freed of the check imposed by the predators had multiplied out of control. Stanley Piper, a government biologist, came to Kern County a week after Hall and concluded that the problem was not the lack of predators but the abundance of food and cover provided by the fallow fields. Sheltered from their enemies and provided with an abundance of food, the mice had multiplied out of control.[18]

They could so easily disagree because there was so little known about the mechanism of population regulation. Much of the argument turned on the food habits of the carnivores, their relative addiction to mice and mutton, and their effect in cutting down the breeding population of mice, but there was virtually no worthwhile scientific data on the question. The Survey relied heavily on studies of stomach contents, but these had been done by untrained trappers and had included far too many stomachs with poison bait (domestic stock) to be reliable. The head of the Survey's food habits laboratory, W. L. McAtee, refused to accept them as scientific evidence.[19] Biologists arguing the other side were on even shakier grounds. They were accepting, on the basis of casual observation and armchair reasoning, the idea that predation was a check--the major check--on rapidly breeding species. The idea was seductive, reasonable, and possibly right, but they had no evidence to support it.

At the bottom of the controversy was a disagreement over the value of wild animals, but that never became an open issue. It was not just that aesthetics and sentiment were poor grounds from which to challenge a policy, the mammalogists were themselves confused. Olaus Murie, who worked for the

Survey in the 1920s and went on to become a strong defender of wilderness and wildlife, commented twenty years after the debate was over that "the scientists who became so concerned at that time did not, I believe, understand their own motivation. The big issue put forth was that 'innocent' animals would be killed incidental to poisoning operations. Deep in their hearts, if they had thought it out fully in those formative years of the opposition, was concern for the coyote itself." [20] Murie is correct in saying that the mammalogists were concerned about "the coyote itself" but equally correct in his belief that they "never thought it out fully." At the center of the confusion was an inadequate understanding of the place of predation in nature. Only when they had a clearer picture, based on scientific evidence, could the scientists defend predators as an essential element of a native fauna, and it was this new scientific picture which led to a changed public attitude in the post-World War II period and to the ultimately successful attack on poisoning in the late 1960s.

THE MEANING OF PREDATION, 1930-1950

The first steps in the new understanding of predation which developed in the 1930s were taken by animal ecologists working on the foundation of their discipline. Slower to develop than plant ecology (partly because their material was mobile) animal ecology began to come into its own in the 1920s, and the ideas developed led naturally into a study of predation. One of the most important problems was the structure of animal communities, and animal ecologists began to attack this by studying food habits of various species and their organization into trophic levels (herbivores, for example, would be the first level, the second animals which ate herbivores, the third animals which ate those animals, and so on). The new emphasis on quantitative techniques led to more rigorous studies of diet, going well beyond the simple question of who ate whom. [21] By the late 1920s animal ecologists were coming to see predation studies as a central part of their work.

Events reinforced the emphasis on predation; the need to increase small game in settled areas and the difficulties in managing large animals focused attention on our ignorance of natural biological systems. The problems of the deer herd in the Kaibab

National Forest, on the North Rim of the Grand Canyon, were the most dramatic example of problems in wildlife management, and that disaster led to the agonizing reappraisal of theories of deer management.[22] In the winter of 1924-1925 the herd went into a drastic decline. Protected from predators and competing grazing animals for 20 years, the herd had seemed, until the deer began dying, to be a model of good management. Live-trapping, driving, and hunting failed to check the decline, and investigations showed that the damage went well beyond the herd. The range had suffered damage which would take decades, if not centuries, to repair. By 1930 the idea that killing the predators might have been a major mistake, not a triumph of management, had begun to take root.[23]

It was not experience in the Kaibab, though, but studies of game bird populations which led to new ideas about predation. The first work was that of Herbert Stoddard, between 1924 and 1929, on the ecology of Georgia quail. A group of wealthy sportsmen interested in the very practical problem of producing more birds on their shooting grounds provided the funds but both Stoddard and the Bureau of Biological Survey, which supervised Stoddard's work for his sponsors, took a broader view of the subject. Stoddard did a full investigation of the effect of various factors in the habitat on quail population, including that of other competing species, predators, weather, cover, year-round food supply, and fire. The resulting monograph was not only a guide to quail management but an ecological treatise.[24] The year Stoddard finished Aldo Leopold set one of his graduate students, Paul Errington, to work on the bobwhite at the other end of the bird's range, in central Wisconsin. Like Stoddard's, this study was done for practical purposes of game management but informed by a strong interest in ecology.

Errington, who went on to make the study of predation a life-long project, provided the most important evidence yet gathered. On a five-square mile near Prairie du Sac he did an intensive study of the quail population.[25] Tramping through the fields and hedgerows, he took frequent censuses, with particular attention to winter losses, and plotted the results. The figures from two and then three years study raised a startling possibility--that

predation was not, at least here, of much importance in regulating the quail population. Cover and food seemed much more important than predators, and areas seemed to have an almost constant "carrying capacity." On good land many birds survived the winter, on poor land few did, even when the summer and fall populations had been high. In the winter of 1933-1934 an unusually high fox population strikingly confirmed the earlier results. Good land carried quail despite the foxes and bad land, even lacking predators, did not. "Within ordinary limits, Errington concluded, "the kinds and numbers of native flesh-eaters may not be of much consequence in the winter survival of wild northern bobwhite populations." [26]

He had not, as he was careful to point out, found a key to "explain" predation. While his results did discredit the conventional notion of predation as a constant drain on the prey population, they did not point to another single factor. Not even all bobwhite populations were immune to predators. In Georgia, for example, predation was clearly an important factor, even at predator densities lower than those at Prairie du Sac. In 1933 Aldo Leopold had warned game managers that "there is only one completely futile attitude on predators: that the issue is merely one of courage to protect one's own interests, and that all doubters and protestants are merely chicken-hearted." [27] The advice was even more to the point at the end of the decade.

Studies of large predators and their prey began in the mid 1930s and, like studies of small game, were done for practical reasons. The interest in "natural" National Parks and in wildlife had led the Park Service, in the early 1930s, to cut back on predator control. This had brought complaints that herbivores, like the elk, would be eaten up by the now unchecked coyotes, and the Service sought scientific advice on the question. In 1937 it hired Adolf Murie to study the ecology of the coyote in the Yellowstone and in 1939 asked him to do a similar project on wolves and the Dall sheep in Mt. McKinley National Park. [28]

Comparing Adolf's studies with the work done by his brother Olaus on coyotes in Jackson Hole, Wyoming between 1927 and 1932 shows what advances had been

made in a decade. Olaus, working for the Bureau of Biological Survey, analyzed the coyote's diet from the standpoint of composition, analyzing scats to see what percentage of the diet was rodents, what sheep, and so forth.[29] Adolph approached the subject from the other end, attempting to determine not what coyotes ate, but what effect they had on their prey. This was, as he admitted, much more difficult. There was not good data on coyote populations or their fluctuations in the past and no good methods by which to estimate it even now. He had to use a combination of methods--field observations, reports of game abundance, travelers' tales, and the recollections of old residents. In analyzing the effect of coyote predation on the elk population he emphasized the year-round conditions of life of the animals, the factors which made them vulnerable to predation or relatively safe from it.

He began his second project, on wolves and Dall sheep in Mt. McKinley National Park, a month after finishing his field work in Yellowstone, but the second study was not a repetition of the first. The emphasis remained the same--the conditions of life of the prey species--as did the object to study the effect of predation on the population, but the methods went well beyond those of the earlier study. He analyzed sheep skulls for evidence of age and disease (picking up and studying 829 of them) and compared the profile of the dead population with that of the living. It was not a perfect method of studying the effect of predation because cause of death was unknown, but it was suggestive. He also speculated on the question of the wolves' evolutionary pressure on the sheep population, but concluded that there was too little evidence to settle the problem. Finally, he did extensive work on the social life of the predators, watching wolf dens through a high-powered telescope. They did not, he found, conform to the stereotype in literature and legend. They were not lone wolves nor were they vicious animals. His dominant impression, in fact, was of their friendliness, as they played, met, greeted strangers, and went through a complicated social life.

Certain things were clear. In neither national park was predation a serious danger to the prey populations. Individuals were vulnerable, particularly if old, young, sick or injured, but the

herd as a whole could easily withstand the predators. So long as the range remained in good condition (something which was not certain at Yellowstone) the spectacular and visible wildlife would be there. Murie's work, in that sense, confirmed what had been said about small-game predator relationships, strengthening the case that the most important factors were, in general, food and year-round shelter requirements.

By about 1950 the accumulated evidence about predation had changed public and scientific ideas. The Pittman-Robertson Act of 1938, which taxed firearms and ammunition sales to fund wildlife research, enabled states to investigate the ecological conditions of their major game birds and mammals. The resulting flood of studies, which included repeated work on the same species in different states, provided overwhelming evidence that the new picture of predation was sound.[30] Wildlife and outdoor magazines brought the scientific information about predation to their readers. E. Raymond Hall and E. A. Goldman fought out the poisoning controversy in the pages of Outdoor Life and the Audubon Society's Bird-Lore became a vehicle for the new gospel, turning in the early 1930s from an exclusive concern with birds to larger questions of wildlife conservation. Errington's scientific papers were used to justify changes in attitude and policy, and by the late 1930s the distinction between "good" and "bad" species, so prominent in the 1920s, had vanished, and Audubon members were being urged to fight for all wildlife.[31]

IDEAS, ATTITUDES, AND POLICY, 1950-1972

Scientific research on predation did not have any major impact on the largest predator control program--the federal government's work--though it did help kill the state and county bounties which had been in force (though declining in popularity) for years. The woolgrowers were unwilling to see any changes, particularly a reduction in poisoning, in the post-World War II period. Falling prices, foreign competition, and increased difficulty and expense in hiring herders led them to favor more strongly a method of "control" which was cheap, simple, and efficient, and the introduction of a new poison, Compound 1080 (chemically sodium

fluoroacetate, but generally called after its laboratory test number) only made them more vehement. Developed during World War II for rodent control it seemed to be ideal too for predator control. Odorless, tasteless, and highly toxic (the normal "dose" was 1.6 grams of 1080 to 100 pounds of meat and about two bites of the bait would kill a coyote) it seemed the answer to the woolgrower's prayers. It roused enthusiasm similar to that for DDT, but its extreme toxicity led the government to seek to limit use and distribution. The woolgrowers, though, were too powerful to be denied, and by 1950 the new chemical was in general use throughout the West, not as a substitute for but as a complement to other poisons.[32]

There was some publicity about the use of 1080 and concern about its effects on non-target organisms, but the general public remained largely indifferent to the potential dangers. Most of the complaints came from hunters who lost dogs to the bait stations, and the mammalogists, though concerned, did not feel sure enough of their ground to make either a concerted protest or to appeal to the public for help.[33] The values and priorities which had allowed the growth of the poisoning program, though, were changing, and the public indifference which had left control in the hands of the woolgrowers was eroding. People had accepted predator "control" by poison because they agreed with the vision of America as a garden, a place of fields and pastures in which wild animals had no significant place. The economic values of efficiency and productivity and the desire for tamed land had taken precedence over wildlife and wilderness. Now millions of Americans, far from the hard years of the Depression and further from the need to confront nature directly, were coming to value amenities, including wildlife, more highly than they had before. Too, they were becoming skeptical of the possibility or desirability of total human management; an environment with as much of the natural wildlife and plants in place as possible was now the goal. With these changes both the poisoning program and 1080 became very obvious, if only potential, targets.

Biologists played a key role in translating latent dissatisfaction with the "conquest of nature" into a political movement which included, as part of its program, a new attitude and policy toward

predators. In 1962 Rachel Carson's Silent Spring crystallized many vague fears about pollution and the direction of technological "progress," vividly describing the dangers we faced from residues of chemicals used to control pests. It also presented a compelling vision of harmony with nature, based on a respect for natural processes and actions.[34] We must, Carson said, learn to work with nature, not against it, to accept our proper role as citizens of a biological community. "Ecology" became a rallying cry; it was not just a science but a "subversive science," promising a revolution in our attitudes toward nature and an end to our alienation from the world.

The next year Farley Mowat published Never Cry Wolf, an account of his observations of a wolf family in northern Canada. Some critics claimed that the book was fiction, that Mowat was telling the story of what he would like to have happened, but no one claimed that the book was inaccurate in its portrayal of wild life, and whether or not it accurately represents events is immaterial.[35] It was clearly attractive to a public alienated from technology and progress and eager to identify, at least vicariously, with nature. Mowat made this easy, for the book not only presented his observations, much like those of Olaus Murie, but put them within the context of his own conversion. He had come to the field, he said, with all the prejudices and fears of the ordinary person. Gradually he had come to see the wolves as interesting creatures which served a useful purpose and he came to identify with the natural world of which they were a part. At the emotional climax--an encounter with the cubs and the mother wolf in the den--he reverted, momentarily, to fear and hate, and felt, later, that he had failed to meet their and nature's standards. This glimpse of Eden lost was followed by a page describing the Canadian government's predator control work in the area a few years later--using poison baits. The book was a best seller and has sold, to date, a million copies.

The catalyst for policy change, though, was not Mowat's appealing picture of wolves, but a much more prosaic document: the report on the federal government's predator control work delivered to the Secretary of the Interior in March, 1964 by his Special Advisory Board on Wildlife Management.[36]

In 1962 Secretary of the Interior Udall had asked a group of eminent wildlife biologists to make a study of the problems of the elk herd in Yellowstone National Park and he turned to the Board again, in 1963, to investigate the predator poisoning. The report, usually called the Leopold report after the Board's chairman, A. Starker Leopold, set off a controversy which only died down a decade later, with the banning of 1080. The predator control division had traditionally defended itself on the grounds that what it was doing was economically justified and carried out in a scientifically sound manner; the Board found that it was neither. What evidence there was on the protection given to stock--and it was scanty--suggested that poisoning cost more than it was worth. At the very least it could not be shown to be effective. Other justifications for poisoning or otherwise killing predators were very weak. There was, the committee found, little danger to humans from rabid coyotes, and the argument that native wildlife needed protection from predators was "supported weakly, if at all," by the mass of evidence accumulated in the last thirty years.[37]

The program was also open to criticism on practical grounds. There was strong evidence of careless use of poison, of overuse, and of the flouting of regulations. Poisoned grain used to kill rodents pose a serious danger of secondary poisoning and might threaten endangered wildlife (particularly the black-footed ferret, which lived on prairie dogs). Control was, in theory, based on demonstrated need, but seemed actually to depend on "the subjective judgment of the PARC [Predator And Rodent Control] field men or supervisors in conference with livestock operators and agricultural officials." Some supervisors were "careful and conscientious," but "we have abundant evidence that others willingly support almost any control proposal in which someone is interested enough to contribute matching funds...."[38] The program has "become an end in itself and no longer is a balanced component of an overall scheme of wildlife husbandry and management," the PARC a "semi-autonomous bureaucracy whose function in many localities bears scant relationship to real need and less still to scientific management." [39]

The committee called on the PARC to reassess its goals in the light of new public attitudes toward

wildlife, to use the minimum of control consistent with economic interests, to exercise tighter control over field operations, and to resist building the program for its own sake. Most important, it sought a redistribution of power--the appointment of a permanent advisory board which would represent all parties and make the Secretary "aware of sensitive problems and divergent interests." [40] The closed process of policy formation had to be opened to accommodate the social value of wildlife to the entire population.

The report focused attention on the problems of the predator control program and provided the opposition with a powerful weapon: the condemnation of a respected group of scientists. The Board, speaking officially and representing the judgment of experienced field biologists, carried weight where others did not. In addition, their criticisms went beyond generalities and ideas about our relationship with nature. They named a specific agency and a specific practice: the predator control group and the widespread use of Compound 1080. The Fish and Wildlife Service rushed to repair the damage, but it could not defuse the criticism. In 1966 Representative Dingell held hearings on the Leopold report before the Subcommittee on Fisheries and Wildlife of the House Committee on Commerce, beginning what became almost an annual ritual. [41] As public concern about the effects of poisons in the environment mounted 1080, and the now-renamed Division of Wildlife Services, made almost ideal targets, seeming to combine arrogance toward the environment and wildlife with the reckless use of a highly poisonous compound and the backing by a small group of greedy men bent on destroying nature. The woolgrowers' lack of political sophistication, blunt speech, and often obvious contempt for their opponents only increased the opposition's fervor, and while the woolgrowers still had strong support in Congress the formation of the Council of Environmental Quality and the passage of the National Environment Policy Act gave environmental scientists a base in the bureaucracy. The woolgrowers found themselves outflanked. [42]

The controversy in the late 1960s was significantly different than that in the 1920s. There was nowt a clear division over values, one side believing that predators had to go (though that

sentiment was rarely, now, openly defended), the other thought predators were an important part of the fauna, a part to which economic interests, to some degree, had to adjust. In the 1920s the agreement had been in the other direction, that the West would be turned into a pasture for man's use with predators confined to a few areas. Then the scientist had not spoken out "for the coyote itself," now they did. Then the scientific evidence had been scanty and ambiguous, now it was clearly on one side--that of curbing predator control and changing the current policy. The scientist had not shown predators controlled rodent populations but that they were not such a significant factor in stock losses and, more important, that they could not be treated by a general simple policy. It was also clear that predator control was not useful for improving game populations, as a general rule. Finally, the public was involved as it had not been in the 1920s, and victory, ultimately, depended upon public pressure on the government.

The end came for 1080 in 1972. The year before environmentalists had forced the appointment of a new commission to look into the implementation of the Leopold report. The new group concluded that little had changed and its report was the basis for President Nixon's announcement, in his environmental state-of-the-union address on 18 February 1972, that he would immediately ban the use of 1080 and other predator poisons on federal lands. The woolgrowers protested bitterly that they had not been consulted. They were correct, and correct in pointing out that Secretary of the Interior Rogers Morton had promised to consult them before taking action, but that changed nothing. President Nixon, anxious to improve his rating with environmentalists in the coming election, had seized on a dramatic gesture to offset his decisions on the Alaska pipeline and the supersonic transport. In the ten years since that time there have been strenuous attempts to reintroduce the old system, but to little avail.[43] The era of poisoning seems to have passed, and we are now struggling to establish a new policy.

CONCLUSIONS

Throughout this period science has played a basic and obvious role: as the common ground on which arguments over policy have been conducted. It

has not been a simple matter of justifying action by an appeal to objective data; science had provided a neutral ground on which the debate, over values, disguised as a scientific one, could be carried on. The point of the debate, as Murie said, was the "coyote itself," and there was not only little common ground between the two sides, but no way, other than through science, for the opponents to meet. For some the coyote was worth preserving, either as a symbol of the wilderness or as part of nature which deserved our appreciation, for others the coyote was simply part of a nature which must be "conquered" for man's benefit. These sentiments, even when articulated (and they were not usually presented in clear terms) could not be debated. One valued nature or one wanted to conquer it; man was above nature or part of it. The defenders of predator poisoning, though, could meet with opponents on the technical issues. How much damage did the coyotes actually do? What was their effect on game populations? What degree of "control" was feasible and compatible with economic objectives and other needs?

Science, though, also played a role in shaping the public values, in convincing people that nature was good or bad. People who hated and feared carnivorous animals did not do so because of stomach content studies, nor did they change their minds because of monographs showing much of the coyote's diet was mice and other rodents. The prestige of science, though, did something to diminish the virulence of complaints about predators. If aesthetics and sentiment were poor grounds on which to challenge a policy, so were hatred and fear. By the late 1930s, too, scientific studies were presenting a vision of order in nature which struck a responsive chord in many people and provided a "rational" justification for protecting nature. Aldo Leopold, commenting on a study which showed that geese did, apparently, travel in family flocks, said that "it is not often that cold-potato mathematics thus confirms the sentimental notions of the bird-lover," but in the case of predators the cold observations of science reinforced and to some extent fostered the "sentimental notions." [44]

[1] T. S. Palmer, "Extermination of Noxious Animals by Bounties," in U. S. Department of Agriculture, Yearbook of Agriculture, 1896 (Washington: Government Printing Office, 1897), 55-68; Chronology and Index of the More Important Events in American Game Protection, 1776-1911, Bulletin 41, Bureau of Biological Survey, U. S. Department of Agriculture (Washington: Government Printing Office, 1912). Stanley P. Young and Edward A. Goldman, The Wolves of North America (1944, reprinted New York: Dover, 1964), 296-320 and 340-364. On sentiments about predators in this period see the general run of outdoor magazines, particularly the advertisements.

[2] There were a number of hearings in the late 1960s and early 1970s on predator control; see, for example U. S. Congress, House of Representatives, Committee on Agriculture, Predator Control (Hearings before the Committee on Agriculture, House of Representatives, 93rd Congress, 1st Session) (Washington: Government Printing Office, 1974).

[3] On the scientific backing of the new animal stories of the early twentieth century see Charles G. D. Roberts, "The Animal Story," in Kindred of the Wild (1902; reprinted New York: Blue Ribbon, no date, 23rd printing, 1932), 15-29; Introduction to Watchers of the Trails (Boston: L. C. Page, 1904); Ernest Thompson Seton, Trail of an Artist-Naturalist (New York: Charles Scribners' Sons, 1940), 367-371. More recent additions to the literature are Roger Caras, The Custer Wolf (Boston: Little, Brown, 1966) and Farley Mowat, Never Cry Wolf (Boston: Little, Brown, 1963). On the development of the nature craze in early twentieth century America see Peter Schmitt, Back to Nature: The Arcadian Myth in Urban America (New York: Oxford University Press, 1969).

[4] Palmer, "Extermination," 57.

[5] Jenks Cameron, The Bureau of Biological Survey (Baltimore: Johns Hopkins Press, 1929; reprinted New York: Arno, 1974), 45-48.

[6] The activities of the Bureau may be best traced through Bureau of Biological Survey, Annual Report of the Chief of the Bureau of Biological Survey (Washington: Government Printing Office, annual).

The Bureau begins as Office of Economic Ornithology and Mammalogy--the name changed in 1896. The Survey was broken up in 1939 and predator control put in the Department of the Interior's new Fish and Wildlife Service (1940-1957) and then Bureau of Sport Fisheries and Wildlife, (1957-). It is now called the Division of Wildlife Services.

[7] Ernest Thompson Seton, Wild Animals I Have Known (New York: Charles Scribners' Sons, 1898), 180, 51.

[8] William T. Hornaday, Our Vanishing Wildlife (New York: New York Zoological Society, 1913), 80, 140; _____, Wildlife Conservation in Theory and Practice (1914, reprinted New York: Arno, 1974), 141-151; _____, American Natural History (New York: Charles Scribners' Sons, 1904), 222-231, 22.

[9] Journal of Mammalogy, 8 (May 1927), 173 contains the only protest against this language the author found in searching the early issues. On Leopold's activities, see Susan Flader, Thinking Like a Mountain (Columbia: University of Missouri Press, 1974).

[10] The advertisements and articles in sportsmen's journals show this attitude very clearly. For a discussion in which the assumptions of the public are made articulate, see Paul Errington, "What is the Meaning of Predation?" Annual Report of the Smithsonian Institution for 1936 (Washington: Government Printing Office, 1937), 243-252.

[11] The mammalogists' feelings are best seen in their private correspondence, much of which is in the Museum of Vertebrate Zoology, Berkeley, California, which has kept complete files since its formation in 1908. See the files of Joseph Grinnell, Joseph Dixon, C. C. Adams, Lee R. Dice, H. E. Anthony, and A. Brazier Howell. See also "Predatory--Sale of Poisons," "General Correspondence, 1890-1944," and "Predatory--States," General Files, Division of Wildlife Services, Records of the United States Fish and Wildlife Service, R.G.22, National Archives and Records Service.

[12] The session, presented at the 6th annual meeting of the American Society of Mammalogists, included H. E. Anthony, "General Status of Predatory Mammal

Problems"; Lee R. Dice, "Scientific Value of Predatory Mammals"; W. B. Bell, "Predatory Mammals, a Practical Problem in Economics"; E. A. Goldman, "The Predatory Mammal Problem and the Balance of Nature"; Joseph Dixon, "Food Predilections of Predatory Mammals"; and C. C. Adams, "The Conservation of Predatory Mammals," Journal of Mammalogy, 5 (August 1924), 220. The papers of Dice, Goldman, Dixon, and Adams were printed in the Journal of Mammalogy, 6 (February 1925), W. B. Bell's is in "Research Reports," Division of Wildlife Research, R.G. 22, National Archives.

[13] Goldman, "Predatory Problems," 33.

[14] "Report of the Committee on Wildlife Sanctuaries, Including Provisions for Predatory Mammals," Journal of Mammalogy, 9 (November 1928), 354-358, also resolution passed at 10th annual meeting, May, 1930, Journal of Mammalogy, 11 (August 1930), 431. More is in letters of A. Brazier Howell, Joseph Dixon, C. C. Adams, and H. E. Anthony in Correspondence, Museum of Vertebrate Zoology, Berkeley, California. See also report by Olaus Murie and correspondence in "Report, Predator Animal Poisoning--Colorado, Wyoming," and "Report on Poisoning," Olaus Murie papers, Conservation Center, Denver Public Library.

[15] The petition and the names of the scientists are in "Poisons--Maryland," General Correspondence, R.G. 22., National Archives. Hearings U. S. Congress, House of Representatives, Committee on Agriculture, Control of Predatory Animals (Hearings before the Committee on Agriculture, 71st Congress, 2nd Session) (Washington: Government Printing Office, 1930). Comments on this in Hall correspondence, MVZ, Berkeley, California.

[16] Goldman, "Predatory Problem," 33.

[17] Frank N. Egerton, "Changing Concepts of the Balance of Nature," Quarterly Review of Biology, 48 (June 1973), 322-50. See also "Balance of Nature," General Files, Division of Wildlife Services, R.G. 22, National Archives.

[18] E. Raymond Hall, "An Outbreak of House Mice in Kern County, California," University of California Publications in Zoology, 30 (1927), 289-303, Hall

field notes from Museum of Vertebrate Zoology, Berkeley, California. Stanley E. Piper, "The Mouse Infestation of Buena Vista Lake Basin," Monthly Bulletin, Department of Agriculture, State of California, (October, 1928), 538-560.

[19] On the food habits studies on coyotes and McAtee's opinion, we have the testimony of Tracy I. Storer, a zoologist with the University of California, Davis, who visited McAtee in Washington in the spring of 1930. "Field notes, Unpublished field notes of Tracy I. Storer, 1912-1963," 1232, used with permission of Dr. Ruth Risdon Storer, 619 Oak Avenue, Davis, California. W. C. Henderson, "The Control of the Coyote," Journal of Mammalogy, 11 (August 1930), 336-350, contains the Bureau of Biological Survey's defense of its work and comments by biologists on Henderson's paper.

[20] O. J. Murie to C. C. Presnall, 7 December 1952 in "Miscellaneous P File," Murie papers.

[21] Charles Elton, Animal Ecology (1927, reprinted London: Methuen, 1966).

[22] The best description of the impact of the Kaibab on game management is Susan Flader's Thinking Like a Mountain. For contemporary comment on the early situation see Bird-Lore, 28 (January-February 1926), 88-90 and Outdoor Life, 53 (December 1924), 436-437. Some information is in the file "Predatory--States, Arizona," General Files, R.G. 22, National Archives.

[23] Walter G. Mann and S. B. Locke, "The Kaibab Deer: A Brief History of Recent Developments," (unpublished paper of the Forest Service, May 1931), copy from E. Raymond Hall, Museum of Natural History, Lawrence, Kansas; John P. Russo, The Kaibab North Deer Herd: Its History, Problems, and Management, Wildlife Bulletin No. 7, Arizona Game and Fish Department (Phoenix, Arizona, State Game and Fish Department, 1964); Francis Harper file, Correspondence of the Museum of Vertebrate Zoology, Berkeley, California. For recent criticism of the standard "lessons" of the incident, see Graeme Caughley, "Eruption of Ungulate Populations, with Emphasis on Himalayan Thar in New Zealand," Ecology, 51 (Winter 1970), 53-72 and C. John Burk, "The Kaibab Deer Incident; A Long Persisting Myth," Bioscience, 23 (February 1973), 113-114.

[24] Herbert L. Stoddard, The Bobwhite Quail: Its Habits, Preservation, and Increase (New York: Charles Scribners' Sons, 1931).

[25] The record of the quail study is contained in "Research Areas and Projects--Prairie du Sac," Aldo Leopold Papers, Department of Wildlife Ecology, University of Wisconsin Archives, Madison, Wisconsin. See also Errington to Robert McCabe, 1 March 1948 in Errington file, Correspondence, Leopold Papers.

[26] Paul Errington, "Bobwhite Winter Survival in an Area Heavily Populated with Grey Foxes," Iowa State College Journal of Science, 8 (1933-1934), 130. _____, "Vulnerability of Bobwhite Populations to Predation," Ecology 15 (April 1934), 110-127.

[27] Errington, "What is the Meaning of Predation?" 243-252. _____ and H. L. Stoddard, "Modification in Predation Theory Suggested by Ecological Studies of the Bobwhite Quail," Transactions of the Third North American Wildlife Conference (Washington: American Wildlife Institute, 1938), 736-740. Aldo Leopold, Game Management (New York: Charles Scribners' Sons, 1933), 252.

[28] Adolph Murie, Ecology of the Coyote in the Yellowstone, Fauna Series Number 4, National Park Service, Department of the Interior (Washington: Government Printing Office, 1940); _____, The Wolves of Mt. McKinley, Fauna Series Number 5, National Park Service, Department of the Interior (Washington: Government Printing Office, 1944).

[29] Olaus Murie, "Food Habits of the Coyote in Jackson Hole, Wyoming," USDA Miscellaneous Circular 362 (October 1935). A copy, with the criticisms of others in the Survey, is in Murie Correspondence.

[30] Starker Leopold stressed the importance of the Pitman-Robertson act for game research in an interview with the author, 16 June 1981.

[31] Bird-Lore for this period shows clearly the changes in attitude and development. Sportsmen could follow the predator poisoning debate in Outdoor Life, beginning with A. Brazier Howell's blast: "The Poison Brigade of the Biological Survey: An

Open Letter to Paul G. Redington" [Chief of the Survey], Outdoor Life, 66 (July 1930), 32-33 and continuing on, almost in each issue, to W. C. Henderson's "The Other Side of the Poison Case," December 22-23 and E. Raymond Hall's replies in 1931 (67) "The Poisoner Again," April, 26-27, and May, 28-29.

[32] "Poison 1080" files, R.G. 22, National Archives, contain extensive data on the development and use of this compound. Of particular interest regarding the memos on proposed changes in "Poison 1080, Correspondence--Instructions to Regions (ADC)" and "Poison 1080--Studies of." In this latter file see E. R. Kalmbach's memo of 10 January 1951, calculating the area covered by 1080 stations. For a private admission that things had been overdone with 1080 see C. C. Presnall to Olaus Murie, 4 September 1952 in Murie Correspondence.

[33] "Poison 1080, Accidents, 1946-1960," "Poison 1080, Complaints, 1949-1960," "Criticism of, Use of, 1947-1964," in General Files, R.G. 22, National Archives.

[34] Rachel Carson, Silent Spring (Boston: Houghton Mifflin, 1962).

[35] Farley Mowat, Never Cry Wolf (Boston: Little, Brown, 1963). On Mowat's work see reviews by A. W. F. Banfield, Canadian Field Naturalist, 78 (1964), 52-54, by Douglas H. Pimlott, Journal of Wildlife Management, 30 (1964), 236, by A. M. Stebler, Journal of Wildlife Management, 29 (1963), 906-907.

[36] The report, usually called the Leopold report, is Advisory Board on Wildlife Management, "Predator and Rodent Control in the United States, Transactions of the 29th North American Wildlife and Natural Resources Conference (Washington: Wildlife Management Institute, 1964), 27-49.

[37] Advisory Board, "Predator Control," 34.

[38] Advisory Board, "Predator Control," 33.

[39] Advisory Board, "Predator Control," 42.

[40] Advisory Board, "Predator Control," 40.

[41] U. S. Congress, House of Representatives, Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, Predatory Mammals (Hearings before the Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, 89th Congress, 2nd Session) (Washington: Government Printing Office, 1966).

[42] The most complete account of the political maneuvering over the 1080 ban is Angus A. MacInyre, "The Politics of Nonincremental Domestic Change: Major Reform in Federal Pesticide and Predator Control Policy" (unpublished doctoral dissertation, University of California, Davis, 1980).

[43] On policy see United States Department of the Interior, Fish and Wildlife Service, "Final Environmental Impact Statement, U. S. Fish and Wildlife Service's Mammalian Predator Damage Management for Livestock Protection in the Western United States," (1979), 745-747.

[44] Aldo Leopold, A Sand County Almanac (1948; Ballantine edition, 1969), 22.

INSECTS, FOOD, AND HUNGER: THE PARADOX OF PLENTY FOR
U.S. ENTOMOLOGY, 1920-1970

John H. Perkins
The Evergreen State College

INTRODUCTION

Rachel Carson's Silent Spring (1962) is perhaps one of the best known books among all environmental historians, even the ones who have not done their research in the history of agriculture, pest control, or toxic substances. It is no exaggeration to say that Silent Spring had a catalytic effect on the creation of an environmental revival in the U.S. and Europe during the late 1960s and the 1970s. The very fact that environmental history exists as a field of study can in part be credited to Carson's work. Despite the importance of Silent Spring and the controversy over pesticides in sparking wide intellectual interests in environmental matters, historical investigations have just begun to reconstruct the context and substance of Carson's battle. Whorton's Before Silent Spring (1974), Graham's Since Silent Spring (1970), and Dunlap's DDT (1980) each developed important aspects of the story.[1] In this essay, another part of the subject is explored: the relationship among invention and innovation in pest control practices, the food supply, and hunger in the U.S. between 1920 and 1970.

Agricultural professionals are sharply divided about the current necessity of using insecticides in the amount and manner as occurs in the U.S. and other parts of the world. One analyst estimated that "food production could decrease 25 to 20 percent" and "our food and fiber depend at present and for several years to come on the judicious use of pesticides." An even more pessimistic view came from former Secretary of Agriculture Earl L. Butz, who flatly predicted famine: without pesticides farmers "could not produce enough food for 206 million Americans." [2]

Other agricultural scientists believe a much less serious situation faces the U.S. David Pimentel, an entomologist from Cornell University,

for example, argued that crop losses would increase by 9 percent in dollar value and 5 percent in terms of energy content. "No serious food shortage would occur in the United States if pesticides were withdrawn, because most staple foods, such as wheat, would not be greatly affected by the withdrawal of chemicals. However, the production of certain fruits and vegetables, such as apples, peaches, onions, and tomatoes would be greatly reduced." [3]

Given the fact that highly knowledgeable sources disagree about the necessity of current insecticide uses to feed the American people, one is led to wonder about the processes by which these chemicals came to play such a large role in contemporary agriculture. Stated more generally, what factors were conducive to the development of insect-control technology? If prevention of famine and hunger do not stand as universally compelling reasons for the current functions of insecticides, what must have been the case in previous years?

PRELUDE TO CHANGE, 1860-1920

A society's methods of obtaining its food supply are indicative of the culture's relationship to the natural environment. Food production in the United States underwent a profound change during the period 1920 to 1970; capital inputs were substituted for human and animal labor in ways that allowed and required many rural people to leave agriculture and seek their fortunes in urban areas. This revolutionary transformation began before the nineteenth century and its course of events are not at an end. [4] Farming as a way-of-life with commercial overtones became primarily a specialized industry in which the "manufacturing plant" was a rural homestead. Remnants of an agrarian ideology clouded the transformation in which scientifically-based technology replaced a folk art. Insect-control technology was part of the package of new technological knowledge.

Transformation of the food production system by the adoption of new technology changed the economic, social, and political fabric of the United States. It also altered the philosophical attitudes toward farmers and farming in the American culture. Given the seriousness and complexities of the changes, it is somewhat surprising that they occurred in the

absence of any serious disruptions in the physical capacity to produce food. A variety of social dislocations, some of which were linked to the technological transformation in agriculture, resulted in hunger and malnutrition for some Americans, but this essay will argue that the failures in the food production system were never due to a diminished physical capacity of the environment to sustain us.

New farming technologies were the product of many private and public research laboratories. Development and adoption of important nineteenth century mechanical devices, ranging from the cotton gin to the moldboard plow to horse-drawn reapers and threshers, were primarily the result of private entrepreneurial inventors, some of whom were also farmers.[5] Successful inventions often provided the basis for founding a new company. Some of the largest farm machinery manufacturers, such as Deere and Co., can be traced to successful inventions before the start of the twentieth century.[6] Companies based on the production of mechanical devices were joined by chemical companies, particularly after 1915. The chemical industry was the primary source of new products in fertilizers and pesticides. Today, private-sector research continues to pour new money into the development of new farm technology. An estimated \$575 million was invested in 1975.[7]

Outputs from private research were merged with equally important knowledge production by the public sector research and education establishment. Land grant universities were established to educate the farming class in 1861 and 1890. Agricultural experiment stations were created as research adjuncts to the land grant universities by the Hatch Act of 1887. Extension education, a key ingredient in the transfer of new knowledge to working farmers, was considerably enhanced by passage of the Smith-Lever Act in 1914. Some controversy surrounded the establishment of each component of the public teaching-research-outreach education complex, but by 1920 proponents of the system had clearly solidified their gains.[8] The United States had the largest agricultural research establishment in the world, and its elements stretched from USDA headquarters in Washington, D.C., to each of the states' land grant universities to each county's cooperative extension office.

Knowledge generated by the public and private research establishments was heterogeneous and diverse. New machines, improvements on old machines, and adaption of horse-powered machines to the steam and gasoline engines were particularly important developments of the late nineteenth and early twentieth centuries. Introduction of new plant varieties from abroad and creation of new varieties through genetic breeding were significant in the early twentieth century, particularly the development of hybrid corn. Fertilizers, pesticides, antibiotics and other chemicals were adopted by increasingly mechanized farmers, especially after 1945.

Econometric studies of technological development in Japan and the United States between 1880 and 1960, indicate that American inventions were biased toward the creation of labor-saving devices. Japanese inventions, in contrast, were slanted more towards knowledge that increased the productivity of land instead of labor. These general patterns reflected the relative scarcity of labor compared to land in the United States and of land compared to labor in Japan.[9] In short, the inventive genius in the United States was successful in creating the conditions of capital-intensive farming in part because the North American environment had abundant land compared to people during the early part of the twentieth century.

Entomology became a profession and an academic discipline in the last three decades of the nineteenth century. Land grant universities, state agricultural experiment stations, the U.S. Department of Agriculture, and state Departments of Agriculture provided jobs that permitted students of insects to move from amateur to professional status at a time when serious efforts at farm mechanization were underway. Much entomological work before 1920 was devoted to identification and taxonomic classification of insects and to the design of practical pest-control measures. Only a few insecticides, such as lead arsenate, Paris green, and botanical products, were available before 1920. Their uses were restricted primarily to high cost fruits and vegetables. With few exceptions, entomological knowledge for most field crops before 1920 consisted of variations in farming practices so as to destroy or remove insect-breeding habitat.

Some farmers made little or no conscious effort to reduce their losses to insects.

AGRICULTURE TRANSFORMED, 1920-1970

High prices for farm produce plus heavy production was stimulated by the needs for food in Europe during World War I, 1914-1918. American farmers thus prospered mightily during the conflict and used many of their profits to invest in new types of farm machines. Motorized tractors on farms, for example, increased from 25 thousand in 1915 to 246 thousand in 1920.[10] Unfortunately for American farmers, their export markets collapsed with the end of hostilities, and prices dropped sharply. While the rest of American society entered a wild, woolly, and generally prosperous decade, farmers descended into a chronic state of depression. For them the doldrums of the Great Depression of the 1930s began a decade early.[11]

It is important to note that economic problems for farmers were not caused by a shortage of goods for sale. Rather it was precisely the opposite. American farmers could produce more food and fiber than the U.S. market could absorb. Prices were depressed, a bonus for the growing body of urban consumers but a bane for the farm producers. Wheat, for example, went from \$2.19 per bushel to \$0.97 per bushel between 1919 and 1922.[12] Total food supplies were more than adequate to supply the U.S. population, but that fact did not spell prosperity for farmers. At least one agricultural economist summed it up neatly in 1927 by noting that more people assumed someone lived on a farm only if they had to.[13] Adequate supplies from the countryside did not make the countryside an attractive place to live.

Doldrums on the farm notwithstanding, the 1920s were exceptionally active years for economic entomology. New chemicals were developed or adopted for use as insecticides. One of the most spectacular successes resulted from the work of E. B. Blakeslee of USDA. He discovered that para-dichlorobenzene (PDB) could effectively control the peach-tree borer (Sanninoidea exitiosa [Say]) an insect that formerly could be controlled only by labor-intensive methods such as removing larvae from beneath the bark by hand.[14] PDB was a by-product of the manufacture of

picric acid, which was an essential part of making explosives. Blakeslee's success was a boon to peach orchardists, who began increasing their use of the material until they reached one-half million pounds per year in the early 1940s. Protection of clothes from moths was an even more important market that used 12.5 million pounds of PDB per year.[15]

Of equal or more importance to entomology and to American agriculture was Bert R. Coad's discovery that calcium arsenate could control the depredations of the boll weevil (Anthonomus grandis Boh.). Coad, also a USDA entomologist, did his experimental work during the period 1916-1918.[16] Cotton growers began adopting the use of the material after 1920, and 13 million pounds were used per year by 1923.[17] Although calcium arsenate was not universally used by cotton producers, it was important in some operations and it was important symbolically because it allowed the mass treatment for the first time of a row crop. Previous to calcium arsenate's use on cotton, only fruits and vegetables were significant users of insecticides. Calcium arsenate joined lead arsenate, Paris green, other arsenicals, and a variety of botanical insecticides as one of the products that gave a boost to the growing American chemical industry. The fact that these compounds enjoyed increasing use by at least some American farmers indicated that they were also becoming part of the U.S. food production system.

New methods of applying insecticides also became important during the 1920s. Advances in aircraft technology stimulated by World War I yielded better aircraft plus a growing body of skilled pilots. Attachment of dusting and spraying machinery to aircraft were all that was necessary in order to launch the field of "ag aviation." The first recorded aerial application of insecticides was in Ohio in 1921 when entomologists of the Ohio State University applied lead arsenate dust to catalpa sphinx moths. The new aerial application industry grew slowly as new chemicals for different crops were added to the ag aviator's capabilities. Application of calcium arsenate dusts became popular on some large cotton plantations, for example in the Mississippi delta with large, flat field unhindered by forests. After World War II, aerial application became a highly significant part of American agricultural production.[18]

Growth in the uses of insecticides during the 1920s was accompanied by an increase in the regulatory power and responsibility of the federal government. Major legislation was passed in 1910 to establish quality standards for the major insecticides, lead arsenate and Paris green. For other materials, the law required that the product be labelled with an accurate statement about the product's capabilities.[19] Federal regulations under the Insecticide Act of 1910 were primarily a consumer protection law with the consumer being the farmer or homeowner who purchased a pesticide product.

Advances in the uses of insecticides were the most spectacular development of economic entomology through the 1920s, but they were by no means the only ones. "Classical biological control," the deliberate importation of natural enemies of insects into the U.S., became a prominent component of entomological science. Major units of the USDA and of the University of California were the loci for most such work during the decade. Curtis P. Clausen and Harry S. Smith, plus other colleagues, continued efforts to control the Japanese beetle, European corn borer, gypsy moth, European earwig, San Jose scale, and other insects.[20] Although they were not always successful in practical matters, the biological control specialists contributed importantly to the growing discipline of ecology, especially in the area of population dynamics. The concept of "density dependent regulation of populations" developed as a theoretical adjunct to applied studies in biological control through the works of Smith and his associates.[21]

A second area of development was in organized programs of "cultural control." The European corn borer, (Ostrinia nubialis Hubn.), was discovered in eastern North America in 1917. It spread steadily toward the massive corn acreage of the American midwest and was clearly posing a threat to the region by the early 1920s. Experiences with the insect on the east coast demonstrated that the insect's damage could be controlled by careful sanitation in the field. Stalks of corn had to be buried by plowing them under soon after the harvest. Although entomologists themselves may not have been heavily involved in its design, a program was advocated by

the International Corn Borer Committee to prevent the insect's advance into the Canadian and American midwest. Congress appropriated \$10,000,000 for a massive "clean up" campaign in 1927, mostly in the states of Ohio, Indiana, and Michigan. Federal crews assisted farmers in destroying all stalks that could harbor the following year's crop of the moth. A tremendous hoopla of public relations efforts surrounded the campaign, but its practical effects were judged to be nil. The moth kept spreading its geographic range. USDA entomologists failed to support a second year's efforts, and the program died after the end of 1927.[22]

Even though entomologists made progress in fields other than insecticidal control, it is important to note that by the end of the 1920s insecticides were clearly showing strong increases in use compared to alternative methods of insect-pest control. Biological control, organized programs of cultural control, and other suppression methods never totally atrophied but they became more and more relegated to a secondary importance in practical agricultural production. By 1930 only a few crops, such as fruits, vegetables, and cotton, were receiving regular treatments with chemicals. Some insect pests of livestock, such as screwworm fly (Cochliomyia hominivorax [Coqu.]), were also treated regularly with various chemical concoctions.[23]

By and large, these crops and livestock either were not part of the staple diet of the American people or the supplies of these commodities were not heavily dependent upon the chemical treatments. Advances in entomological science and technology were thus not cloely tied to efforts to improve the food supply of the American people.

A social support system for the use of insecticides was also firmly in place by the end of the 1920s. The chemical industry was increasingly able to supply products in the amounts and qualities needed. Calcium arsenate, for example, went from being a compound of essentially zero commercial value to an insecticide with annual sales of tens of millions of pounds, all within the space of a few years in the early 1920s. More significant in the light of later developments, the rise to commercial prominence of PDB signalled that the American chemists could reliably produce insecticides based on

synthetic organic molecules. Before the start of World War I, virtually all American uses of such molecules were based on German imports. Cessation of trade due to the hostilities stimulated the development of an American industry that could use coal tar intermediates. PDB was simply the first of many insecticides that ultimately was produced in large quantities by the new industry.

Other parts of the social support system for the regular use of insecticides in American agriculture included the aerial application industry and the system of government regulations. The former was an aid to farmers seeking to economize on the labor costs, and the latter was essential to protect farmers from fraud that they could not detect themselves without sophisticated chemical skills. Both aerial application and regulation created a climate that encouraged producers to make insecticides a regular part of their production system.

Only two factors hindered the adoption of insecticides during the 1920s. First, increasing use of lead arsenate on apples, pears, and other fruits and vegetables ignited a controversy over the safety of residues of lead and arsenic on marketed fruit. Harvey Willey, head of USDA's Bureau of Chemistry, championed the cause of unadulterated food and was the major author/proponent of the 1906 Pure Food and Drug Act. Although Willey seemed not to have been seriously worried about the residues of lead and arsenic on fruit, the regulatory powers he initiated were the basis for serious concern by the government over the spray residues after 1919. Continual squabbles through the 1920s and 1930s dampened enthusiasm for insecticides, at least in the eyes of physiologists and medical scientists who thought the practice dangerous to human health.[24] The fact that lead arsenate and other compounds were not dropped from commercial apple production indicated that farmers and entomologists were marching to a different tune than the regulators. Nevertheless, a cloud hung over production methods of those farmers who first and most enthusiastically headed for regular use of insecticides.

A more serious concern with the wider adoption of insecticides was a simple economic and technical problem. Despite the utility of the compounds

developed before 1930, they still didn't work very well. The arsenicals had to be applied in fairly large quantities to be effective. Doses of five to ten pounds per acre of calcium arsenate on cotton, repeated several times a growing season, for example were necessary to protect cotton from the boll weevil.[25] In general, only high priced fruits and vegetables or crops subject to massive damage, such as cotton, were treated with insecticide. Beef and dairy cattle, pigs, and chickens received little chemical input, except in southerly areas subject to attack by cattle ticks and screwworm flies. Insect damage was occurring in these crop and livestock enterprises. Control measures, however, consisted mostly of cultural and sanitation practices or, most often, the farmer simply "grinned and bore it."

General depression in the 1930s made the farm depression even worse than it had been in the 1920s. Unemployment rose in the cities and produced extreme hardship and an inability to purchase needed food supplies. Industrial output slumped, and banks were unable and unwilling to provide credit. Drops of stock prices on Wall Street, especially during October, 1929, are the best known characteristics of the Great Depression today and provide the most vivid images in the minds of most people. Equally disastrous, however, were the drops in prices of farm commodities after 1929. Aggregate prices stood at an index of 100 in 1926, reached a slightly higher 104.9 before the stock market crash, and then plummeted steadily to 48.2 in 1932. Specifically, hogs dropped from \$10.67 per hundredweight in 1929 to \$4.12 in 1932. Wheat, the American staple, went from \$1.30 per bushel in 1929 to \$0.53 in 1932.[26] Those who kept their jobs and incomes were better off financially, but great hardship was wreaked on the millions of farm and urban families who lost their sources of livelihood.

Murray. R. Benedict summed it up neatly:

Conditions in the farm areas were truly desperate. Yet the situation was greatly changed from that of the 1920s. No longer was the farmer voicing his protest against a prosperous urban sector of the economy. Inequalities had been removed, not by raising the farmer to the urban level, but by a disaster that reduced

nearly all classes to a condition of severe depression.[27]

Hunger and malnutrition lurked in the pockets of the American people who were too poor to buy enough good food in the 1920s. The great Depression changed a moderately small problem to an epidemic. Poverty-induced hunger existed in the face of surplus agricultural production. President Franklin Roosevelt's New Deal redesigned the function of the federal government in agriculture by attacking the price-reducing surpluses. The Agricultural Adjustment Administration, created in May, 1933, entered into voluntary agreements with farmers to reduce acreage planted and thus reduce output.[28] Other forms of relief helped both rural and urban poor gain access to food and other necessities of life, but it is important to note that the government's primary aim during the 1930s was to reduce the output of American agriculture.

Despite the surpluses and low prices, important change in agricultural production practices continued during the 1930s. All of them tended to increase the output available from either human labor or from land. Some technological changes did both. Mechanization, for example, increased the efficiency of human labor. Tractors increased from 920,000 to 1,567,000 between 1930 and 1940. Grain combines increased from 61,000 to 190,000, and corn pickers increased from 50,000 to 110,000 during the same period. Milking machines went from 100,000 to 170,000.[29] Continued developments with hybrid corn also produced increases in efficiency, especially land. Possibly of most significance for increasing the productivity of land was the effort to produce and use more fertilizer. Average yields per hectare of wheat, corn, cotton, and other crops began steadily to rise as American farmers turned increasingly toward the use of fertilizers of many sorts.

Insect-control technology changed little during the decade of the 1930s. Important advances were made in the identification, rearing, and control of many species. Screw worm flies, for example, were distinguished taxonomically from other livestock pests in 1933, and new control practices were designed on the basis of a new understanding of the

insect's biological habits.[30] Similarly, a few new chemicals were introduced as insecticides, but few of them received much attention. Problems in insect control had no particular relationship to efforts to solve the problems of hunger resulting from the Depression. Such advances as there were tended to increase the productivity of labor and land, but those advances were insignificant.

Only the continued bickering of entomologists, apple growers, and toxicologists over the safety, or lack thereof, of lead and arsenic residues on fruit captured the imagination of the public at large. Passage of the Federal Food, Drug, and Cosmetic Act of 1938 was in part the result of agitation over this particular insect-control technology. After 1938, the government was empowered to establish tolerances for the poisonous residues and then seize all marketed items that exceeded the limits. Previous to 1938, federal authorities had to prove in court that each individual shipment seized constituted a hazard to human health.[31] Few cases could be won under such stringent rules.

Relative stability in matters of insect control ended after 1939 due to two primary factors: the invention of DDT in 1939 and politico-economic changes stimulated by World War II. Even though DDT was invented before and independently of the war, its own history quickly became engulfed in the conflict. Paul Herman Mueller, a chemist with the J. R. Geigy Co. SA in Basle, Switzerland, identified the insecticidal properties of the compound as he searched for a compound that could protect clothes against deprecations of moths. Had the war not intervened, little evidence suggests that adoption of DDT for other purposes would have proceeded quickly. The Swiss, however, faced a cutoff of food imports plus the influx of lice-ridden refugees from the war zone. They therefore quickly tried DDT for control of Colorado potato beetle and of human lice. It was successful in both areas and quickly adopted for both agriculture and public health purposes in Switzerland by 1942.[32]

J. R. Geigy officials notified their branches of DDT's abilities, but their first approach to their subsidiary in the U.S. brought a total lack of interest. Lead arsenate was considered good enough to take care of all problems in the U.S. with the

Colorado potato beetle. A second approach, initiated after the U.S. had entered the war, brought a much more enthusiastic reception. Geighy officials in New York passed the substance to USDA laboratories that were desperately searching for agents to kill mosquitoes, lice, chiggers, and other vermin affecting combat troops.[33]

By 1943, the USDA recommended the material to the armed forces, and most production of the substance was channeled to military purposes until the end of the war in 1945. Experiments to adopt DDT for American agriculture were initiated at USDA and state university experiment stations before 1945, and recommendations were quickly forthcoming on how to use the chemical in the production of apples, oranges, cotton, dairy products, beef cattle, and many other crops. DDT quickly became regarded as a miracle chemical in the popular mind and as the most stunning scientific discovery ever in the community of professional entomologists. Research avenues in entomology and production practices of farmers and ranchers were adjusted to investigate and exploit the enormous power of DDT to suppress many insect populations. Similarly the chemical industry quickly leaped to investigate the potential for other synthetic organic molecules to provide a foundation for other insecticides with which to compete with the DDT insecticides.[34]

Preparation for DDT's ready acceptance by American farmers was a by-product of the economic conditions of war-time farming. Surpluses and low prices were the dominant problems of American farmers during the 1920s and 1930s, but in war, surpluses turned into vital military commodities. War interrupted agricultural production and trade in Europe, and the United States began to supply crucial food stuffs to allied countries. War also brought economic recovery to the American people, who placed increased demand on the bounty of American farms. Moreover, war removed labor from the farm to the factory and to the armed forces. Farmers, left with little hired labor, high prices, and good incomes did the only logical thing they could: continue to mechanize and to adopt any other capital input they could so as to raise their own yields.[35] Fertilizers, newly developed herbicides, and insecticides such as DDT were exactly the types of inputs American farmers could profitably use under

the conditions generated by the war.

Fears of a postwar depression of farm prices was an overriding concern among agricultural administrators, farm-state Congressmen, and farmers during the war. No one wanted a repeat of the farm depression that followed World War I. Provisions were built into the farm legislation effective during the war that high price supports would continue for two years after a declared end of hostilities.[36] President Truman made the required declaration on December 31, 1946, and thus established continued high prices through the end of 1948. An additional bulwark against a postwar depression was the launching of the Marshall Plan to restore prosperity to capitalist Europe. A conscious effort to rehabilitate the industrial and agricultural economy of Europe, plus efforts to provide emergency food relief to both Europe and Japan ensured American farmers of excellent export markets and high prices through the end of the 1940s.[37]

Adoption of DDT and the other new insecticides that flowed from the chemical industry after the war was assured by the price structures then prevailing for farm goods. By 1950, the new chemicals had effectively supplanted the older insecticides such as lead and calcium arsenate, Paris green, and the botanicals. Research on biological control was largely abandoned, especially by the USDA, in favor of the new insecticides. Entomologists and farmers drifted away from cultural controls such as crop rotation and orchard sanitation, because the toxic chemicals obviated the need for such expensive, labor intensive practices.[38]

Was the "chemicalization" of insect control designed as a measure to insure food supplies for the American people? No. The major fear when the new chemicals replaced other methods was that of a return to unmarketable, price-depressing surplus. American people achieved record high consumption levels of food during World War II, before insecticides made much contribution to the output of staple crops, meats, and dairy products. Moreover, substantial supplies of foodstuffs went to allied nations during the war.[39] Immediately after the war, only a continuation of export markets and government price supports could save the American farmer from a return to the conditions of the 1930s. Protecting crops

from insects had something to do with the structure of agricultural production, but it had nothing to do with the feeding of the American people.

Insecticides appeared to be the unchallengeable wave of the future in 1950 for entomological researchers and for farmers and ranchers, but blemishes appeared. Residues of the sprays and dusts on food and feed emerged as an issue in the late 1940s after having been largely ignored for nearly ten years. At the outbreak of World War II, regulatory personnel of the Food and Drug Administration had been preparing to hold public hearings for establishing tolerances of arsenical and other insecticidal materials of fruits and vegetables. War forced a postponement of the procedures outlined in the Food, Drug and Cosmetic Act of 1938. The invention of the synthetic organic insecticides such as DDT completely changed the nature of the problems.[40] Congress and the Food and Drug Administration moved to rectify the situation in 1949.

The House of Representatives established the Select Committee to investigate the Use of Chemicals in Foods and Cosmetics, or the "Delaney Committee" after its chairman, James J. Delaney (D., N.Y.). Hearings of the Delaney Committee (1950-1952) were aimed at the need for new legislation to control the amounts of pesticide residues that could occur on foods and feeds.[41] Simultaneously, the Food and Drug Administration initiated a series of hearings on the amounts of residues that could be tolerated safely on fruits and vegetables. Results at the FDA hearings were made moot by the passage of an amendment to the Food, Drug, and Cosmetic Act that changed the mechanism by which tolerances for pesticidal residues were established. The Miller Amendment, after Congressman A. L. Miller (R., Nebraska), provided that a manufacturer of a chemical to be used in pest control had to obtain a "tolerance" from the Food and Drug Administration prior to registering and selling the chemical in interstate commerce.[42] FDA would award a tolerance based on data from safety tests conducted by the manufacturer. The intent of the Miller amendment was to shift the burden of proof of a pesticide's safety from the government to the manufacturer.

Pesticide manufacturers were nervous and upset

by the Congressional and FDA hearings of 1950-1952, because they feared that new laws might hinder their ability to discover, develop, and market new chemicals or to continue selling the products they already had. Similarly, most research entomologists from state and federal laboratories feared that new regulations would dampen their professional autonomy to research and recommend the methods of pest control they considered most "efficient." Fred C. Bishopp, director of entomological research for USDA, felt that the threats to the use of insecticides hindered the ability of farmers to provide a plentiful supply of inexpensive nutritious food. Public arguments in defense of pesticides generally did not touch on the relationship between the uses of the chemicals and the prevention of hunger and malnutrition, but Bishopp's private remarks indicated that he, as a national spokesman for entomology, was concerned about the issue.[43] Bishopp did not discuss the pre-eminent role of crop surpluses in American agricultural policy.

Did the new laws, particularly the Miller Amendment, have any noticeable effect on the use of pesticides? Apparently not. After its passage in 1954, uses of insecticides, herbicides, fungicides, and other chemicals continued to rise.[44] Ironically, in fact, the Miller Amendment's major effect may have been to remove a serious problem of public relations that was possibly of more danger to the chemical industry than was the requirement of safety testing. Adverse publicity about insecticide residues in food ultimately might have provoked far more stringent reactions had not the Miller Amendment intervened to promote an atmosphere of security.

Two other serious problems with insecticides emerged in the 1950s, and they threatened to destroy reliance on the use of insecticides. Their influence was not ameliorable by the passage of legislation. Insect populations were changed in important ways by the continued uses of insecticides. First, continued killing of individual insects that were susceptible to poisoning resulted in the increase of individuals that were more tolerant of the toxic substance. Resistance, in other words, developed in treated insect populations. Second, insecticides applied broadcast against a pest species also killed large numbers of the pest's predatory and parasitic insects (natural enemies). As a result, populations of the

pest species or of another previously innocuous species erupted into large and damaging numbers. "Resurgence" and "secondary-pest outbreaks" respectively, were the names established for these phenomena.

Resistance and the destruction of natural enemies created quite a different set of problems for entomologists and farmers than did the question for residues. Residues were perceived as a threat to public health and an attack was launched by forces outside of agriculture on the use of insecticides. Toxicologists and consumers argued for low tolerances of chemicals in order to protect the health of the consuming public. Residues, therefore, created an external threat to the use of insecticides. Resistance and the destruction of natural enemies, in contrast, were technological failures for the entomologist and farmer. One could simply not recommend the use of an insecticide if the target was not affected by it or if it unleashed more pest individuals over the long-term than it killed in the short-run. Resistance and the destruction of natural enemies, in other words, made the use of insecticides counterproductive. Use of the chemicals created the conditions for the cessation of their use.

Public arguments over the safety of residues created a climate that was, in theory, congenial to the search for new, non-chemical methods of insect control. Entomologists did not take advantage of that atmosphere to any significant extent. Those who testified before the Delaney Committee, for example, believed that the adverse publicity given to insecticide residues in food were overblown for the most part. Quite the opposite reaction attended the emergence of resistance and the destruction of natural enemies. Although both phenomena had been identified before the invention of DDT and the widespread use of the synthetic organic insecticides, the new insecticides promoted so many new examples of both phenomena that some entomologists argued that heavy reliance on chemicals was an unsound insect-control strategy.

Edward F. Knipling, director of entomological research in USDA from 1953-1971, for example, recognized the critical importance of resistance by the mid-1950s. In his own work on insects affecting man and animals, he had been keenly aware of the

resistance to DDT developed by house flies, human body lice, and anopheline mosquitoes. In his new position of research director for USDA, he was quickly made aware of the near panic caused by development of resistance to chlorinated hydrocarbon insecticides in the boll weevil in 1945.[45] Knipling had specifically come to the defense of insecticides in 1952 when substantial adverse publicity was occurring over the issue of residues, but to him resistance was a problem that could not be solved either by eloquent speeches or merely switching chemicals.[46] Entomologist A.W.A. Brown put it succinctly in 1960 when he argued that the "Golden Age" of chemical control had already passed because of the ever more frequent occurrence of resistance.[47]

Resistance and the destruction of natural enemies prompted the American entomological profession into a new state of inventive flurry in the years after 1954. Two new, general strategies for approaching insect problems were developed, one predominantly by USDA laboratories, the other by workers in the land grant universities and state agricultural experiment stations. Even though both of the new strategies were prompted by the technological failures associated with insecticides, they were incompatible on many criteria, and they were rivals in terms of the advocacy of their respective proponents.

USDA's contribution was Total Population Management (TPM), developed under the guidance of Knipling and his associates. TPM was based on the central idea that good insect control should be aimed at the total population of a pest, not just isolated segments of the population that could be found in the fields of individual farmers. Knipling believed that attacks should be conceived against a pest population spread over hundreds or even thousands of square kilometers. He advocated a variety of techniques for attacking the pest population including insecticides, sterile males, traps baited with pheromones, and a variety of alternatives in farming practices. Knipling's enthusiasm for advocating attacks against total populations was kindled by his dramatic successes with sterile males in suppressing the populations of screwworm flies in the southeastern states (1958-1959) and in the southwestern states and Mexico in 1962.[48]

Resistance of boll weevils to insecticides emerged just as he was having success in the use of sterile males to control screwworm flies, and he quickly transferred his methods onto work with the boll weevil. Later he developed similar wide area attack plans for the cotton boll worm/corn earworm and for the pink boll worm in the central valley of California.[49]

Knipling and his associates also believed that for certain key species, such as the boll weevil, eradication of the population was both achievable and desirable. Knipling's role as both scientific and administrative leader of USDA entomological work from 1953 to 1971 made his ideas of exceeding importance for all USDA research.[50]

Integrated Pest Management (IPM) was the alternative to TPM developed primarily in a variety of state laboratories. The central tenet of IPM was that sound insect control methods would come from a reliance on biological control and resistance of the host plant or animal to attack by the pest species. All other suppression techniques such as chemicals and alteration of farming practices were to be carefully integrated with the core suppression measures provided by biological control and host resistance. Careful scouting to determine levels of the pest species present was the primary tool to ensure integration of biological control and host resistance with other suppression methods. No treatments with chemicals, for example, would be made in IPM unless the pest population had surpassed an "economic threshold" that would result in economically unacceptable losses.[51]

Because of the diffuse origins of IPM, it is more difficult to identify the early successes that made its proponents enthusiastic. Work in England by Ripper and in Canada by Pickett was important, but the articulation of IPM as a formal strategy was largely the result of work at the University of California. Ray F. Smith, Robert van den Bosch, Kenneth S. Hagen, and Vernon M. Stern articulated the "integrated control" concept in 1959 as a result of their successful efforts to solve the problems of resistance and destruction of natural enemies associated with insecticidal treatments of the spotted alfalfa aphid. Earlier successes with the

alfalfa butterfly and with other insects formed an important prelude to the work on the spotted alfalfa aphid. Eradication of the pest species was specifically rejected as a goal for IPM research under most circumstances.[52]

TPM and IPM were the principle novel research efforts in entomology after 1960. It is fair to say that entomology as a field of knowledge was (and still is) in a state of tremendous flux because of the continuing problems with the use of insecticides and because of the on-going rivalry between proponents of TPM and IPM as the best way to solve the crises associated with the insecticides.

It is also important to note that just as entomology entered a period of intense flux after 1955, so, too, did the enterprise of American farming continue and intensify a trend of long-standing duration. As Willard W. Cochrane so eloquently put it, farmers in the United States were on a "treadmill" during most of the twentieth century but especially after 1945.[53] Farm surpluses, which depressed prices, were the hallmark of American agriculture. Individual farmers could better their own income only by lowering the unit production costs of their crops so as to compete favorably in a market place that could not absorb all of the produce entering it at a price commensurate with production costs. Lowering of production costs was achieved primarily by adopting new technology in the form of machines, fertilizers, pesticides, and other items. Farmers adopting the new production practices first intended to profit the most, but they also tended to raise the amount of produce reaching an already glutted market, thus depressing prices further. Farmers who adopted new practices later were able to stay in business but not able to earn handsome returns. Those who did not adopt new technology were gradually forced to retire from business because the prices they received were not enough to pay for the production inputs. Subsequent new inventions started a new round on the treadmill process. Again, early adopters profited handsomely, middle adopters stayed in business, and late and non-adopters were the ones who left farming.

The period 1950 to 1970 was especially momentous in the operation of the agricultural treadmill. Farm numbers dropped from 5.6 million to 2.9 million, and

the average size of farms rose from 213 acres to 374 acres. The number of people working on farms dropped from 9.9 million to 4.5 million as more and more machines and other capital inputs obviated the need for human labor on the farm.[54] As laggards in the technological revolution left farming, their lands were generally purchased or leased by their more progressive colleagues who were making enough money to stay in business.

Food surpluses during the 1950s and 1960s were a political embarrassment to the federal government. President Eisenhower's Secretary of Agriculture, Ezra Taft Benson, had a difficult time because he firmly believed in an ideology of economic freedom for farmer-capitalists. Political realities forced the Administration to maintain government controls on production levels and a price support system that helped keep many farmers in business who otherwise would have been driven out of existence.[55] Inauguration of a new round of food-as-foreign-aid began in 1954 with the passage of Public Law 480 (P.L. 480). It was largely an effort to rid the government of its surpluses. Despite these efforts to dispose of the supplies, large amounts of surplus food were held in federal warehouses during the 1950s.[56]

Surpluses continued in the Kennedy-Johnson administrations, and the P.L. 480 program became the more strategically conceived program of "Food for Peace." [57] Disposal of surplus American farm produce was thereby consciously integrated into overall strategic planning against the USSR, other socialist nations, and against insurgent movements in a variety of third world countries.[58]

Crop failure in India during 1964-66 elicited large shipments of wheat from the U.S. but only under conditions acceptable to the U.S. Incentives for foreign private investment, population control measures, and improvement of Indian agricultural production were the key requirements to receive aid.[59] Rediscovery of domestic hunger came in 1967, and amendments to the Food Stamp Act of 1964 (P.L. 88-525) created a more elaborate surplus disposal program within the U.S., which helped bring a wide variety of food aid to the poor within our own boundaries.[60] Disposal of food abroad and domestically helped absorb some of the tremendous

capacity of American farmers to produce food, but no distribution program totally removed the surpluses from government ownership.

INSECTS, FOOD, AND HUNGER: THE PARADOX OF PLENTY

What was the relationship of hunger to the development of insect control technology from 1920-1970? Did insect competition with humans for the food supply have any important relationship with the progress of technological invention for insect suppression? "No" is clearly implicit in the historical summary of important developments in insect control. The argument needs to be made more explicitly, and an alternative proposition about why insect-control technology was developed is required.

North America has been virtually free of mass starvation, hunger, and famine since European settlement began. Hunger and starvation occurred in various places and times, but it was usually a reflection of social disruption, war, racism, or poverty. Famine did not result from an inability of the physical environment to produce food, whether efforts to control insect damage were made or not. Cases of hunger that were best known resulted from destruction of traditional Indian game species,[61] tenant cotton farming in the south after the Civil War,[62] and poverty and racial discrimination in urban and rural areas.[63] Physical factors other than insects have caused severe problems of hunger. Kansas, for example, was severely disadvantaged by drought from 1859 to 1861.[64]

Insecticides were the most important inventions for insect control in terms of their abilities to replace alternative control methods or provide control where previous to their invention control was not practiced at all. A few exceptions are worth noting, but their importance stems as much from their anomalous character in twentieth-century American farming rather than their role in providing food. First, a few cases of biological control probably permitted some farming industries to develop that would not have done well without biological control. The citrus industry of southern California, for example, was materially boosted by biological control of cottony cushion scale during its beginnings in the late 1880s.[65] Second, alterations of farming practices and host plant resistance were important to

the production of at least one human staple crop, wheat. Burning or plowing under of stubble, late planting, and destruction of volunteer wheat all help avoid damage from the Hessian fly. Pawnee wheat, the product of years of plant breeding in USDA and the state universities, materially aided the protection of midwestern wheat from Hessian fly after World War II.[66] Even though these two examples demonstrate that prominent, non-insecticidal developments occurred during the heyday of inventing chemicals, it must be noted that both developments had little to do with feeding the American people. Citrus was a small, luxury crop until frozen orange juice made it a product for mass consumption. Where and when citrus was eaten, nutrition was improved by the Vitamin C and pleasure was enhanced by a delicacy. But no famine was prevented. Wheat supplies were crucial to the American people's diets from colonial times, and some wheat areas were badly damaged by Hessian fly in the nineteenth century.[67] Damage was by no means calamitous and surpluses were the rule during most of the twentieth century. Selection of resistant varieties occurred during the 1930s when surplus wheat was a severe problem.[68]

An examination of the precise context in which major insecticide inventions occurred also reveals that the inventions were unrelated to questions of preventing famine or hunger. Paris green was first used against Colorado potato beetle in the nineteenth century, and it probably was of some utility in helping farmers and gardeners maintain their yields of potatoes.[69] Wheat, corn and other grains were also in plentiful supply, however, so it is hard to argue that prevention of damage by the Colorado potato beetle was necessary to prevent famine. The utility of potatoes may have had more to do with the fact that they could be raised, harvested, and stored for long periods without much labor or the need for external processing.[70] Wheat, in contrast, required more labor, plus the miller had to be paid for making flour before the wheat could be consumed in its usual form.

A similar situation surrounded major insecticide developments in the twentieth century. E. B. Blakeslee's discovery of para-dichlorobenzene's utility against peach-tree borers may have helped provide more peaches, but peaches were largely a delicacy, not a foundation staple. Development of

lead arsenate occurred as a component of the campaign against gypsy moths in Massachusetts.[71] Protection of forests was important economically, but development of this particular insecticide had nothing to do with the food supply. Even when lead arsenate was adopted for use in apple production, its other major use before 1945,[72] it contributed little to a more healthy diet. Apples were chronically in oversupply after 1910. Moreover, apples contribute mostly gustatory pleasure plus a few calories to a diet.[73] Calcium arsenate presents yet another similar story. It was developed for use on cotton against the boll weevil. The entire motivation for growing cotton was for its fiber, not the food and feed value of its seeds. The invention of calcium arsenate had essentially no contextual relationship to any problem of feeding people.

Examination of the nature of the crises surrounding insecticides also gives valuable clues into the lack of relationship between insect control technology and prevention of hunger. The first crises in the 1920s and 1930s were centered on the question of how much residue of lead and arsenic could be tolerated on fruits such as apples and pears. Entomologists and farmers argued strenuously that lead arsenate and Paris green were "essential" to the farm production processes. Medical doctors argued contrarily that the residues appearing in market were too high and should be lowered.[74] The medical community has not always been a good advocate of sound nutrition, but during the entire argument over the residues, little mention was made of the need for apples and pears to feed people and that reduction of insecticide use would curtail critical supplies. Whatever lay beneath the battles over residues, it was not prevention of famine or hunger.

Disagreement over residues re-erupted in the late 1940s after synthetic organic insecticides had virtually replaced all uses of the arsenical and botanical insecticides. A lobbyist for the apple industry made a small pitch to the Delaney committee that insect control was needed to prevent famine, but little was made of the argument by the Committee.[75] Similarly, the USDA's Bishopp clearly felt food supplies were at stake in his private correspondence during the Delaney committee's hearings, but his public testimony was mute on the point of hunger.

Representative A. L. Miller of the Delaney Committee was the lead congressman in the legislation (the Miller Amendment) creating a new process for setting tolerances for residues. Despite his training as a physician, Miller always focused on the dangers of residues, not the need for increasing food supplies that could be used against hunger and malnutrition.

Resistance and destruction of natural enemies, the internal crises that afflicted entomological practice and research after 1950, were just as unrelated to serious questions of hunger and famine as were the debates over residues. Resistance emerged as a crisis issue on the research agenda only after disease vectors became resistant in the early 1950s and after boll weevils became resistant to chlorinated hydrocarbons in 1954. Prevention of human disease and provision of adequate supplies of cotton may be important environmental manipulations, but they are not critical to the food supply of Americans. Despite the lack of relationship to the food supply, entomologists took resistance seriously. The emergence of TPM as a new strategy was critically linked to resistant boll weevils. Similarly, the emergence of IPM as a new strategy was critically linked to the development of resistance in spotted alfalfa aphids and the destruction of natural enemies of the aphid. Alfalfa, in contrast to cotton, was important to the human food supply by serving as hay for beef and dairy cattle. Animal feed products, however, were in surplus supply during the 1950s, so it is hard to argue that any American's diet was dependent upon a solution to the depredations of the spotted alfalfa aphid.[76]

Close linkages between the emergence of IPM and the alfalfa industry point to another important dimension of the hunger-insect control relationships. The American diet, especially during the twentieth century, has had a heavy reliance on meat, dairy, and poultry products compared to direct human consumption of cereals, beans, and potatoes. Such a heavy use of animal products was common only in North America, Western Europe, Argentina, Australia, and New Zealand. The rest of the world's population was dependent much more directly on plant products.

The importance of this feature of the American diet is two-fold. First, high use of animal products is preferred by all human populations as far as is

known, but it is not essential to adequate nutrition. Cereals, potatoes, legumes, and vegetables combined with small amounts of animal and fish products are perfectly adequate nutritionally.[77] Second, it requires more food production to support a diet of animal products than a diet of plant products. To produce a pound of beef, for example, requires approximately 10 pounds of grain for cattle feed. Pork meat can be produced more efficiently, about one pound of pork for four pounds of grain.[78]

The result of these two factors is that even if insects had been a limiting factor in American animal agriculture during 1920-1970, it does not necessarily follow that insect-control technology was needed to prevent hunger or famine. People could and would have switched to a diet more based on plant products if grain supplies had been limited by insect damage. Surplus was already the problem of twentieth-century American agriculture, even when animal products were so important, so a switch to plant foods for human diets would have severely exacerbated the surplus problem.

A final observation about American agriculture during the period of intensive developments in insect control demonstrates further that the technological developments had little or nothing to do with the problem of feeding people. Exports have been essential to the prosperity of American farmers since colonial times. Western Europe was the first and primary market for North American export produce, but Japan, the USSR, and other countries joined the western Europeans after World War II. The U.S. government took a direct role in prompting exports, even to countries without the wherewithal to purchase food, through P.L. 480.[79]

Countries that purchased American exports directly with their own funds were for the most part attempting to achieve an animal-product diet rather than prevent starvation.[80] In other words, our food exports were going to feed cattle, pigs, and chickens, not people directly. For those countries receiving food aid through P.L. 480, the criteria for receipt was based primarily on the political value of the country to the aims of U.S. strategists in conducting the cold war with "international communism." Perhaps the classic example of the use of the food aid programs to further political goals

was the massive amount of food given to South Vietnam. "Between 1968 and 1973, South Vietnam alone received twenty times the value of food aid that the five African countries most seriously affected by drought received during that same period." [81]

If preventing insects from causing human hunger was not an important factor in stimulating the development of insect-control technology, what was? The key concept in unlocking reasons for the active inventive efforts of entomologists and the innovations farmers made in their production practices lies in Cochrane's notion of the "agricultural treadmill." [82] Demand for food is relatively inelastic with respect to income. As American people became wealthier during the twentieth century, they did not purchase more food. Rather they began purchasing the luxuries known as the middle class lifestyle, or more. Houses, automobiles, travel, clothing, entertainment, and so forth was the outlet for our ever increasing purchasing power, not more food of which we already had too much.

Farmers became atomistic entrepreneurs competing against one another for a spot in a limited market place. [83] Production costs lower than selling price was the key to economic success. Farmers at the beginning of the twentieth century were highly heterogeneous with respect to the technology they used and therefore the production costs they incurred to produce food for the market. Those farmers who were on the leading edge in the adoption of new production technology were the ones who competed best in the limited market for farm products. In fact, through time the only farmers to remain in business as full-time commercial farmers were the technologically progressive individuals who continually updated their technological repertoire.

High supplies of land compared to labor on the North American continent placed a premium value on any technology that substituted a production factor that was cheaper than labor. [84] For most of the twentieth century capital-intensive inputs were the cheap substitutes for labor. Developments of machinery, power sources, irrigation, and chemicals were the major developments that allowed one man to economize on the use of labor in the production of food. Education also became a prime method for

enhancing the skills of the labor involved in agriculture to use ever more sophisticated technological processes. The U.S. is now recognized as one of the countries that has gone farther than most in the elimination of human labor from field production by means of technological innovation.

The departure of labor from agriculture left one man, often working with only a few helpers such as children or a hired man, in charge of hundreds of hectares of land. Capital investment rates in farming were so high after 1937 that labor productivity in the farming sector of the American economy grew about twice the rate of the non-farming sector.[85] The investments were often made with borrowed money. Farm businessmen became dependent upon reliable production levels to repay their debts. They were dependent upon low total production costs to make their goods compete well in the limited market.

Insect-control technology of all types played a significant role in helping to insure the individual farmer a crop sufficiently large to pay his debts. Insect control also played an important role in helping the individual farmer lower his production costs so as to compete well in the market. Farmers who were advanced in their use of new insect-control practices were better able to meet the economic constraints of the American food production system than their colleagues who were less adroit at fending off the insects.

Insecticides were particularly valuable in the technological armamentarium of the twentieth-century farmer. Compared to alternative methods of suppressing insects, chemicals are capital inputs with low labor requirements for their use. Moreover, chemicals were designed for use by individuals without regard to the practices of the neighboring farmers. A farmer using insecticides could organize his entire production system as an atomistic entrepreneur seeking to beat his competition in the market. In a word, insecticides as a class of insect-control technology fit the requirements of American agriculture better than non-chemical methods of control. For this reason, insecticides became the premier technology of insect control. Insect-control technology in general was an important part in the transformation of agriculture from labor to capital

intensiveness.

Apples,[86] corn,[87] and cotton[88] became the largest uses of insecticides after 1950, and the context of their use on those crops provides an interesting demonstration that the protection of capital-intensive farming was the foundation for inventive and innovative activity in insect-control technology. Apple production is based on a competition for the limited fresh market for fruit, which returns the highest price to the farmer. Competition for the fresh market is based on size, color, and freedom from fungal or insect blemishes. Apple growers have been heavy users of insecticides since 1900 in order to capture a place in the fresh-fruit market that tolerated no insect blemishes. Failure in this market relegated a grower to the far less lucrative processing market. In short, he had to make applesauce, not money. As already mentioned, apples make scant contribution to the diet anyway. This further examination shows that the vast majority of insecticidal treatments were made for fresh compared to processed markets. Developments of insect control technology in apples had nothing to do with preventing hunger.

Insect control in cotton presents a similar situation. Despite using from 40% to 50% of the insecticides used in agriculture during the 1950s and 1960s, cotton growers were not growing a food crop directly. Moreover, the major problem cotton growers faced was tremendous capital investments as labor left for better paying jobs elsewhere. Competition from foreign growers of cotton plus the synthetic fiber industry also gave cotton growers a difficult job. Cotton was generally in surplus supply except for the war years of the twentieth century. Nevertheless a tremendous inventive activity in insect control centered on the crop. First calcium arsenate, then a tremendous market for synthetic organic insecticides made cotton a center for invention of insecticide-based control technology. Resistance and destruction of natural enemies in the 1950s fostered significant inventions in the forms of various TPM and IPM strategies. Cotton is not a major food crop despite the fact that cotton seed is used as livestock feed and as a source of oil for human consumption. Provision of food for people was not the framework for these inventions.

Corn is one of the major contributions of North America to world agriculture. Its importance from colonial America through today cannot be overestimated. Direct human food, however, was only one of several uses to which it was put. It fattened many a hog, cow and chicken compared to the amount that went into corn bread, tortillas, popcorn, and hominy grits. Perhaps the making of bourbon whiskey was the only use of the corn that ever competed economically with animal feed as a use for the crop. Little effort was made to protect the crop from insects until the 1920s, by which time its role in animal agriculture made corn more important than its use as a human food. Had corn been used entirely to feed people directly, no insect yet found on the North American continent, aside perhaps from the introduced corn borer and grasshoppers, is likely to have interfered with an adequate supply of the crop. To the extent that insects such as rootworms did bother the plant, crop rotation was early identified as a more than adequate control technology.

Corn made an important contribution to human nutrition but largely through its inefficient use as an animal feed. Nevertheless it was an active center for invention and innovation in insect-control technology. The "\$10,000,000 Cleanup Campaign" was a strikingly original concept in the development of wide-area cultural control practices, even though it didn't work. Resistant plant varieties became the primary method of dealing with the corn borer. After 1950, corn became an important market for synthetic organic insecticides. Most applications were soil incorporated for rootworm controls.

These inventions can be linked to prevention of hunger only indirectly. First, the produce went to animals, not people. Second, significant parts of the American crop were exported for foreign livestock, especially after 1960. Third, crop rotation accomplished the same thing as insecticides but required the farmer to grow oats, barley, wheat, soybeans, and other crops, none of which brought the returns of corn. Corn farmers thus innovated in the area of insect control, but their innovative pattern was focused on the means by which capital intensive production could be protected. They then tended to grow corn year after year on the same ground to raise an animal food, much of which went to livestock abroad. Prevention of hunger was not a significant

part of the context of innovation.

Was amelioration of hunger never important for the entomologists and farmers who developed the current technology of insect control? Does inventiveness in insect control have anything to do with prevention of future hunger, either here or abroad? It would be too simplistic to say that neither entomologist nor farmer had any concern for improving the human environment by provision of more food. Most people, when faced with the question of starvation and famine, would argue that prevention of damage by insects is one thing that ought to be done. What must be understood, however, is that technological change that occurred in insect control during the past 100 years in the United States was not related in major ways to the human need for more food.

Entomologists and farmers have been joined in a joint project of enabling and protecting capital-intensive agriculture, most of which occurred in a context of crop surpluses. Future insect-control technology might have some positive effect on the amelioration of world hunger, but the scientists involved will have consciously to adapt their procedures to a new context.[89] Protection of capital-intensive farming might well be the antithesis of what is needed for adequate human nutrition on a global basis.

ENDNOTES

[1] James Whorton, Before Silent Spring (Princeton, Princeton University Press, 1974), 288 pp; Frank Graham, Jr., Since Silent Spring (Greenwich, Fawcett Publications, Inc., 1970), 288 pp; Thomas Dunlap, DDT: Scientists, Citizens, and Public Policy (Princeton: Princeton University Press, 1980), 318pp.

[2] Quotations taken from David Pimentel, John Krummel, David Gallahan, Judy Hough, Alfred Merrill, Ilse Shreiner, Pat Vittum, Fred Koziol, Ephraim Back, Doreen Yen, and Sandy Fiance, "Benefits and Costs of Pesticide Use in U.S. Food Production," BioScience 28 (1978J): 772, 778-784.

[3] Ibid.

[4] Willard W. Cochrane, The Development of American Agriculture: A Historical Analysis (Minneapolis: University of Minnesota Press, 1979), 197-208, 410-425.

[5] John T. Schlebecker, Whereby We Thrive (Ames: Iowa State University Press, 1975), 77, 113-129, 188-198.

[6] Ibid., pp. 81, 103, 175, 177, 245; Economic Research Service, USDA, Six Farm Input Industries, ERS-357, 1968, pp. 14-18.

[7] Agricultural Research Institute, A Survey of U.S. Agricultural Research by Private Industry (Washington: Agricultural Research Institute, 1977), p. 5.

[8] Cochrane, Development, pp. 240-252.

[9] Yujiro Hayami and Vernon Ruttan, Agricultural Development: An International Perspective (Baltimore: Johns Hopkins University Press, 1971), p. 133.

[10] U.S. Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970 (Washington: Government Printing Office, 1975), Series K 184, p. 469. (Hereafter cited as Historical Statistics to 1970.)

[11] Murray, R. Benedict, Farm Policies of The United States 1790-1950 (New York: The Twentieth Century Fund, 1953), pp. 180-181; Carl T. Schmidt, American Farmers in the World Crisis (New York: Oxford University Press, 1941), p. 42.

[12] U.S. Bureau of the Census, Historical Statistics to 1970, Series K 508, p. 511.

[13] T. N. Carver, "Rural Depopulation," Journal of Farm Economics 9 (1927): 1-10.

[14] E. B. Blakeslee, "Use of Toxic Gases as a Possible Means of Control of the Peach-Tree Borer," U.S.D.A. Bulletin, No. 796, October 21, 1919, 23 pp.

[15] Harold H. Shepard, The Chemistry and Action of Insecticides (New York: McGraw Hill Book Co.), 1951,

p. 272.

[16] B. R. Coad, "Recent Experimental Work on Poisoning Cotton-Boll Weevils," USDA Bulletin, No. 731, July 19, 1918, 15 pp.

[17] Shepard, Chemistry, pp. 25-26.

[18] U.S. Department of Agriculture, The Yearbook of Agriculture, Insects, 1952 (Washington: Government Printing Office, 1952), p. 250.

[19] P. L. 61-152; 36 Stat. 331.

[20] K. S. Hagen and J. M. Franz, "A History of Biological Control," in Ray F. Smith, Thomas E. Mittler, and Carroll N. Smith, eds., History of Entomology (Palo Alto: Annual Reviews, Inc., 1973), pp. 433-476.

[21] Harry S. Smith, "The Role of Biotic Factors in the Determination of Population Densities," Journal of Economic Entomology 28 (1935): 873-898.

[22] Thomas R. Dunlap, "Farmers, Scientists, and Insects," Agricultural History 54 (1980): 93-107.

[23] Thomas R. Dunlap, "The Triumph of Chemical Pesticides in Insect Control, 1890-1920," Environmental Review No. 5 (1978): 38-47; John H. Perkins, "Edward Fred Knipling's Sterile-male technique for Control of the Screwworm Fly," Environmental Review No. 5 (1978): 19-37.

[24] Whorton, Before Silent Spring, pp. 116-121.

[25] L. D. Newsom, "Pest Management: History, Current Status, and Future Progress," in Fowden G. Maxwell and F. A. Harris, eds., Proceedings of the Summer Institute on Biological Control of Plant Insects and Diseases (Jackson: University Press of Mississippi, 1974), pp. 1-18; L. D. Newsom, Personal Interview, 1978; C. L. Metcalf, W. P. Flint, and R. L. Metcalf, Destructive and Useful Insects (New York: McGraw-Hill Book Company, Inc., 1951), pp. 512-513.

[26] Benedict, Farm Policies, p. 246.

[27] Ibid., p. 247.

- [28] Ibid., p. 283.
- [29] U.S. Bureau of the Census, Historical Statistics to 1970, Series K 184, 187, 188, 189, p. 469.
- [30] Perkins, "Knipling's Sterile-male Technique."
- [31] Whorton, Before Silent Spring, pp. 198, 240-242.
- [32] John H. Perkins, "Reshaping Technology in Wartime: The Effect of Military Goals on Entomological Research and Insect Control Practices," Technology and Culture 19 (1978): 169-186.
- [33] Ibid.
- [34] Ibid.
- [35] Benedict, Farm Policies, pp. 165n, 405-408, 433-440, 443-445, 452-454; Albert A. Blum, "The Farmer, the Army, and the Draft," Agricultural History 38 (1964): 34-42.
- [36] Benedict, Farm Policies, pp. 449-472.
- [37] Ibid., pp. 461-465; Allen J. Matusow, Farm Policies and Politics in the Truman Years (Cambridge: Harvard University Press, 1967), pp. 145-169; Harry B. Price, The Marshall Plan and Its Meaning (Ithaca: Cornell University Press, 1955), pp. 29-38.
- [38] Perkins, "Reshaping Technology."
- [39] Benedict, Farm Policies, pp. 165n, 443-445.
- [40] Whorton, Before Silent Spring, pp. 246-247.
- [41] U.S. Congress, House Resolution 323 (81:1), June 20, 1950.
- [42] Federal Register, Sept. 17, 1949, p. 5724; 68 Stat. 511-517; John H. Perkins, Insects, Experts, and the Insecticide Crisis (New York: Plenum Publishing Corp. 1982), pp. 30-31.
- [43] F. C. Bishopp to Bailey D. Pepper, March 30, 1951, Record Group 7 National Archives.
- [44] Data on pesticide production and use before 1963 are sparse. In 1963, a total of 732,390,000 pounds

of pesticides were produced in the United States. Production in 1978 was 1,416,484,000 pounds, nearly twice as many as in 1963. Production of herbicides grew the most. See USDA, Pesticide Review 1966, p. 3, and Pesticide Review 1978, p. 3.

[45] Perkins, Insects, Experts, and the Insecticide Crisis, pp. 111, 113.

[46] E. F. Knipling, "The Greater Hazard: Insects or Insecticides" Journal of Economic Entomology 46 (1953): 1-7.

[47] A. W. A. Brown, "The Challenge of Insecticide Resistance," Bulletin. Entomol. Soc. Am. 7 (1961): 6-19.

[48] John H. Perkins, "The Quest for Innovation in Agricultural Entomology, 1945-1978," in D. Pimentel and J. H. Perkins, eds., Pest Control: Cultural and Environmental Aspects (Boulder: Westview Press, 1980), pp. 23-80.

[49] Perkins, Insects, Experts, and the Insecticide Crisis, pp. 111-114.

[50] Perkins, "The quest for innovation."

[51] Ibid.

[52] Ibid., Perkins, Insects, Experts, and the Insecticide Crisis, pp. 67-81.

[53] Willard W. Cochrane, Farm Prices, Myth and Reality (Minneapolis: University of Minnesota Press, 1958), pp. 105-107.

[54] Bureau of the Census, Statistical Abstract of the United States (Washington: Government Printing Office, 1979), Tables 1173 and 1218, pp. 682 and 703.

[55] Ezra Taft Benson, Freedom to Farm (Garden City: Doubleday and Co., Inc., 1960), pp. 37, 222-223, 231, 233-235; Edward L. Schapsmeir and Frederick H. Schapsmeier, "Eisenhower and Ezra Taft Benson: Farm Policy in the 1950s." Agric. Hist. 44 (1970): 369-378.

[56] Earl O. Heady, A Primer on Food, Agriculture, and Public Policy (New York: Random House, 1967), pp.

77-78; Cochrane, Development, pp.402-403.

[57] Peter A. Toma, The Politics of Food for Peace (Tucson: University of Arizona Press, 1967), pp. 39-45.

[58] Francis Moore Lappe' and Joseph Collins, Food First (Boston: Houghton Mifflin Company, 1977), pp. 336-340.

[59] Francine R. Frankel, India's Political Economy, 1947-1967 (Princeton: Princeton University Press, 1978), pp. 285-286; Lester R. Brown, Seeds of Change (New York: Praeger Publishers, 1970), p. 3; Economic Research Service, P. L. 480 Concessional Sales (Washington: USDA, Foreign Agricultural Economic Report No. 142, 1977), p. 3.

[60] David R. Long and Howard C. Williams, Evolution of the Food Stamp Program, Ohio Agricultural Research and Development Center, Research Circular No. 91, June 1972, pp. 7-11; U.S. Congress, Senate, Select Committee on Nutrition and Human Needs, The Food Gap: Poverty and Malnutrition in the United States, Committee Print, 91:1, pp. 1-4.

[61] Harold E. Driver, Indians of North America (Chicago: University of Chicago Press, 1969, 2nd Edition), pp. 505, 537, 546.

[62] Gavin Wright, The Political Economy of the Cotton South (New York: W. W. Norton & Co., Inc., 1978), pp. 172-174.

[63] For an example from the late 1960s, see U.S. Congress, Senate, Select Committee on Nutrition and Human Needs, Hearings, Nutrition and Human Needs, Part 15, "Human Needs in Health," 91:2, 1969, pp. 5561-5579.

[64] Joseph G. Gambone, "Economic Relief in Territorial Kansas, 1860-1861," Kansas Historical Quarterly 36 (1970): 149-174.

[65] L. O. Howard, A History of Applied Entomology, Smithsonian Miscellaneous Collections 84 (1930): 57, 153-155.

[66] Thaddeus William Harris, Report on Insects Injurious to Vegetation (Boston: White & Potter,

1852), pp. 467-478; Metcalf, Flint, and Metcalf, Destructive, pp. 462-463; Reginald H. Painter, Insect Resistance in Crop Plants (New York: Macmillan, 1951), pp. 148-153.

[67] Harris, Report, pp. 453-454.

[68] Benedict, Farm Policies, pp.311-312.

[69] Howard, History, p.64.

[70] See Paul W. Gates, The Farmer's Age: Agriculture 1815-1860 (White Plains: M. E. Sharpe, Inc., 1960), pp. 262-267, for a general discussion of potatoes and American agriculture. Even though insects were usually not calamities for potato production, fungal diseases were, especially in the 1840s.

[71] Metcalf, Flint, and Metcalf, Destructive, p. 261; Edward H. Forbush and Charles H. Fernald, The Gypsy Moth (Boston: Wright and Potter Printing Co., 1896), pp. 142-143.

[72] Shepard, Chemistry, p. 18.

[73] The following table gives values for a number of vitamins and minerals in a comparative fashion. Apples are nutritionally poor compared with apricots.

<u>Substance</u>	<u>RDA</u>	<u>[a]</u>	<u>Apples</u>	<u>[b]</u>	<u>Apricots</u>	<u>[c]</u>
Phosphorus	1200 mg		14 mg		25 mg	
Calcium	1200 mg		10 mg		18 mg	
Iron	18 mg		0.4 mg		0.5 mg	
Vitamin A[d]	5000 IU		120 IU		2890 IU	
Thiamin	1.5 mg		0.04 mg		0.03 mg	
Riboflavin	1.8 mg		0.03 mg		0.04 mg	
Niacin	20 mg		0.1 mg		0.6 mg	
Ascorbic Acid	45 mg		6 mg		11 mg	

a. RDA is Recommended Dietary Allowance per day. Values listed are maximum values, excluding needs of pregnant and lactating women (National Academy of Sciences, Recommended Dietary Allowances (Washington: National Academy of Sciences, 1974, 8th edition), p. 129).

b. Data are for one apple, raw, unpeeled, 138 g.

c. data are for three apricots, raw, without pits, 107 g.

Source for b. and c.: U.S. Department of Agriculture, Nutritive Value of Foods, Home and Garden Bulletin No. 72, April, 1981, p. 12.

d. IU = International Units.

[74] Whorton, Before Silent Spring, pp. 68-71, 142-157.

[75] U.S. congress, House, Select Committee to Investigate the Use of Chemicals in Food Products, Hearings, Chemicals in Food Products, 88: 2, 1951, pp. 679-680; U.S. Congress, House, Select Committee to Investigate the Use of Chemicals in Foods and Cosmetics, Report. No. 2356, 82: 2, June 30, 1952, p. 24.

[76] Heady, A Primer, p. 75.

[77] Christine M. Trahms, "Vegeterianism as a Way of Life," in Bonnie S. Worthington-Roberts, ed., Contemporary Developments in Nutrition (St. Louis: C. V. Mosby Company, 1981), pp. 440-442.

[78] Lester R. Brown and Erik P. Eckholm, By Bread Alone (New York: Praeger Publishers, Inc., 1974), pp. 205-206.

[79] For a general review of postwar U.S. agriculture, see Patrick M. O'Brien, "Global Prospects for Agriculture," in USDA, Agricultural-Food Policy Review, AFPR-4, April, 1981, pp. 2-26.

[80] The basis for the statement lies in the observed pattern of how people spend their money for food. Classes with low incomes and countries with low incomes both show a high proportion of their income going to food grains. Classes and countries with high incomes show a high proportion of their income going for animal-derived protein. Through time, countries that have achieved high income levels have also switched the proportion of their calories ingested from grains to animal fats and proteins. See Alan d. Berg, The Nutrition Factor: Its Role in

National Development (Washington: Brookings Institution, 1973), pp. 40-42; Maurice Aymard, "Toward the history of nutrition: some methodological remarks," in Robert Forster and Orest Ranum, eds., Food and Drink in History (Baltimore: Johns Hopkins University Press, 1979), pp. 1-16.

[81] Lappe' and Collins, Food First, p. 337.

[82] Cochrane, Farm Prices, pp. 105-107; See also Willard W. Cochrane, The City Man's Guide to the Farm Problem (Minneapolis: University of Minnesota Press, 1965), pp. 40-46.

[83] J. C. Headley, "The Economic Milieu of Pest Control: Have Past Priorities Changed?" in David Pimentel and John H. Perkins, eds., Pest Control: Cultural and Environmental Aspects (Boulder: Westview Press, 1980), pp. 81-97.

[84] Hayami and Ruttan, Agricultural Development, p. 133.

[85] John W. Kendrick, "Productivity Trends in Agriculture and Industry," Jour. Farm Economics 40 (1958): 1554-1564.

[86] For a general discussion on apples and insect control, see Perkins, Insects, Experts, and the Insecticide Crisis, pp. 15-22.

[87] For a general discussion of corn and insect control, see National Academy of Sciences, Pest Control: An Assessment of Present and Alternative Technologies, Volume II, Corn/Soybeans Pest Control (Washington: National Academy of Sciences, 1975), pp. 25-30, 50-59; Perkins, "Reshaping Technology."

[88] For a general discussion of cotton and insect control, see National Academy of Sciences, Pest Control: An Assessment of Present and Alternative Technologies, Volume III, Cotton Pest Control (Washington, National Academy of Sciences, 1975), pp. 50-70; John H. Perkins, "Boll Weevil Eradication," Science 207 (1980): 1044-1050.

[89] National Academy of Sciences, World Food and Nutrition Study (Washington: National Academy of Sciences, 1977), pp. 80-83.

COMMENT

Karl Hufbauer
University of California, Irvine

I come to the papers of Dunlap and Perkins not as a practitioner of environmental history, but rather as a social historian of science. Considered from my vantage point, the papers raise two intriguing issues. When have scientists advanced positions that challenged important patrons' assumptions and practices? Under what conditions have such heretics been able to influence public attitudes and policies? In this brief commentary, I appraise the papers as contributions to these general issues which, it seems to me, are central for understanding the place of scientists in environmental history. I first indicate what Dunlap and Perkins have to say about these issues in their case studies. Then I venture a few general observations.

Dunlap's study focuses on the role of zoologists working on mammals in changing American opinion toward and treatment of coyotes, wolves, and other large predators. It was in the mid-1920s, according to Dunlap, that the mammalogists started questioning the prevailing view that predators were wanton killers which ought to be eliminated from the American countryside. At first they criticized the goal of extermination primarily on the grounds that the chief means to this end -- poisoning -- was taking a heavy toll on many non-target species. In the mid-1930s, however, they began to think that predators are essential to the balance of nature and hence should be defended against extirpation. The sources of this new view of predation, Dunlap plausibly asserts, were prior fundamental studies by the animal ecologists (e.g. Elton) and field investigations by ornithologists with an ecological orientation (especially Errington). During the 1940s and 1950s, mammalogists evidently proceeded to confirm and disseminate the idea that predators play a beneficial role in ecosystems. Thereafter, thanks both to the environmental movement and to popularizers (especially Mowat), they finally were able to challenge the federal predator control program in the highest councils. Indeed in 1972, they and their newfound allies managed to secure a presidential ban on Compound 1080 and several other

of the most lethal predator poisons.

Although Perkins' main goal is to establish that fear of hunger was not an important motivation for the increasing use of insecticides in American agriculture, his study also tells us a good deal about the role of economic entomologists in this country's insect-control programs. Before the mid-1950s, Perkins shows, the entomologists consistently advised and assisted farmers to attack insect pests with the most effective means available -- e.g. biological control and crop rotation as well as insecticides around 1920 and powerful new organic chemicals around 1950. The increasingly heavy reliance on the novel insecticides after World War II soon had unanticipated consequences -- the emergence of resistant strains and the decimation of natural enemies. These backfire results obliged entomologists to devise new control strategies. The Department of Agriculture sought to get around the problem of resistance by combatting insect populations throughout their ranges rather than on a farm by farm basis. This strategy, which continued to rely heavily on insecticides and to aim for complete control, even eradication, of the target insects, was essentially a scaled-up version of the prevailing postwar approach. Meanwhile, some entomologists working in state laboratories advanced an alternative strategy -- Integrated Pest Management -- that depended mainly on biological control and host resistance, advocated minimal use of insecticides, and rejected the goal of exterminating established species. Perkins does little in his paper by way of elucidating IPM's theoretical background or implementation record. But it seems reasonable to suppose that IPM's advocates within the entomological community drew upon ecology in constructing this alternative strategy and that, thanks to the environmental movement's campaign for stricter insecticide regulations, they have made some headway in securing its adoption.

Extrapolating from our case studies, I would suggest that there is a common pattern for the emergence of scientific opposition to man's conquest of nature. As I see it, scientists have stepped forward to challenge important disciplinary patrons when their patrons' programs have created problems for their disciplines -- e.g. the demise of non-target species for mammology; the emergence of

resistant strains for economic entomology. Some scientists have responded to such situations by advancing new interpretations with new programmatic implications -- e.g. the ecological theory of predation with its defense of coyotes and other predators; the ecological theory of insect control with its IPM program. However, such scientists have not had much influence on policy until they have managed to ally themselves with more powerful social groupings -- e.g. the environmental movement. It will be interesting to see whether, as environmental history progresses, this pattern is confirmed by further case studies, especially of different disciplines in different national contexts.

WORLD WITHOUT BORDERS: THE INTERNATIONALIZING OF ENVIRONMENTAL HISTORY

Donald Worster
University of Hawaii

An intriguing question that has never gotten much attention is why the study of history, which is the study of social change over time, should itself often be highly resistant to change. I mean especially change within the profession--in its intellectual boundaries, its moral consensus, its order of priorities. One begins to suspect that a collective conservative impulse has been at work in the making of the discipline, creating a guild temperament that, to put the best face on it, encourages the genuine virtues of tradition and continuity. But there can also be a less attractive aspect to that kind of temperamental conservatism. Traditional historians today sometimes resemble a besieged country defending its resources and culture against an invasion by pushy, clamorous immigrants. The newcomers won't fit in, it is argued, they will fragment the community. Their language is odd; they go to the wrong churches and worship the wrong gods. Many of them are polemical, indiscreet, and anarchical. Let them in and they will use up scarce resources. They will insist on making changes.

Environmental history is inevitably cast in the role of one of those boatloads of immigrants arriving on the American strand. It is being admitted to the promised land, though on a limited basis and with no great enthusiasm. New immigrant groups are typically eager to make good; fortunately this one is no exception, because along the way it will have to prove itself again and again in terms of the established order of thinking. I don't mean to be altogether unsympathetic to that ruling order. From the mainstream historian's point of view, it may seem entirely reasonable to make such demands, even to try to close the gates. But from the immigrant's perspective, which is the one I assume here, success will depend on a liberalized policy of admission. It also will depend on altering, to some extent, the existing climate of opinion, making the discipline of history more open, more congenial to its needs.

High on the list of fixed assumptions defended by traditionalists, and ripe for challenge by the new

immigrants, is the belief, born in the 19th century, that history is about nations and national cultures. It is true that some traditional scholars have qualified or even ignored that assumption; nonetheless it continues to dominate the discipline. Environmental history, it seems to me, cannot flourish in the face of so constricted a mobility. Its greatest success, I predict, will be found in research that moves easily across national boundaries. We may have little control over academic immigration policy, though we are often told that good behavior and a quiet manner will get us in. But once admitted, we face the challenge of finding a framework that frees us from the obligatory nation-state pigeonholing. If we fail to locate that framework, then environmental history will likely be relegated to a marginal existence, like a Chinese laundryman living in goldrush Montana.

Unfortunately the tribe of environmental historians has already gone far to mold itself to fit the national boundaries mindset, with the consequence being that we generally fail to insist on freedom to travel and even fail to recognize our intellectual compatriots working in other places. Environmental history is not an exclusively American invention; it has emerged, under different names and sometimes well in advance of our own efforts, in other countries too. The principal items on our research agenda then must be to bring the tribe together and to achieve a cosmopolitan synthesis of method and substance, one that can help redirect the larger discipline toward a postnationalist history. The outcome of that research agenda would be, I believe, a revival of the local and regional in historical inquiry along with an awakened global imagination.

A new postnationalist synthesis should begin among scholars in the three countries where environmental history has flourished most impressively--Britain, France, and the United States. Each of these countries has so far followed mainly its own direction, and we will first have to get better acquainted with the territory each has covered. In Great Britain the inquiry has characteristically been preoccupied with intensely local matters--the changing landscape of Devon or the New Forest or the West Highlands. It has tracked an immensely long timeline back, all the way to Romans building roads through marshland and to paleolithic

hunters fashioning hand-axes in the Thames Valley. The distinction between humans and nature has not been easy, or even important, to fix in that history, at least until it reaches the industrial revolution. Thus we come upon such inclusive, symbiotic titles as H. J. Fleure and Margaret Davies's A Natural History of Man in Britain, in which flora, clothing, geology, and architecture all flow together with persuasive grace and ease. It is an environmental history that grows out of the Englishman's passionate attachment to place, out of affection for a diverse land as well as the people who have come to live on it. But at the same time it is usually a history without general ideas, without theories or modes of explanation that can be applied to other, non-British settings. The particular, the insular, and sometimes the antiquarian have come to typify environmental history there.

France, in contrast, has developed an environmental history that is weak on affection for local place but strong on global imagination. French historians--I have in mind such names as Lucien Febvre, Marc Bloch, Michel Devezé, Emmanuel LeRoy Ladurie--have resembled the British to the point of frequently choosing premodern communities to investigate. But they demonstrate a greater talent for seeing the general pattern in the particular instance. A recent example of their peculiar genius is LeRoy Ladurie's study of the 14th-century southern France village of Montaillou, in which he explores the ecological factor in the shift from medieval to capitalist economy and culture. The French historian asks what we can use from anthropology to understand the past; above all, he asks what are the fundamental, though often submerged, determinants that give coherence to a mass of surface details. This is not a history that is prompted by much personal concern over the fate of nature. Rather, its value lies in its insistence that environmental history is an integral part of social development, requiring a probing structural analysis to be understood.

And what of Americans studying American subject matter? We have in this country wisely made a virtue of necessity. Lacking much premodern depth or profound regional diversity, we have poured our talents into biography, into the study of published ideas, and into the political history of

conservation. A very large part of our achievement is the chronicle of a national reform movement that has sought to regulate the actions Americans have taken toward nature. The strengths of that approach, I submit, are these: the American school has made us aware of the role prominent individuals and their ideas can play in articulating a society's consciousness. It has brought history out of the archives and into the contemporary debate over environmental issues. And it has produced a history that, at its best, displays a creative tension between careful scholarship and moral commitment. But these strengths must be set over against a few weaknesses--especially a persistent tendency to identify environmental history with the history of environmentalism. The study will inevitably languish if it is narrowed to that small niche. And it will stultify too if it is relegated to a mere subdivision of intellectual history, purveying an unconvincing idealist notion of social change; that is, if it takes ideas, religions, and philosophies to have been the sovereign shaping forces in history.

It may be said that these three examples demonstrate the reality of national differences--and they do. Americans, even in this day of mass travel, obviously retain many distinctions of value and style, as do the French and the English and everyone else. But while historians are justified in still giving some attention to those national differences, they can be fairly accused of fencing themselves in with those peculiarities, of ignoring many critical transnational phenomena, of failing to keep pace with modern global imperatives. A mature, vigorous environmental history for the future must somehow bring all three national approaches, and others, together in a common inquiry. The immediate problem becomes, how can we do this? What research strategies should we follow? What questions should come to the forefront if we are to make this leap to a broader horizon? More biographies of John Muir will not take us very far forward, nor will more surveys of Celtic settlements in Cornwall. I have an alternative agenda to suggest, one that draws on good work already done yet attempts to move from that work into a new international consciousness. It is based on the fact that there are bedrock historical issues shared by virtually every nation today and by communities in every part of the planet. The outcome of research on such problems would be a literature

that invites sophisticated comparison across national frontiers. My agenda includes two problematiques--root predicaments in modern history that are of paramount interest.

The first of those proposed problematiques is the transition from vernacular to professionalized authority in perceiving and acting on the natural environment. Vernacular refers to the common, untutored language of the people. It derives from the Latin word vernaculum, used for whatever was homemade or homegrown, not purchased from someone else. In environmental terms it works as well as any label we have to indicate the long, intricate experience that ordinary people have had with nature. Left to their own devices, ordinary people the world over have, until recently, always tried to make personal sense of their surroundings; what place is this, they have asked, and how are we to live here successfully? They have invested the nature they know with spiritual and aesthetic value, and they have followed tested strategies for extracting a living from the ecosystem around them. No one told the peasant how he should talk about his fields. And no one came along with scientific advice that would improve the hunter's kill ratio. However, the rise of a new class of professionals has changed all that. Now vernacular competence is everywhere dying out and is being replaced by the impersonal competence of technicians, scientists, doctors of philosophy, and bureaucrats. That transition to what Ivan Illich calls the "managed society" is fundamentally an environmental matter and belongs at the very center of our inquiry.

An impressive series of studies has appeared in the United States on aspects of this subject. But we still have no full-length investigations of the various engineering fraternities as environmental managers--who they worked for, what values directed their work--or of agricultural scientists' impact on world land use. The exporting of know how overseas and its inevitable collision with vernacular traditions is an even more neglected topic. Consider the Philippines as a case in point: under American colonialism those islands became an inviting tropical laboratory for foreign experts to experiment on. Yale-trained professionals invaded with new ideas on how rain forests might be harvested; they were followed by Johns Hopkins public health nurses

bringing changes in medicine and sanitation, and more recently, by Rockefeller geneticists promoting the green revolution. A parallel story can be told of British hydraulic engineers in India or of French range agronomists in the African Sahel. Professional knowledge, professional technique supposedly comprise a language benefitting all peoples on an equal basis. But the reality has been somewhat different. Environmental professionalism has been more dependent on preexisting structures of power and cultural values than we have often acknowledged, becoming in many instances a potent tool of empire.

The professionalization of nature is a subject that fits easily into the American scholar's preoccupation with intellectual history. Vernacular traditions, on the other hand, are less familiar, less amenable to that conventional approach. How does one gain access to the rich, complex emotional and imaginative life of ordinary people, particularly those long dead? Or how do we reconstruct the skill they exercised, the understanding they acquired? One answer comes from Victor Turner, who in works like The Forest of Symbols, has demonstrated what can be learned about the vernacular from the study of folk rituals. In religious, procreative, hunting, and harvest rituals, he maintains, we can locate "decisive keys to the understanding of how people think and feel about . . . the natural and social environments in which they operate." Another anthropologist, Monica Wilson, has written: "Rituals reveal values at their deepest levels Men express in rituals what moves them most, and since the form of expression is conventionalized and obligatory, it is the values of the group that are revealed." This is even now unfamiliar ground for most historians. Focused as we have been on the individual consciousness--and on the published consciousness at that--we have only just begun to explore the realm of collective mentality: of myth, of ethnohistory, of ritual, and of folklore. After we have mastered that study will come the more central problem for historians of modern society--mapping the shift from vernacular to professionalism.

The second problematique on my agenda is the economic and ecological transition from local subsistence communities to the world market order. The vernacular cultures we have been discussing were

not mysteriously self-generated; they emerged and grew strong under specific material conditions. Where people defined their own needs and satisfied them directly by their own efforts, vernacular flourished. We attach the term "subsistence" to that mode of production, suggesting a wretched, impoverished life. A better term might be Raymond Dasman's "ecosystem cultures." It can be applied to all those peoples who lived their lives deeply rooted to a special place, whether as farmers or nomadic hunters, and who formulated their needs mainly in terms of self-sufficiency and of the resources that place furnished. We need not idealize such cultures, though there is much to admire in them. Our chief purpose must be to comprehend how they shaped their economies to fit the ecosystem at hand, contriving in most cases to sustain themselves for very long periods of time in stable equilibrium. Methods and tools of production, ways of working the land and extracting energy, provide the principal stuff for this undertaking.

The destruction of ecosystem cultures by marketplace ideas and institutions has now been going on for some four hundred years. But it is only in the last century that the conquest has become so thoroughly planetary. Historians are only just beginning to discover the full extent of that invasion, and we have yet to explore from every angle the revolution it has worked in the human relationship with the earth. The process by which nature has been transformed into an abstract commodity having marketable value remains obscure, though the rise of professional economists surely had much to do with it, as did the emergence of a powerful new class of capitalists. The French-trained scholar Immanuel Wallerstein has shown how the marketplace became the basis for a world system, which is to say, a planet-wide social order with member groups, claims to legitimacy, and a single division of labor--a world system that moved from its birthplace in western Europe to dominion over the uttermost parts of the earth. But it remains for environmental historians to make a coherent story out of the resulting ecological upheaval. When written, that story will range from Amsterdam to Borneo, from Houston to Saudi Arabia. It will tell how the nexus between local people and local resources was broken, with devastating consequences for both. There is no better way to

penetrate that transition than through the study of agriculture, which even now constitutes the most common occupation of humanity and the most pervasive influence people have on the natural environment. Marketplace agriculture offers literally a world of subject matter. And writing as environmental historians, we will be principally concerned with modern agriculture's impact on global forests, grasslands, energy patterns, population, wildlife, water, and soils.

The familiar American theme of environmentalism also appears in a fresh light when regarded in relation to the evolution of the world market order. For one thing, social and ecological consequences become more difficult for historians to separate and specialize in. For another, the environmentalist as social type comes to be seen as an increasingly international figure, whose reformist zeal enlarges steadily from national to worldwide proportions. The process of that internationalization is largely unresearched. No one, for example, has yet investigated the connections between late 19th-century American conservation leaders and their European counterparts, a cross-fertilization that continued into the New Deal era and down to our own time. There are associated questions that can be raised: When does the notion "biosphere" appear and when does it begin to win popular acceptance--marking the perception of the earth as a single, interrelated whole supplanting the older local ecosystem? How has nationalism thwarted that expanding earth consciousness? And in what ways have environmentalists and ecologists come to play the role of specialized, educated elites in the world system, promoting the overthrow of vernacular cultures?

I began with the still common assumption that the boundaries of the nation state ought to define the historian's imagination. It is now a very old assumption, supported by deep-working emotions as much as by scholarly judgment, by tradition as much as by logic. To a point it has served, and still serves, the historical enterprise well. It is, however, beginning to lose some credibility and value. There are signs on every hand that the nation-state is no longer a suitable framework for many of the issues that need to be addressed, issues of the future as well as of the past.

Wallace Stegner, himself an immigrant who has moved back and forth across international borders, once wrote words to this effect: I no longer really think of myself as an American. I know what it is to feel intense attachment to a specific locale and acknowledge the need for geographic roots, for a tenacious, manageable sense of identity. And I answer, on the other hand, the call to a greater world citizenship that reaches out to embrace the interests of all humanity, all nature, as my own. But "America" is neither small enough nor large enough to stir my commitment. Increasingly, it is an abstraction that has outlived its personal usefulness.

That stance is, for Stegner, primarily a matter of private loyalties. It resembles the direction taken by the peripatetic Yankee traveler Henry David Thoreau, who moved between the poles of Concord village and the round, unbounded world. Both men have been read by many environmental historians, though not taken very seriously as guides to academic research. But together they suggest a point of view that, to some degree, can be separated from the matter of personal patriotism, that can be made a matter of scholarly strategy. It calls for the reformulation of much of our research, so that when we have found our Walden Pond to study we will also have found the River Ganges.

LIST OF CONTRIBUTORS

Kendall E. Bailes. Professor of History, University of California, Irvine and U.C.L.A. Dean of Humanities, UC Irvine. Author, Technology and Society Under Lenin and Stalin (1978). Winner, 1979 Herbert Baxter Adams Prize of the American Historical Association. Currently working on a book about comparative environmental history in the 19th and 20th centuries.

Harold Burstyn. Historian of the United States Geological Survey, Department of the Interior. Author of numerous articles on the history of environmental sciences and their technological application.

Cesar Caviedes. Professor of Geography, University of Florida. Author of numerous articles on climate and historical geography in Latin America.

Robert Claxton. Associate Professor of History and Coordinator of Environmental Studies, West Georgia College. Author of articles on environmental history and climatic change in Latin America, with particular emphasis on the response of Central American and South American societies to drought.

Thomas R. Cox. Professor of History, San Diego State University. Author of numerous articles on forest and conservation history and a monograph, Mills and Markets: A History of the Pacific Coast Lumber Industry to 1900 (1974).

Alfred W. Crosby. Professor of American Studies, The University of Texas at Austin. Author of America, Russia, Hemp and Napoleon: American Trade with Russia and the Baltic, 1783-1812 (1965); The Columbian Exchange: Biological and Cultural Consequences of 1492 (1972); Epidemic and Peace, 1918 (1976).

Thomas R. Dunlap. Associate Professor of History, Virginia Polytechnic Institute and State University. Author, DDT: Scientists, Citizens, and Public Policy (1980); articles in Journal of Forest History, Agricultural History, Social Studies of Science, and Environmental Review; completing a monograph on the history of predator control and popular attitudes

toward predators.

Richard Frank. Associate Professor of History and Classics, University of California, Irvine. Currently at work on a study of modern historiography of the Roman Empire.

Roderick S. French. Professor of Philosophy and Director, Division of Experimental Programs, The George Washington University. Author of articles on environmental themes and co-editor of What Is Humanistic Education?

Samuel P. Hays. Professor of History, University of Pittsburgh. Author of The Response to Industrialism (1957); Conservation and the Gospel of Efficiency: The Progressive Conservation Movement (1958); American Political History as Social Analysis (1980); completing a monograph on U.S. environmentalism in the 1960s and 1970s.

J. Kristian Gerner. Professor of History and Slavonic Studies, University of Lund, Sweden. Member, board of editors of Historisk Tidskrift (Stockholm); author of Environmental Problems of A Planned Economy: The Soviet Debate on Nature and Society, 1960-1976 (with Lars Lundgren, 1978) and The Heritage of the Past: The Soviet Union on the Threshold of the 1980s (1980).

Clarence Glacken. Professor of Geography, University of California, Berkeley. Author, Traces on the Rhodian Shore (1968); completing a book, Culture and Environment in Western Civilization During the Nineteenth Century.

Donald Grinde. Director, Native American Studies Program, University of Utah. Member, editorial board, Indian Historian. Author of numerous articles on American Indian history and a monograph, The Iroquois and the Founding of the American Nation (1977).

Karl Hufbauer. Associate Professor of History, University of California, Irvine. Author of The Formation of the German Chemical Community (UC Press, 1982).

J. Donald Hughes. Professor of History, University of Denver. Author, Ecology in Ancient Civilizations

(1975), American Indian Ecology (1983) and numerous articles on environmental themes, including deforestation and climatic change, and American Indian attitudes toward nature.

Peter Iverson. Associate Professor of History, University of Wyoming. Author of articles on Navajos in the twentieth century and The Navajos: A Critical Bibliography.

Clara Sue Kidwell. Associate Professor, Native American Studies Program, University of California, Berkeley. Author of numerous articles on the history of science, American Indian history and Native American women.

Clayton Koppes. Associate Professor of History, Oberlin College. Author, JPL: A History of the Jet Propulsion Laboratory, 1936-1976 (1981); Winner, Dexter Prize, Society for the History of Technology, 1983; completing a study of the Department of the Interior and environmental policy during the Roosevelt and Truman administration.

Lars Lundgren. Member, Planning Secretariat, Environmental Protection Board, Sweden. Author of The Water Pollution Problem in Sweden: A Historical Survey (1973); Water Pollution: The Debate in Sweden, 1890-1921 (1974); Methods in the Study of Man in His Environment (1975); Energy Policy in Sweden, 1890-1975 (1977); Planned Economy and Environmental Problems: The Soviet Debate on Nature and Society 1960-1976 (with K. Gerner, 1978).

Calvin Martin. Associate Professor of History, Rutgers University. Author of Keepers of the Game: Indian/Animal Relationship and the Fur Trade (1978), which won the Beveridge Prize of the AHA.

Margaret A. McKean. Associate Professor of Political Science, Duke University. Author of Environmental Protest and Citizen Participation in Japan (1981). She is currently writing a book on the Japanese experience with scarcity.

Martin V. Melosi. Associate Professor of History, Texas A&M University. Author, The Waste Problem in America: Refuse Pollution and Environmental Reform in the Cities, 1880-1980 (1980); editor of Pollution and Reform in American Cities, 1870-1930 (1980);

completing a book on "Energy and Environment in Industrial America."

Carolyn Merchant. Associate Professor, College of Natural Resources, University of California, Berkeley. Author of The Death of Nature: Women, Ecology and the Scientific Revolution (1980).

Gerald D. Nash. Professor of History and Chairman, Department of History, University of New Mexico. Author of United States Oil Policy, 1890-1964; Business and Government in Twentieth Century America (1968) and editor, The Fight for Conservation (1967) and Issues in American Economic History (1980); completing a study on the American West during World War II.

Roderick Nash. Professor of History, University of California, Santa Barbara. Author, Wilderness and the American Mind (1967); editor, The American Environment (1968); member, editorial board, Environmental Ethics, Journal of Environmental Education, and Environmental Review; currently completing a study of the world nature protection movement and environmental ethics.

Ingmar Oldberg. University of Lund and National Defence Institute, Stockholm, Sweden. Completing a monograph on environmental problems in Eastern Europe.

John Opie. Professor of History, Duquesne University, Pittsburgh. Founding Editor, Environmental Review; founder and first President, American Society for Environmental History; editor Americans and Environment: The Controversy over Ecology (1971); author of numerous articles on environmental issues.

John Perkins, Academic Dean and Professor of Environmental Studies, Evergreen State College, Washington. Author of articles on entomology and the history of science; member, editorial board, Environmental Review.

Joseph Petulla. Graduate Program Director, Environmental Studies, University of San Francisco. Author, American Environmental History (1977) and American Environmentalism: Values, Tactics, Priorities (1980).

Bruce Piasecki. Instructor, Liberal Studies, Clarkson College. Completing a dissertation concerning attitudes toward nature in American literature and teaching courses on environmental history.

Carroll Pursell. Professor of History, University of California, Santa Barbara. Editor of From Conservation to Ecology: The Development of Environmental Concern (1973) and numerous articles on the history of American technology.

J. F. Richards, Professor of History, Duke University. Author of Mughal Administration in Golconda (1975); editor of Precious Metals in the Later Medieval and Early Modern World (1981).

Joel A. Tarr. Professor of History and Public Policy, Carnegie-Mellon University, Pittsburgh. Author, Water and Wastes: A Retrospective Assessment of Wastewater Technology in the U.S., 1850-1972 (1981); and editor of Retrospective Technology Assessment (1977) as well as many articles on technology and environmental issues. Director, Program on Science, Technology and Society, Carnegie-Mellon University.

Ronald C. Tobey. Associate Professor of History, University of California, Riverside. Author of American Ideology of National Science, 1919-1930 (1971) and Saving the Prairies: The Life Cycle of the Founding School of American Ecology (1981).

Richard P. Tucker, Associate Professor of History, Oakland University. Author of Ranade and the Roots of Indian Nationalism (1977). His current research focuses on the political impact of changes in forest cover in the Bombay area and the western Himalayas.

Douglas Weiner. Columbia University. Completing a dissertation on the origins of Soviet environmentalism; recently completed a year of research in the USSR under the U.S.-USSR Cultural Exchange Agreement.

Donald Worster. Professor of American Studies, University of Hawaii. Author of Nature's Economy (1977); American Environmentalism (1973) and Dust Bowl: The Southern Plains in the 1930s (1979). The

latter book won the Bancroft Prize of the American Historical Association for 1980.

INDEX

A

Abbey, Edward The
Monkey Wrench Gang
 249

Abdalonymos 77

Aberle, David 272

abolition 250, 252

acclimatization 379,
 380, 395, 396, 402

acid rain 20, 530

Adams, Henry 263

Adams, Wm. Y. 289

Adams-Williams, Mrs. Lyn
 157, 168

"Conservation--Women's
 Work" 157

"A Million Women
 for Conservation"
 157

Addams, Jane 500

Advance Club 344

Aeschylus 65

Suppliants 65

agriculture 11-12,
 33-34, 75-77, 25,
 161-162, 279, 295,
 348, 352, 386, 400,
 401, 579, 580, 619,
 621

capital intensive
 12, 622

labor intensive
 622

Russian 379, 380

Eastern European
 300-301, 314

Agricultural Adjustment
 Administration 629

Air Conservation
 Commission 529

Air Quality Act 185

Alaska National Interest
 Lands Act 215

Albee, Edward 23

Albrecht, William 23

Allison, Graham Essence

of Decision:
Explaining the Cuban
Missile Crisis, 490

Allsopp, Bruce The
Garden Earth: The
Case for Ecological
Morality 247

American Academy of Arts
 and Sciences 106

American Association for
 the Advancement of
 Sciences 529

American Civic
 Association 159

American Civic
 Federation 504

American City 535

American Forestry 167

American Forestry
 Association 157,
 167, 168

American Game Policy
 205

American Institute of
 Chemical Engineers
 186, 187

American Institute of
 Mining Engineers 177

American Journal of
Public Health 534

American Meteorological
 Society 107

American Mining Congress
 157

American Public Health
 Association 520

American Public Works
 Association 536

American Red Cross 167

American Revolution
 243; see Nash
 242-257

American Society for
 Environmental History
 1, 26

American Society of
 Civil Engineers 186,
 535, 536

American Society of
 Mammologists 597,

- 598
 American Society of
 Mechanical Engineers
 177, 525
 Ananichev, A. 418
 Anati, Emmanuel Camonia
Valley 100
 Anderson, Clinton 460
 Anderson, J. L. 124
 Animal Damage Control
 Act 599
 Anti-Smoking League 345
 Appalachian Mountain
 Club 153, 168
 Appleby, Andrew 123
 Arakawa, H. 116
 Aristotle 75
 Ashby, Mrs. Harriet
 Wallace 161
 Audubon clubs 160, 161,
 261
 movement 153, 159,
 170
 Australia 555, 556,
 558, 560, 562
- B
- Babbitt, David and
 William 289
 Bailes, Kendall 1-21,
 10
 Bailie, M. G. L. 112
 Baity, E. C. 114
 Baer, Richard, "Land
 Use: A Theological
 Concern" 247
 Ballod, Karl 423
 Banfield, E. C. 447
 Barbour, Ian G. Earth
Might Be Fair:
Reflections on
Ethics, Religion and
Ecology 247
 Baruch, Bernard 451
 Bates, Henry Naturalist
on the Amazon 48
 Battagel, A. T. 115
 Becker, Carl 59
 Bell, Barbara 114
 Benedict, Murray R. 628
 Benedict, Ruth "The
 Concept of the
 Guardian Spirit in
 North America" 247
 Benson, Ezra Taft 639
 Bentham, Jeremy 243
 Berger, Peter The
Homeless Mind 260
 Beria, Lavrenti 397
 Berlin, Isaiah 28
 Berliner, J. S. 425
 Besancon, Alain 423
 Bestuzhev-Lada, I. 418
 biocoenose 384, 388,
 389, 391, 392, 393,
 394, 395, 401
 biosphere 72, 73, 79,
 389, 399
Bird Lore 160, 605
 Birkinbane, John 177
 Birks, H. J. B. 111
 Bishopp, Fred C. 634,
 642-643
 Bjerkness, J. 140
 Black, Mrs. Elmer 165
 Black, Mary 282-283
 Blakeslee, E. B. 641
 Bloch, Marc 664
 Boardman, Mabel 167
 Bogdanov, Andrei
 Petrovich 380, 381,
 382, 402
 Bognar, Josef 320
 Bookchin, Murray 254
 Borodin, Ivan
 Parfen'evich 381,
 382, 383, 387
 Borsodi, Ralph 202
 Bosch, Robert van den
 637
 Brannan, Charles F. 460
 Braudel, Fernand 34
 Bray, J. R. 140, 141,
 142, 143
 Brezhnev, L. 417, 418
 Brooks, C. E. P. 106
 Brown, A. W. A. 636
 Brown, Mrs. Frances 162
 Brown, John 253
 Brugge, David M. 289

- Bryce, James 501
 Buffon 52
 Budyko, Mikhail 106,
 145
 Bulgaria 293, 297, 298,
 300, 304, 313
 Bulletin of the American
 Meteorological
 Society 108
 Burdette, Mrs. Robert
 154-55
 Burnham, John C. 501
 Burrows, C. 116
 Burstyn, Harold C.
 485-486
 Butz, Earl L. 619
- C
- capitalism 14, 39, 196,
 312, 318, 422, 423,
 424
 Carnegie, Andrew 541
 Carson, Rachel 26, 214,
 252, 261, 607, 619
 Silent Spring 26,
 214, 252, 607
 Carson, Kit 270
 Carter, James 2, 225
 Caviedes, Cesar N.
 135-149
Century Magazine 169
 Cerna, Alena 309, 316,
 317
 Chadwick, Sir Edwin 520
 Chapin, Charles V. 520
 Chapman, Oscar 443, 449
 450, 451, 453-460,
 477, 482
 Chardin, Teilhard de
 The Phenomenon of Man
 52
 Charta 77 Movement 302
 Chinook 108
 Chittendon, Alice 166
Chemical Engineering
Progress 187
The Christian Century
 247
 Cicero 72, 75
- City Beautiful Movement
 507
 Civilian Conservation
 Corps 271, 445
 Claiborne, Robert 106
 Clare, John 56
 Clark, Ronald and Peter
 List, eds.
 Environmental
 Spectrum 255
 Clausen, Curtis B. 625
 Claxton, Robert 104-134
 Clay, Grady 30
 Clean Air Act 214, 220,
 258, 529
 Clean Streams Act 531
 Clean Water Act 540
 Cleveland, Grover 459
 climate 104-134,
 135-152
 anomalies 122,
 135-141, 143-147
 El Nino 138-142
 grande seca 137
 history 135, 141,
 144, 146, 149
 impact research
 agencies (list)
 126-127
 normality 116-117
 oscillation 135,
 136, 137, 139,
 143-147
 simultaneity 137
 sunspots 120, 145
 synchronism 137,
 139, 143, 146
Climate Change 108
Climate Monitor 108
 Club of Rome 3, 24, 319
 Limits to Growth
 3, 319
 Coad, Bert R. 624
 Coastal Zone Management
 Act 83, 84, 216
 Cochrane, Willard 638,
 645
 Collier, John 272, 289
 Columbia Basin Project
 443, 448

- Columbia Valley
 Authority 354, 451,
 454
- Columella 70, 76
- Commoner, Barry 2, 14,
 261
- commons, see McKean
 337-376
 tragedy of the
 commons: see Hardin,
 Garrett
- Communist Party 301,
 318, 412, 413, 416,
 417, 426, 427, 429
 revisionist vs.
 dogmatist 416
- Conference on Non-Human
 Rights 246
- Congress, U. S. 3, 83,
 84, 216, 254, 444,
 448, 456, 459, 461,
 480, 488, 537
- conservation 193-197,
 243, 248, 255, 303,
 304, 305, 309, 310,
 313, 314, 347
 ideology 162 ff.
 as efficiency 437,
 439
 management 199
 ff., 212, 243, 244
 Progressive 439,
 454
 role of engineers
 176-192, 193, 194
 role of women
 152-175
 Russian 379-401
 soil 204, 242,
 243, 249
 Soviet 387-394,
 401
 versus environment
 242
 versus preservation
 200
 and women's
 suffrage 165 ff.
 See also Hays
 198-241
- conservatives 224, 225,
 226, 227, 445
- consumerism 18, 501,
 505, 507-508
- Conwentz, Hugo von 382
- Cook, Captain 560
- Cooke Morris L. 177,
 182
- Cooper, James Fenimore
 54
- Costigan, Edward 453,
 489
- Council on Environmental
 Quality 609
- counterculture 246, 254
- Cox, Thomas R. 5, 13,
 14, 20, 587-593
- Crane, Caroline Bartlett
 500, 507
- Crocker, Mrs. Emmons
 156, 160, 169
- Crosby, Alfred W. 5,
 553-576, 590, 592
- Cunningham, Peter 565
- CSSR 308, 310, 312, 318
- Czechoslovakia 293-296,
 298, 300, 303-309,
 311
- D
- Daley, Richard 537
- Darwin, Charles 47, 48,
 54, 566
The Origin of
Species 46
 Darwinism 41, 47,
 48, 49, 54
- Dasmann, Raymond 668
- Daughters of the
 American Revolution
 153, 158, 159, 165,
 166
- Davies, Ralph 483
- Day, Sam 289
- decentralization
 201-202, 209-210,
 217, 219, 339, 447,
 455
- deforestation 347-348

- Delaney, James 635
 Delaney Committee 633,
 643
 Demeter 69
 democracy 249, 250, 260
 democratic ideology
 249, 250, 260
 dendochronology 112,
 113
 design argument 46, 47
 determinism 416
 biologic 5
 geographic 46
 environmental 29,
 50, 51, 502
 Devall, Bill 247-248
 de Vries, Jan 123
 Devlin, Thomas 501-502
 Dewey, John 63
 Diaz, H. F. 119
 Dingell 609
 Dinosaur National
 Monument 454, 458,
 461
Disasters: the
 International Journal
 of Disaster Studies
 and Practices 109
 disease 23, 208, 509,
 562, 564, 565 ff.,
 586 ff.
 Djilas, Milovan 482,
 483, 491
 The New Class 482
 Doniphan, Colonel
 Alexander W. 268
 Douglas, Paul 457
 Douglas, William O.
 203, 253, 451, 459
 A Wilderness Bill
 of Rights 248
 Drury, Newton 451, 453
 Dubos, Rene 2, 3, 7, 8,
 9, 12, 24, 88-94,
 101, 102
 The American
 Scholar 8
 Celebrations of
 Life 3, 90
 The Wooing of the
 Earth 88-94
 Downey, Sheridan They
 Would Rule the Valley
 491
 Dubois, Mark 248-249,
 252
 Dunlap, Thomas R. 5, 6,
 7, 20, 23, 594-618,
 659
 DDT: Scientists,
 Citizens and Public
 Policy 619
 E
 earth See environment,
 nature
 as a goddess 64,
 65-70
 as an organism
 70-74, 78
 in reciprocal
 relation to man
 74-78, 79
 Earth Day 185, 214,
 216, 217, 242, 246
 Eastern Europe 290 ff.
 Eastern Wilderness Act
 215
 Echo Park Dam 454, 458,
 459, 461
 ecology 11, 24-25, 30,
 31, 34, 38, 39, 61,
 62, 63, 217, 242,
 247, 253, 254, 255,
 264-276, 403, 607,
 625
Ecology Action Guide 90
 economy 9, 17, 19, 20,
 39, 41, 75, 243,
 578-590
 ecosystem 6, 7, 10, 25,
 38, 217, 242, 399,
 401
 Eddy, John 120, 121
 Ehrlich, Paul 2, 261
 Eisenhower, Dwight D.
 203, 455, 460, 461,
 479, 486
 Eliot, Charles 169

- Eliss, Mrs. Overton
 163, 164
- Elliot, I. F. The Soviet Energy Balance:
Gas, Other Fossil Fuels, and Alternative Energy Sources 415
- El Nino 136, 138-142, 145
- Elton's pyramid 389-390
- Emerson, Ralph Waldo
 11, 12, 61, 62
 "Nature" 61
 "Fate" 61
- Emiliani, Cesare 110
- Empedocles 72, 73
- endangered species 248, 254
 egrets 161
 palila 254, 259
 snail darter 253
 whales 248
- Endangered Species Act 254, 258
- energy 218-219
 Eastern European 295-299
 human 283-284
 Native American 277-279
 nuclear 217
 Stanchinskii energetics 398
 energy crisis 218-219
 energy transfer 389
- engineers 176-192, 193, 195, 196
- Engineering News 182
- Engineering Record 180
- environment 198, 201, 202, 206, 209
 vs. conservation 202, 244
 vs. economy 221, 222
- environmental ambivalence 12, 83-98
 environmental amenities 18, 205, 210, 212, 214, 222
 environmental ethics 242-257
 land ethic 242, 245, 253, 262. See also Leopold, Aldo.
 environmental efficiency 212, 213, 223, 236, 293, 438
 environmental history 1, 4, 5, 6, 8, 9, 10, 11, 12, 14, 15, 19, 21, 23 ff., 30, 31, 32, 42, 43, 44, 476, 665 ff.
 environmental movement(s) 23, 24, 198, 201, 206, 213, 216, 495
 environmentalism 248, 249, 252, 253, 254, 260, 441, 442
- Environmental Journal 201
- Environmental Protection Act 178
- Environmental Protection Agency 24, 537, 538, 540
- Environmental Ethics 246
- Errington, Paul 602, 603, 605, 659
- etalony 384, 385, 387, 391, 392, 398, 400
- ethics 19, 242, 246
 See also Nash, Ronald 242-257.
- eugenics 164, 165
- Equal Rights Amendment 175
- Ermolov, A. S. 381
- F
- Fair Deal 437, 460,

- 461, 462, 464, 486,
488, 492
- Fairbridge, R. W. 121
- Fairmont Water Works
518
- Farm Security
Administration 449
- farmers 11, 12, 22,
105, 161, 162, 639
See agriculture.
- Federal Drug
Administration 633,
634
- Federal Land Planning
and Management Act
215
- Federal Power Commission
203
- Federal Water Pollution
Control Act 187
- Federation Courier 168
- Fedorenko, N. P. 418
- Felt, Jeremy 494
- Finley, Wm. 160
- First All-Union
Conference for the
Conservation of
Nature (USSR) 394,
395
- Fish Commission 335,
486
- Fish and Wildlife
Service 446, 450,
486, 596, 609
- Fiske, John 554, 555,
573, 591, 592
- Fleurbaey, H. J. and
Margaret Davies, A
Natural History of
Man in Britain 664
- Flohn, Hermann 137,
138, 141, 142, 145
- Food and Drug
Administration 633
- Food, Drug and Cosmetic
Act 630, 633
- Food Stamp Act 639
- Forbes, Stephen The
Lake as a Microcosm
49
- Ford, Gerald 459
- forests 156-157, 167,
168, 170, 199, 293,
347, 348, 577, 579,
588
- management 582,
583
- tropical forests
582-583, 589, 590
See also Tucker and
Richards 580-589
- Forestry and Irrigation
156
- Forsling, Clarence
449-450, 452
- Fortas, Abe 443, 449,
450, 457, 477, 482,
483
- Foutz, Joseph Lehi 289
- Fox, Robin Lane 77
- Fox, Stephen 153
- Frank, Richard 7, 8,
12, 16, 99-103
- Freeman, J. 125
- free rider 12-13, 337,
340-346, 365. See
McKean 337 ff.
- French, Roderick 58-63
- Friends of the Earth
246
- Fritts, Harold C. 112
- G
- Gabriel, Ralph J. 31
- game reserves 388, 396.
See zakazniki and
zapovedniki
- Gardner, Warner W. 451
- Garrison, Wm. Lloyd The
Liberator 252
- Gates, William 106
- Gauze, G. F. 394
- Gay, Peter 59
- Gelfand, Mark 462
- General Plan for the
Reconstruction of
Fauna in the USSR
393, 395
- Geoffrey-St. Hillaire,

- E. and I. 402
 Geological Survey 157
 George, Henry 501
 Gerard Mrs. F. W. 155
 Gerasimov 418
 Gerner, Kristian 14,
 412-436
 Glacken, Clarence 23,
 46, 59, 63
 Traces on the
 Rhodian Shore 38, 58
 Global 2000 Report 2
 GOELRO 443
 Golding, William 72
 Goldman, M. I. The
 Spoils of Progress
 415
 Goldman, E. A. 597-598
 Goldschmidt, Arthur
 443, 448
 gospel of efficiency
 See Hays, Samuel.
Gosplan 387, 418
 Goss, Charles 164
 Graber, Linda
 Wilderness as Sacred
 Space 247
 Graham, Frank Since
 Silent Spring 619
 Graham, Otis 462
 Grant, Theodore Madison
 Winning the West 592
 Gray, Elizabeth Why the
 Green Nigger? 252
 Grazing Service 446,
 452
 Greenpeace 248, 261
 Gribbin, John 106
 Grinde, Donald 6, 19,
 264-276, 288, 289,
 290
 Gross, M. Howard 166
 Grosske 1, 45
 Grove, J. M. 115
 Gunnarson, Gisli 125

- Hagen, Kenneth S. 637
 Hall, E. Raymond 600,
 605
 Hallam, H. E. 115
 Hallowell, A. Irving
 280, 281
 Hammond, John Hays 184
 Hansen, Alvin 481
 Hardin, Garrett 261,
 337
 "Tragedy of the
 Commons" 337
 See also commons
 Harper's Ferry 253
 Hatch Act 621
 Haumann, Heiko 423
 Hays, Samuel 9, 17, 18,
 23, 153, 193-194,
 198-241, 242, 437
 The Politics of
 Health, Beauty, and
 Permanence
 Hell's Canyon 239, 459
 Hesiod 66, 67
 Hill, W. W. 289
 Homer 47, 66, 77, 99
 Hoover, Herbert 439
 Hornaday, William 597
 Hornbrooke, Mrs. Francis
 156
 Howell, A. Brazier 599
 HOWL (Help Our Wolves
 Live) 594
 Hubbell, Lorenzo 289
 Hufbauer, Karl 662-664
 Hughes, Donald 6, 7,
 23, 64, 82, 99, 101,
 102
 Hungary 293, 298, 301,
 303, 304, 305 ff.,
 315, 320
 Huntington, Elsworth
 51, 106
 Hutchinson, G. Evelyn
 390

H

- Hacker, Andrew 491
 Hague, Harlan 29

I

- Ickes, Harold L. 271,
 440, 441, 443, 446,

J

447, 449, 450, 451,
453, 457, 458, 483,
486
Imbrie, John 106
immunology
Native American
586
Imperial Russian Society
for the
Acclimatization of
Animals and Plants
380
industrialization 206,
294-295, 495, 502,
589
Inland Waterways
Commission 157
insecticides 23, 619
ff., 622 ff., 630,
632 ff., 640, 641
ff., 646, 647
calcium arsenate
624, 626, 628, 632
DDT 218, 606, 630,
631, 632, 633, 635,
636
lead arsenate 622,
624, 625, 627,
630-632
Paris green 622,
624, 625
aerial application
of . . . 623
resistance 634,
635, 636
secondary pest
outbreak 635, 636
Integrated Pest
Management 637, 638
Insull, Samuel 443
Isaacs, Hope 283
Iverson, Peter 288-292
Izvestiya Akademii
Nauk/geografiya 415
Izvestiya Vsesojuznogo
Geograficheskogo
Obshchestva 415
Izrael, Yu. 433

Jacobs, Wilbur 288
Japan 337-377, 623
Jeffers, Robinson 246
Jevons, William Stanley
106
Johnson, Arnold 207
Johnson, Broderick 290
Johnson, Lyndon 215,
537
Johnson, Robert
Underwood 169
Joravsky, David 403
Journal of Climatology
109
Journal of Human Ecology
106
Journal of Interdisciplinary
History 107
Journal of Mammology
597

K

Kamakura Shogunate 344
Kashchenko, N. F. 382
Kashkarov, Danill 394,
395
Kearny, General Stephen
Watts 268
Kelly, D. R. 427, 428
"Environmental
Policy Making in the
USSR: The Role of
Industrial and
Environmental
Interest Groups" 415
Kelly, D. R., Stunkel,
K. R., Westcott, K.
R. The Economic
Superpowers: the
United States, the
Soviet Union and
Japan 416
Kennedy, John 459
Kidwell, Clara Sue 6,
19, 277-287, 290
Kington, J. A. 119
Klackova, Jana 309,

- 316, 317
 Klapac, Josef 306
 Klimkova 307
 Knudson, Margaret
 Russell 164
 Knipling, Edward F.
 635-636, 637
 Kolodny, Annette The
Lay of the Land 254
 Komarov, Boris
Destruction of Nature
 414, 416, 428
 Kommunist 415
 Koppen, Wladimir 568
 Koppes, Clayton R. 16,
 437-475, 476, 477,
 479, 481-484, 488-493
 Kosygin, A. N. 417
 Kozhenikov, U. 384,
 395-396, 403
 Kozlov, P. K. 386
 Kraeved 386
 Kramer, J. 428
 Krug, Julius A. "Cap"
 451, 452, 453, 456,
 457, 460, 481, 482
 Krushchev, Nikita 413
 Kuby, Dennis G.
 "Ecology and Religion
 Newsletter" 247
- L
- Lacepede 379
 Lacko, Ratislav 311
 Ladies' Health
 Protection
 Association 499
Ladies' Home Journal
 159
 Ladurie, Emmanuel LeRoy
 664
 Lamb, H. 141
 Lamarck 47, 380, 402
 Land and Water
 Conservation Fund
 215
 Landsburg, Helmet 437
 Lasswell, Harold 437
 Lawson, John 566
 League of Conservation
- Voters 200
 Lee, Benjamin 519, 520
 Lee, Dorothy 281
 Lenin, V. I. 386, 422,
 423-424
 Leopold, Aldo 245, 246,
 247, 252, 253, 262,
 597, 602, 603
A Sand County
Almanac 245, 252
 Lewis, Pierce 30
The Liberator William
 Lloyd Garrison 252
 liberalism 16, 17, 194,
 195, 196, 224, 246,
 440, 444, 446, 450,
 451, 462, 476, 482,
 liberal ideology
 440, 448, 454
 commonwealth 440,
 442, 445, 446, 447,
 449, 481, 485, 486,
 462
 corporate 440,
 442, 445, 447, 448,
 453, 455, 481, 487
 Lilienthal, David 446,
 447, 455, 456, 457
T.V.A.: Democracy
on the March 454
 Lindeman, Raymond 390
 Lindeman
 efficiencies 390
 Lindsey, Judge Ben 167,
 453
 Ling, Joseph 224
Literaturnaia Gazeta
 428, 433
 Locke, John 54, 55
 Love Canal 218
 Lovelock, James 71, 79
 Lowi, Theodore The End
of Liberalism 194
 Lubove, Roy 502
 Lucretius 67
 Lunacharskii, A.V. 386,
 388, 391, 402-403
 Lundgren, Lars J.
 412-436
 Lysenko 393, 398

Lysenkoism 416

M

- MacDonald, Peter 273
Mackay, A. 116
Makhno, 386
Malin, James C. 23
Malinovski, A. V. 397
Malthus, Thomas 48,
553, 554, 564, 566
Manifest Destiny 28,
87, 165
Manin, Yu. M. 421
Manson, Marsden 169
Marilaun, Kerner von
48, 53
Markson, Ralph 121
Mariners Weather Log
109
Marsh, George Perkins
23, 39, 53, 54, 62,
494, 592
Man and Nature
53
Marshall, Robert 442,
443
Marshall Plan 632
Martin, Calvin 5, 586,
587-588
Mather, Increase 566
Marx, Karl 26, 217,
218, 219, 220, 291,
292, 295, 299, 300
Marxism 278, 279,
399, 403, 423, 427,
433
Marxists 42, 258
Marxism-Leninism
414, 422, 423, 434
Matthews, Washington
282
MacAfee, Robert 116
McAtee, W. L. 600
McCarran, Patrick 338
McConnell, Grant 438
McDonald, Peter 273
McCrae, Lt. Col. John
268
McGhee, Robert 114
McGhee, W. J. 82, 185,
243, 249
McIntyre, R. J. and
Thornton, J. R. "On
the Environmental
Efficiency of
Economic Systems"
415
McKay, Douglas 460
McKean, Margaret 12,
13, 14, 338-377
McKee, J. E. 536
Medvedev, Sergei
Ivanovich 394
Meiji Restoration 342,
359
Meinig, Donald 25, 26,
30
Melosi, Martin 17, 23,
495-515
Merchant, Carolyn 17,
153-175, 193, 195
Michel, H. 140
Micklin, P. P.
"Dimensions of the
Caspian Sea Problem"
415
Milankovitch, Milutin
121
Miller, A. L. 633, 643
Miller Amendment 633,
634, 643
Mills, C. Wright The
Power Elite 482
Mineral Leasing Act
439, 487
Missouri Valley
Authority 454
Mitchell, Thomas 560
Möbius, Karl 48, 49, 53
Moore, John 291
Moore, Mrs. Phillip
158, 167, 169
Morgan, Arthur 440,
441, 443, 447
Morton, Rogers 610
Moscow Agricultural
Society 379, 380
Moses, Robert 485
Mowat, Farley Never Cry

Wolf 607, 659
 Mueller, Paul Herman
 630
 Muir, John 38, 168,
 169, 200, 243, 260,
 494
 Mumford, Lewis Pentagon
of Power 40
 Murie, Adolf 603, 604
 Murie, Olaus 600, 601,
 603-604, 607
 Murray, Albert 32
 Murray, James 338
 Murray, Thomas 145

N

Nagahara 344
 Naisbett, John 207
 Namias, Jerome 125
 Nash, Gerald 16, 17,
 476-484, 485, 486,
 488-492
 Nash, Roderick 18, 19,
 23, 242-257, 258,
 261-263
 National Parks See
Parks
 National Board of Health
 520
 National Chamber of
 Commerce 184
 National Climate Program
 Act 104
 National Coal
 Association 528
 National Council of
 Churches 247
 National Conservation
 Conference 159-161,
 163-165, 167, 169
 National Environmental
 Policy Act 607
 National Environmental
 Protection Act 185
 National Irrigation
 Congress 156
 National Municipal
 League 499
 National Outdoor

Recreation Review
 Commission 215
 National Park Service
 201, 447, 453, 603
 National Parks Act 169
 National Parks
 Association 200
 National Park Service
 201, 447, 453, 603
 National Resources
 Committee 441
 National Resources
 Planning Board 446
 National Rivers and
 Harbors Committee
 156
 National Rivers and
 Harbors Congress 160
 National Soil Fertility
 League 166
 National Taxpayers Union
 226
 National Trails Act
 201, 215
 National Wildlife
 Federation 594
 Native American 6, 19,
 29, 264-276, 279-287,
 586
 natural resources 176,
 177, 178-179, 180-184
 Eastern European
 315, 316
 Marxist view of
 422
 misuse of 287,
 290, 295-296, 299
 wildlife management
 205
 See conservation,
environment, forests,
and nature.
 See also Oldberg,
 294-337; McKean,
 338-377; Gerner and
 Lundgren, 412-436;
 Tarr, 515-551; Tucker
 and Richards, 580-589
 nature 25, 39, 55, 56,
 60, 61, 88, 89, 94,

252, 263, 413, 430,
594
attitudes toward
Marxist-Leninist
view of 416-417
Native American
view of 277,
282-284, 285
Navajo view of
266-267
and science 594,
595, 599-600, 610
Stalinist view of
412-413
rights of 243,
249, 252, 263
See Hughes, 64-82;
Nash, 243-258; Gerner
and Lundgren,
412-436; Glacken,
46-63; Frank, 99-103
See also
conservation, earth,
environment.
Nature Conservancy 216
Nelson, Ernest 272
Neo-Britains 553,
555-557, 561-564,
566-570, 588
Neumann, J. 125
New Deal 159, 224, 242,
437, 440, 441 ff.,
453 ff., 461 ff.,
476, 481, 484, 489,
492, 670
Newell-Weaver Agreement
456
New Engineer 188
A New Ethic for a New
Earth 247
Niagara Falls 159
Nicholson, Rex 452
Nicholson, Sharon 116
Niddrie, D. 141
Nietzsche, Friedrich 62
Nixon, Richard 610
North American Wildlife
Lobby 205
North, Douglas C. 588
Novalis 55

Neurath 423

O

October Revolution 386
Odum, Eugene 25
Odysseus 77
Oeppen, J. 124
Oficina Meteorologica de
Chile 138, 145
Ogilvie, Astrid 115
Oldberg, Ingmar 6, 14,
293-336
Oliver, Douglas 587
Oliver, Symmes 279
Olson, Mancur The Logic
of Collective Action
337
Opie, John 9, 10,
22-35, 58
Organic Gardening 209
Orgill, Douglas and John
Gribbin The Sixth
Winter 127
Orion 70
Osbourne, Mrs. D. M.
157
Outdoor Life 605
Ouranos 68

P

Pachoskii, I. K. 386
palila 254, 259
palila vs. Hawaii
254
Palmer Method 119
palynology 111, 112
PARC (Predator and
Rodent Control)
608-609
Park, George The Idea
of Social Structure
37
parks
American National
parks system 201,
445, 447-448, 454,
458, 459, 461, 603
Big Bend 444, 458

Canyonlands 215
 Dinosaur National
 Monument 458
 Echo Park 458,
 459, 460
 Everglades 445
 Grand Canyon 459,
 602
 Grand Teton 459
 Hetch Hetchy
 (Yosemite) 168, 169
 Jackson Hole 417,
 453, 459, 603
 Kaibab 601, 602
 King's Canyon 445,
 459
 Mt. McKinley 603,
 604
 Mission 66, 461
 North Cascades 459
 Olympic 201, 215,
 445, 447
 Redwoods 459
 Virgin Island 461
 Russian parks
 system 383 See
conservation,
environmental
amenity, zapovedniki
 (game reserve)
 Parran Report 534, 535
 Parran, Dr. Thomas 534
 Parry, Martin 124
 Parsons, Elsie Crews
 284
 Pauley, Edwin 450
 Pearl Harbor 447
 Penick, James 494
 Perkins, John 11, 20,
 25, 622-661
 periodicals
 American City 535
 American Forestry
 167
 American Journal
of Public Health 534
 Bird Lore 162
 Century 169
 Chinook 108
 Chemical

Engineering Progress
 187
 The Christian
Century 247
 Climate Change
 108
 Climate Monitor
 108
 Disasters: the
International Journal
of Disaster Studies
and Practices 109
 Ecology Action
Guide 90
 Engineering News
 182
 Engineering Record
 180
 Environmental
Ethics 246
 Federation Courier
 168
 Forestry and
Irrigation 156
 International
Journal of
Biometeorology
 Izvestiya Akademii
Nauk/geografiya 415
 Izvestiya
Vsesojuznogo
Obshchestva 415
 Journal of
Biometeorology 106
 Journal of
Climatology 109
 Journal of Human
Ecology 106
 Journal of
Interdisciplinary
History 107
 Journal of
Mammology 597
 Kommunist 415
 Ladies Home
Journal 159
 The Liberator 252
 Literaturnaya
Gazeta 428, 433
 Mariners Weather

- Log 109
National Parks and Management Magazine: the Environmental Journal 201
New Engineer 187
Organic Gardening
 209
Outdoor Life 605
Pravda 423
Prevention 209
Priroda 386
Public Works 535
Science 179, 180,
 182
Vestnik Akademii Nauk 415
Vestnik Leningradskogo Universiteta/Geografiya 415
Vestnik Moskovskogo Universiteta/Geografiya/biologiya 415
Pochvovedenie 415
Vodnye Resursy 415
Voprosy Ekonomiki 415
Voprosy Filosofiy 415
Weather 109
Weatherwise 109
 Perkins, John 11, 20, 25, 619-652
 Persephone 69
 pests 563, 564, 566-567, 624, 625
 pest control
 biological 625, 626, 632, 640-641, 660
 cultural 626, 630
 IPM (Integrated Pest Management) 637, 638
 TPM (Total Population Management) 646,
 647, 648
 pesticides 216,
 217, 300, 619
 DDT 606, 630-633,
 635, 636
 Compound 1080 605,
 606, 608, 609, 610,
 659
 See Dunlap,
 597-621; Perkins,
 622-661.
 See also
 insecticides.
 Pesticides Act 216
 Petulla, Joseph 5, 7,
 8, 22, 36-45, 58, 59,
 254
American Environmental History
 22, 62
 Pfister, Christian 116
 Phillips, Arthur 565
 Piasecki, Bruce 2, 7,
 21, 83-98
 Pichard, G. 125
 Pigou tax 316
 Pilcher, J. R. 112
 Pimentel, David 620
 Pinchot, Mrs. James 159
 Pinchot, Gifford 2, 39,
 153, 155, 157, 159,
 168, 169, 170, 177,
 184, 185, 201, 201,
 242, 243, 439, 485
The Fight for Conservation 154
 Piper, Stanley 600
 Pittmann-Robertson Act
 199, 446, 605
 Pittock, A. Barie 106
 Pittsburgh Smoke Control
 Movement 527
 Pittsburgh Smoke Control
 Ordinance 526
 Plato 72, 73, 77
 Plutarch 65
 Poland 295, 296, 299,
 300, 302-303, 307
 Polish Ecology Clubs
 15, 302

pollution 216, 217,
 296, 307, 412, 414,
 416, 418, 419, 495,
 496, 502-505, 507,
 606
 air 216, 301, 361
 ff., 365, 373, 420,
 421, 428, 432
 land 366-371, 373
 water 258-259,
 268, 300, 301, 356
 ff., 359 ff., 368,
 371, 373
 See Melosi,
 494-513; Tarr
 516-552.
 Pomare, Maui 567
 Porter, Stephen 111,
 121
 Post, John 125
 Potter, Van Rensselaer
 Bioethics: Bridge to
 the Future 247
 Prague Spring 302
 Pravda 423
 predators 6, 7,
 597-621, 659
 preservation 88, 200,
 391, 392, 437, 442,
 443, 445, 453, 454
 Prezent, Isai
 Israilovitch 393,
 394, 398, 401, 403
 Prevention 209
 Progressive Era 17,
 134-152, 178-194,
 242, 494-505, 506,
 508, 509
 Prohaska, 146
 Priroda 386
 Prometheus 69
 Pryde, P. R.
 Conservation in the
 Soviet Union 415
 P.L. 460 481 639, 644
 P.L. 566 141
 Public Works
 Administration 271
 Public Works 535
 Pure Food and Drug Act

627
 Pursell, Carroll 17,
 176-192, 195, 196
 Pyrrha 67
 Pythagoreans 69

Q

Quayle, R. 119

R

Raker Act 168
 Ransdell, Joseph 156
 Ratzel, Frederick
 Anthropogeographie
 52
 Rauschenbush, Stephen
 443
 Raver, Paul 443, 457,
 482
 Reagan, Roald 37, 43,
 220, 260
 Reclamation Project Act
 444
 Reconstruction of the
 Fauna and Biocoenose
 of the USSR 395
 Reich, Charles The
 Greening of America
 40
 Reimers, Nikolai
 Fedorovich 399
 Resources Conservation
 and Recovery Act
 537, 538, 540
 Rhodes, Richard 32
 Rice, Juliet Bartlett
 500
 Richards, Ellen Swallow
 500
 Richards, John F., and
 Tucker, Richard B.
 20, 577, 586
 Ringelmann Chart 528,
 541
 Ritter, Carl 50, 53
 Roberts, Charles G. D.
 395
 Roberts, Walter Orr 119

S

- Rodman, John 246
- Romania 294, 296, 297,
298, 301, 304, 305,
309
- Roosevelt, Eleanor 453
- Roosevelt, Franklin
Delano 16, 201, 440,
442, 443, 446, 447,
448, 451, 453, 454,
458, 477, 482, 485,
486, 488, 629
- Roosevelt, Theodore
177, 184, 242, 248,
462, 485, 592
- Rosen, Kenneth Voices of
the Rainbow 292
- Rozsak, Theodore Where
the Wasteland Ends
40
- Roth, Dennis 592
- Ruskin, 56
- Russia
Academy of
Sciences, Forest
Institute 398
All Russian Society
for the Conservation
of Nature 386
Commissariat of
Education 386
conservation
379-380, 381-387
Geographic Society
381, 385
Imperial Russian
Society for the
Acclimatization of
Animals and Plants
380
Ministry of
Education 385
Moscow Agricultural
Society 379-380
national parks 383
Permanent Committee
on Conservation 381
Rural Electrification
Administration 460
- Sadtler, Samuel 178
- Saera, Hartvig 422
- Samuels, Marwyn S. 27
- Sanitary Movement 520
- Sanitary Commission 520
- Saturday Evening Walking
Club 169
- Sauer, Carl 22, 31
- Schelling,
Naturphilosophe 55
- Schneider, H. 145
- Schofield, R. 124
- Schneider, Stephen 106
- Schumacher, E. F. 261,
340
- Schweitzer, Albert 252
- Science 181, 180, 182
- Scott, Matthew T.
158-159, 165, 166
- Scully, Vincent The
Earth, the Temple and
the Gods 68
- Sears, Paul 22, 24
- Seaton, Fred 460
- Semenov-Tian-Shanskii,
Andre Petrovich 383,
385, 387
- Semenov-Tian-Shanskii,
Veniamin Petrovich
385
- Semple, Ellen Churchill
51
- Sergel, Mrs. Charles
500
- Sessions, George 247
- Seton, Ernest Thompson
595, 596
"Bingo, the Story
of a Dog" 596
"Lobo, King of
Currumpaw" 596
- Severstov, S. A. 394,
395, 396
- Shaw, B. D. 124
- Shepard, Paul 254
- Sherman, Caroline K.
168
- Shtil'mark, Felicks
Robertovich 399

- Sierra Club 153, 168,
170, 200
- Silko, Leslie Marmon
291-292
- Slocum, M. "Soviet
Energy: An Internal
Assessment" 415
- Smilor, Raymond 504,
505
- Smith, Harold 448, 450
- Smith, Harry J. 625
- Smith, Ray 637
- Smith-Lever Act 621
- Smoke Control
Association of
America 525
- Snake River Dam 459
- socialism 14, 15, 42,
181, 294, 299, 316,
318, 328, 417, 419,
421, 422, 424, 434
- Society for the
Suppression of Noise
500
- Soil Conservation
Program 199
- Soil Conservation
Service 204, 271,
272, 290, 445, 460
- Soil Erosion Service
271, 445, 446
- Solidarity 15, 37, 302,
303, 321
- Solid Waste Disposal Act
537, 539
- Solon 77
- Solov'ev, D. K. 382
- Solyum 307, 308, 309
- Sophocles 76
- Southern Oscillation
137
- Soviet Geography
- Soviet Union 293-296,
299-301, 305, 313,
318, 387, 412-436
Academy of Sciences
421, 432
All-Union
Geographic Society
413
- All Union Institute
for Acclimatization
and Hybridization
393
Commissariat of
Agriculture 391, 393
Commissariat of
Education 385, 388,
391, 394, 401, 402
Commissariat of
Foreign Trade 391,
394, 395
conservation
387-398, 401, 420,
428, 430
energy 297-298
environmental
problems 419-421
First All Russian
Congress on the
Conservation of
Nature 390
Five-year plans
398, 399, 401, 403,
417
Lenin All-Union
Agriculture Club 391
Main Administration
for Scientific
Institutions 387
natural resources
165, 412, 413,
419-421, 422, 424,
427, 431
pollution 412,
418-419
Primate
Acclimatization
Institute in Soviet
Georgia 394
State Committee for
Hydrometeorology 433
State Committee for
Science and
Technology 421
Znanie 421
- Spinoza 34, 46
- Stalin 393, 403,
412-413, 416
- Stanchinskii, V. V.

388-395, 401, 403
 Stanchinskii
 energetics 393
 Stanislaus River Canyon
 248
 Stegner, Wallace 668
 Stern, Vernon M. 637
 Stoddard, Herbert 602
 Stoics 75
 Stoklasa, Jaroslav
 314-315
 Stone, Christopher
 Should Trees Have
Standing??: Toward
Legal Rights for
Natural Objects 253
 Stowe, Harriet Beecher
 252
 Straus, Michel 457,
 458, 459, 482, 492
 Strong, Douglas 23
 Stunkel, K. R. 418,
 427, 428
 Suffrage 165, 166
 Suggs, Richard 587
 Sukachev, V. N. 398
 Sumner, Col. Edward V.
 269
 Suetonius 99
 Sutherland, D. M. G.
 124

T

Taft Hartley Act 461
 Taft, William Howard
 177
 Taliev, V. N. 381
 Taos Revolt 268
 Tarr, Joel 10, 20, 23,
 516-552
 Taylor, Frederick
 Winslow Principles of
Scientific Management
 177
 Taylor Grazing Act 199,
 444-445, 487
 Taylor, Paul S. 457
 Teapot Dome 439
 Teller, Edward 186

Tench, Capt. Watkin 562
 Tennessee Valley
 Authority 225, 442,
 443, 445, 446, 447,
 451, 454, 460, 480
 Themis 69, 70, 78
 Thelen, David P. 505
 Thompson, Arthur S.
 565, 567
 Thoreau, Henry David
 60, 61
 Walden 61
 "On Walking" 61
 Tickell, Crispin 106
 Tokugawa, Ieyasu
 346-347
 Tokugawa period
 348, 352, 361, 366
 Tomkies, Mrs. Hoyle 158
 Toricelli, Evangeliste
 113
 Tosovska, Eva 309, 312,
 316, 317
 Toxic Substances Control
 Act 540
 Toynbee, Arnold Study of
History 278
 Toyotomi, Hideyoshi 346
 "Tragedy of the Commons"
 Hardin, Garrett 337
 tragedy of the commons
 338-342, 363
 transcendentalists 58,
 60, 61, 62
 See also Fuller,
 Emerson, Thoreau, and
 Whitman.
 Tredgold, Thomas 176
 trophic levels 389-390,
 401, 601
 Truman, Harry 16, 203,
 448 ff., 453 ff., 459
 ff., 461 ff., 471,
 479, 486, 489, 492,
 632
 Tuan, Yi-Fu 24, 30
 Tuchman, Barbara 36
 Tugwell, Rexford G.
 440, 447
 Tucker, Richard B. and

- Richards, John F. 577-586
- Turner, Frederick Jackson 27, 29
- Turner, Victor The Forest of Symbols 667
- Turshu, S. V. 394
- Twain, Mark 54
- U
- Udall, Morris 608
- United States of America
 Army Corps of Engineers 204, 226, 248, 249, 456, 459
 Bureau of Biological Survey 596-602, 604
 Bureau of Commercial Fisheries 335
 Bureau of Indian Affairs 271, 442
 Bureau of Reclamation 203, 438, 444, 446, 454, 458, 459
 Bureau of Smoke Prevention 526, 527
 Bureau of Standards 181
 Department of Agriculture 309, 318, 335, 460, 594, 596, 621, 622, 625-627, 631-636
 Department of the Interior 437-462, 486, 489, 596
 Fish and Wildlife Service 217
 Office of Economic Ornithology and Mammals 594, 596
 Public Health Service 536
- Upper Colorado Basin Project 458, 460
- urbanization 495, 501, 502, 504
- Urey, Harold 110
- V
- value, labor theory of (Marxian) 313-315
- values
 biocentric 37, 38, 40, 59, 60, 149, 154, 155, 167, 176, 177, 263
 ecologic 38, 59, 60
 environmental 9, 14, 36, 37-39, 43, 58, 61, 148, 154-155, 175, 205, 213, 225
 social 140, 202, 516, 524
 utilitarian 59
- Values and Lifestyles Study 207
- Vavilov, N. I. 393, 395
- Vernadskii, V.I. 389
- Vestnik Akademii Nauk 415
- Vestnik Leningradskogo Universiteta/Geografiya a 415
- Vestnik Moskovskogo Universiteta/Geografiya a/biologiya i Pochvovedenie 415
- Viazemskii, Prince B. L. 386
- Vincenz, Jean 535
- Vodnye Resursy 415
- Volgyes, I. Ed.
Environmental Deterioration: the Soviet Union and Eastern Europe 415
- Vonnegut, Kurt Sirens of Titan 28
- von Wright, G. H. 433
- Voprosy Ekonomiki 415
- Voprosy Filosofiy 415
- Voroshilov, K. E. 397

- Vrooman, Mrs. Carl 159,
163
VTsIK 394, 395
- W
- Waisel, Y. 114
Wallace, Henry A. 441,
442, 446, 447, 453,
460
Wallerstein, Immanuel
588
Wang, Pao Kuan 116
Ward, Lester Frank 243
Waring, George E. 500
War Production Board
451, 452
waste 517, 522, 530
waste disposal 20, 286,
357, 358, 359, 360,
366, 516
 deep well injection
 532
 sanitary landfill
 533-540
 solid waste 531,
 533
Water Power Act 439
Watt, James 26
Watrous, Richard 504
Watson, Paul 252, 293
Weather 109
Weatherwise 109
Webb, Thompson 111
Wedel, Waldo R. 279
Weeks Bill 156
Weiner, Douglas R. 5,
8, 20, 379-410
Welch, Richard 453
Welker, Robert 153
Wetherill, Richard and
John 289
Westcott, K. R. 416,
427
White, Mrs. Lovell 154,
155
White, Leslie 278
White, Lynn, Jr. 7, 11,
22, 39-40, 43, 62
 "Continuing the
 Conversation" 24
 "The Historical
 Roots of Our Ecologic
 Crisis" 7
White, Richard 587
Whitehead, Alfred North
94
Whitman, Walt 12, 86,
87, 88, 90
 "Passage to India"
 86
 "Song of the
 Redwood Tree" 86-88
Whorton, James Before
Silent Spring 619
Wickard, Claude 459
Wiebe, Robert 178
Wilbur, Ray Lyman 490
Wild and Scenic Rivers
Act 148, 201, 215
Wilderness Act 201, 215
Wilderness Alliance 215
Wilderness Society 200
wildlife 205, 382, 392,
397, 597-621
 feral animals 397,
 596
Wilkes, Frederick G.
502, 503
Wilkinson, Mrs. John
156
Williams, Mrs. Lydia
Phillips 149, 157,
168
Willey, Harvey 627
Wilson, A. T. 110, 111
Wilson, Monica 667
Wilson, Woodrow 458
Witte, Count 422,
423
Wolman, Abel "The
Metabolism of Cities"
516
Woman of Today
women's clubs 158, 161,
167
 General Federation
 of Women's Clubs
 154, 155, 156, 158,
 160, 163, 167, 170

Women's National Press
Association 157
Women's National Rivers
and Harbors Congress
158, 164, 167
Wordsworth, William 54
Work Progress
Administration 271
world's fair
Chicago, Ill.
(1933) 34
Chicago, Ill.
(1893) 507
Knoxville, Tenn.
(1982) 34
World War I 43, 448
World War II 9, 18,
448, 492
See Hays, 198-241
Worster, Donald 8, 10,
19, 20, 22, 258-263,
440, 662-670
Wren, Christopher 113

X

Xenophanes 78
Xenophon 52, 64, 65,
75, 77

Y

Yamamoto, Takeo 114
Young, Edward 55
Young Naturalist
Organization 390
Young Turks 392

Z

zakazniki (game
preserve) 388, 391
zapovednik 382, 384,
386, 387, 388, 391,
392, 393, 394, 395,
396 ff., 398-404
Zeus 67, 68, 101
Zhitzkov, B. M. 382
Ziegler, C. E. 415

RECEIVED
1962
JAN 10 1962