

PRAISE FOR *THE RETURN OF NATURE*

“IN THE CENTURY FOLLOWING Marx’s death, left-wing scientists and writers made major contributions to the development of modern ecological thought. Foster’s brilliant new book recovers that history, making the work and ideas of those neglected ecosocialist pioneers accessible to the activists who are building today’s movements against global environmental destruction.”
—IAN ANGUS, author, *Facing the Anthropocene*; editor, *Climate & Capitalism*

“FOSTER’S MAGNIFICENT *The Return of Nature* tells the story of the late nineteenth and early twentieth scientists and other intellectuals who followed paths laid out by Marx and Engels with respect to the profit-driven degradation of the environment and biosphere. Foster convincingly depicts the genesis—in the writings of figures such as William Morris, Joseph Needham, and Rachel Carson—of an ecosocialist vision whose further development represents the best hope of the present period.” —STUART A. NEWMAN, Professor of Cell Biology and Anatomy, New York Medical College; coauthor, *Biotech Juggernaut: Hope, Hype, and Hidden Agendas of Entrepreneurial BioScience*

“FOLLOWING UP ON his influential *Marx’s Ecology*, in this *tour de force* Foster fills in the broad historical and philosophical details spanning the post Darwin moment to the vibrant 1960s when ecology became common currency, detailing how dialectical thinking penetrates all. Previous histories of ecology have failed to embrace Marxism’s critical association with the development of ecology as a political subject, something this book does elegantly and thoroughly.” —JOHN VANDERMEER, Asa Gray Distinguished University Professor of Ecology and Evolutionary Biology, University of Michigan, Ann Arbor, MI; author, with Ivette Perfecto, *Ecological Complexity and Agroecology*

“WHAT DOES ECOLOGY have to do with a critique of capitalism and a movement for socialism? What are the roots of ecosocialism? For more than twenty years, John Bellamy Foster has engaged in serious thought and massive research, delving into the relation of ecology and socialism, while charting the odyssey of the network of left activist-intellectuals who forged a philosophical-scientific-political vision of our ecosystem and the forces threatening its survival. The result is a monumental book, a genealogy of ecosocialism, a priceless resource for those pursuing this path today.” —HELENA SHEEHAN, author, *Marxism and the Philosophy of Science* and *Navigating the Zeitgeist*

“THIS MAGISTERIAL WORK of profound importance draws on an immense amount of historical source material to provide a coherent and accessible account of the co-evolution of ideas on socialism and ecology from the nineteenth to the mid-twentieth century. It is an impressive, indeed, incredible study.”—FRED MAGDOFF, Professor Emeritus of Plant and Soil Science, University of Vermont

“ONE OF THE MAIN THINKERS of the North American ecological left, John Bellamy Foster offers in this monumental book a fascinating genealogy of ecosocialism, via a synthesis of scientific and artistic critiques of capitalism, developed in United Kingdom between the end of the 19th century and the 1960s.”—MICHAEL LÖWY, *Le Monde diplomatique*, August 2020

“BY NOW, MANY people will have heard about the ecological ideas of Karl Marx. And everyone knows that the modern environmental movement is filled with anti-capitalist energies. But was there anything in between? In this landmark work, John Bellamy Foster fills in the gap and reconstructs an unbroken genealogy of dialectical thinking about the environment, from the last days of Marx to the first stirrings of Western environmentalism. From the neglected writings of numerous thinkers and scientists—evolutionary biologists, not the least—he reconstructs a treasure trove of ecological insights that will keep scholars and activists preoccupied for years to come. The common knowledge of Marx’s environmentalist leanings derives from Foster’s *Marx’s Ecology* from 2000. With *The Return of Nature*, he has given ecological Marxism an epic chronicle that speaks straight to the crises of our times: a sequel and prequel of extraordinary power.”—ANDREAS MALM, author, *Fossil Capital: On the Rise of Steam Power and the Roots of Global Warming*

“LEFTISTS HAVE TOO readily seen capitalist science and technology’s goal—the domination of nature—as inherently progressive. In *The Return of Nature*, John Bellamy Foster tells a different story. The recognition that we humans, rather than dominating, are part of nature, both transformed by and transforming it, was central to Marx and Engels’ dialectical thinking. Foster’s richly detailed and ground-breaking history tells the story of the British and American scientists and activists who in the century following Marx’s death, adopted and built on this dialectical tradition, from Engels’ *Dialectics of Nature* to the fast developing science of ecology and the birth of the radical science movements of the 1970s. A *tour de force*.”—STEVEN ROSE, emeritus professor of neuroscience, Open University

The Return of Nature

Socialism and Ecology

JOHN BELLAMY FOSTER



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Contents

Preface | 7

Introduction | 11

Part One

BEYOND MARX AND DARWIN | 23

Chapter One: Ecological Materialism | 24

Chapter Two: The Art of Labor | 73

Chapter Three: The Movement toward Socialism | 107

Chapter Four: An Earthly Paradise | 137

Part Two

ENGELS'S ECOLOGY | 171

Chapter Five: Environmental Conditions of the Working Class | 172

Chapter Six: The Dialectics of Nature | 216

Chapter Seven: The Ecology of Human Labor and Social Reproduction | 270

Part Three

TOWARD A CRITICAL HUMAN ECOLOGY | 299

Chapter Eight: Ecology as a System | 300

Chapter Nine: The Return of Engels | 358

Chapter Ten: Dialectics of Art and Science | 417

Chapter Eleven: A Science for the People | 457

Epilogue | 502

Notes | 531

Names Index | 640

Subject Index | 661

To John Mage

Preface

Climate change, the Sixth Extinction, and the COVID-19 pandemic arising from a novel coronavirus, all testify to abrupt changes in humanity's relation to the earth in the twenty-first century. The old notion of the "conquest of nature" is being replaced by a radical conception of the need to restore the human social metabolism with nature while promoting genuine human equality. Although revolutionary in its challenge to capitalism, this conception is not new, rather it is traceable to the long struggle for socialism and ecology beginning in the nineteenth century.

The present work begins where another left off. *Marx's Ecology*, which I completed in 2000, ended with the deaths of Darwin and Marx in 1882 and 1883. *The Return of Nature* starts with their funerals. Its title refers to the reemergence of the natural-material or ecological realm within critical social analysis, where the complex, reflexive relation of nature to human production and reproduction has all too often been downplayed. To be sure, the dialectical interplay of society and nature has never been altogether absent from historical materialism, where it was present at the outset in the foundational works of Karl Marx, Frederick Engels, and William Morris. Nevertheless, for socialist theory as for liberal analysis—and for Western science and culture in general—the notion of the conquest of nature and of human exemption from natural laws has for centuries been a major trope, reflecting the systematic alienation of nature. Society and nature were often treated dualistically as two entirely distinct realms, justifying the expropriation of nature, and with it the exploitation of the larger human population. However, various left thinkers, many of them within the natural sciences, constituting a kind of second foundation of critical thought, and others in the arts rebelled against this narrow conception of human progress, and in the process generated a wider dialectic of ecology and a deeper materialism that questioned the environmental as well as social depredations of capitalist society.

The thinkers who are the focal point in this book are quite varied, stretching from the left Darwinian E. Ray Lankester and the Romantic-Marxist Morris in Part One, to the classical historical materialist Frederick Engels in Part Two, to

the Fabian-style socialist ecologist Arthur Tansley, the red scientists J. D. Bernal, J. B. S. Haldane, Joseph Needham, Hyman Levy, and Lancelot Hogben, and the cultural materialist Christopher Caudwell in Part Three. Others are taken up in the Epilogue. But despite their diversity as thinkers all fell into the broad category of socialist materialists concerned with the dialectical interpenetration of nature and society, and the complex relations of evolution and emergence. Central to each of them was a dialectical naturalism that foreshadowed today's systems ecology and Earth System analysis.

This is a story that concerns art as well as science—the two principal means of ascertaining our sensuous relation to the world as a whole. It is the synthesis of the scientific and aesthetic critiques of capitalism that constitutes the basis of the modern ecological critique, leading to the pivotal notion of sustainable human development. As Epicurus said in antiquity, “The justice of nature is a pledge of reciprocal usefulness, neither to harm one another nor be harmed.”¹

The present book has been nearly two decades in gestation and has involved research in numerous archives. In this respect, I would like to acknowledge the following collections of papers upon which I relied to varying degrees for much of the analysis that follows: (1) the E. Ray Lankester Scientific Papers Collection, Marine Biological Association Library, Marine Biological Association, Plymouth, England; (2) the Hyman Levy Collection, 1935–1968, Charles Deering McCormick Library of Special Collections, Northwestern University Library, Evanston, Illinois; (3) the H. G. Wells Papers, 1855–1946, University of Illinois, Urbana; (4) the J. B. S. Haldane Papers, Wellcome Library, University of London; (5) the Joseph Needham Papers and Correspondence, Cambridge University Library; (6) the J. D. Bernal Scientific and Personal Papers, Cambridge University Library; (7) the Christopher St. John Sprigg (Christopher Caudwell) Collection, Harry Ransom Center, University of Texas, Austin; and (8) the Linus Pauling Collection, Special Collections and Archives, Oregon State University, Corvallis, Oregon. I would like to thank Liz Stanley, principal investigator of the online Olive Schreiner Letters Project, for answering my questions with respect to the Schreiner-Lankester correspondence. The bulk of the research was conducted through the University of Oregon library, with the help of the excellent regional Summit library system, and Interlibrary Loan. I owe a debt to the University of Oregon librarians and staff for putting up with my incessant demands. The importance of such backstage work by librarians is often invisible and yet constitutes an invaluable social contribution without which serious scholarship would be rendered much more difficult.

A large part of chapter 4 was published in 2017 as “William Morris’s Romantic Revolutionary Ideal: Nature, Labour and Gender in *News from Nowhere*” in a special issue on revolution for the *Journal of William Morris Studies*. In the process, Owen Holland, the gifted editor of JWMS, improved it in both style and content.

In one of my visits to London I received a warm welcome from members of the William Morris Society at Kelmscott House, Morris's home in Hammersmith, the coach house and basement of which are now a museum.

I have greatly benefited in the research and editing of this book from my association over the years with a number of extremely talented *Monthly Review* research assistants, all of whom have gone on to carry out important scholarly research and build careers of their own, including Brett Clark, Hannah Holleman, Ryan Wishart, Jordan Besek, and Intan Suwandi. All of them assisted me at various stages in the long process of producing this book, helping with gathering materials, copyediting, fact checking, and through the critical feedback they often provided. I am grateful especially to Intan for assisting me with the big task of editing at the end. Brett and Hannah both co-authored a number of writings with me at various times in the years in which I was working on this book, which deeply affected my thinking here.

Paul Burkett and I have collaborated on issues of Marxian ecology since the mid-1990s, feeding into his book *Marx and Nature* in 1999 and my *Marx's Ecology* in 2000, and finally our co-authored *Marx and the Earth* in 2016. Although Paul was not directly involved in the research here, the shared understanding of ecological materialism that we have developed over the years is, I believe, inscribed on every page of this book.

Fred Magdoff's presence too is to be found throughout this book. Fred and I co-authored and co-edited three books and numerous articles while I was working on this project, including our 2011 *What Every Environmentalist Needs to Know About Capitalism*. I frequently turn to Fred with questions related to his vast knowledge of ecological science. He and Amy Demarest have provided a mountain of support.

In the early stages of this research, Robert W. (Bob) McChesney and Inger Stole graciously offered their home in Urbana, Illinois, as a base while I explored the Levy archives at Northwestern University. At my request, Bob also obtained copies of some key letters between Lankester and H. G. Wells from the Wells Papers housed at the University of Illinois, Urbana. Since our days as students and roommates at Evergreen State College in Olympia, Washington, in the early 1970s, Bob has been my intellectual and political touchstone, and the very closest of friends. At the very beginning of this book project, he insisted that I should rely on extensive archival documentation in carrying out the historical research. This meant additional years of investigation, given the need to travel long distances to archives and the additional constraints this imposed. Yet, following his advice on this proved essential, resulting in important discoveries. In this respect his own historical works, especially *Telecommunications, Mass Media, and Democracy* (1993), represent a model of committed scholarship, and a reminder of how much can be achieved through historical research.

Others have also helped me in major ways. Richard York and Theresa Koford have patiently and persistently inquired for years, whenever we met, about the progress on my “big book,” providing continual encouragement. Richard’s own research into ecology and society—extending at times to our own direct collaboration (together with Brett), notably in our 2010 book *The Ecological Rift*—has inspired and informed me in countless ways. Joseph Fracchia and I have shared many discussions on materialism and dialectics, from which I have benefited from his enormous conceptual and philological knowledge of German Idealism, Marx, and contemporary critical philosophy. Ian Angus and I have had a rich correspondence on ecological issues, often related to questions dealt with in this book. My good friend Desmond A. Crooks helped with cover design. My cousins Sandy and Dave Ashton provided me with a rare book at a critical juncture and made possible my visit to the Marine Biological Association Library (housing the E. Ray Lankester Scientific Papers Collection) in Plymouth. The late István Mészáros was at all times unstinting in his support.

Michael Yates, Martin Paddio, John Simon, Susie Day, and R. Jamil Jonna at Monthly Review Press not only helped me immeasurably in various points in this task, but have also offered their full confidence in what amounted to a very extensive and seemingly unending project—a gift for which I am immensely grateful. Michael Yates and Erin Clermont brought their prodigious copyediting skills to bear on every page of the book.

Two people above all provided the insight and support without which this book could not possibly have been written. I have dedicated the book to my close friend John Mage at *Monthly Review*, who has been my primary interlocutor, both for *Marx’s Ecology* and the present work. His extraordinary erudition, stretching from the classics to the history of science and society, to Marxian theory, and to contemporary historical conditions have meant that his judgments and advice were at all times indispensable, and often decisive. When over the years I showed signs of leaving this project unfinished he invariably encouraged me to return to it. Whatever value there is in this work owes much to him. The book’s demerits are undividedly and insistently my own.

Carrie Ann Naumoff is part of the fabric of my life. She has given me every kind of support: intellectual, political, and emotional. Most of the ideas in this book we have discussed at length, but often transposed within the context of our everyday struggles in relation to humanity and the earth, and the people and the environment we love. She has reaffirmed my belief that not only is imagination ultimately more important than knowledge, but that history is never merely history, it is the witness of our collective struggles and the proof that change is always possible.

—EUGENE, OREGON
MARCH 2020

Introduction

The whole of [Hegel's] *Logic* is proof of the fact that abstract thought is nothing for itself . . . and that only *nature* is something.

—KARL MARX

The subject of this book is the history and genealogy of the relations between socialism and ecology, primarily in Britain, in the period from the deaths of Charles Darwin and Karl Marx in 1882 and 1883 up to the 1960s.¹ *The Return of Nature* was originally conceived in a fairly linear fashion as a historical sequel to my earlier *Marx's Ecology*.² But the profusion of unexpected discoveries encountered along the way, the wide cast of characters over several generations, and the innumerable paths that needed to be pursued, sometimes appearing to extend in all directions at once, ensured that it would emerge as a very different kind of study from its predecessor. This was a story where the main lines of development were not known in advance and had to be unearthed, as key sources were buried in obscure archives—seldom, if ever, penetrated.

Even as a chronological history, *The Return of Nature* broke with my original expectations, as it was necessary to cover the early lives of such figures as Frederick Engels, E. Ray Lankester, and William Morris, all of whom were Marx's contemporaries, before it was possible to go forward. Hence, the organization of this work can be viewed as more genealogical than chronological, tracing out lines of influence. Lankester and Morris, who take up the first four chapters, making up Part One, are related to Marx. Only in Part Two does Engels enter centrally into the story. This establishes another line in Part Three that runs through J. D. Bernal, J. B. S. Haldane, Joseph Needham, Lancelot Hogben, and Hyman Levy, all of whom drew principally on Engels rather than Marx, while Arthur G. Tansley and H. G. Wells, also considered in Part Three, are best understood in relation to their connections to Lankester. Christopher Caudwell, treated in the penultimate chapter of Part Three, is the culmination of a line of inheritance reaching back to both Morris and Engels. The closing

chapter in Part Three, on the fall of the British Marxist scientists and their ultimate moral triumph, sets up a logic that points to the present, taken up briefly in the Epilogue.

If *Marx's Ecology* was a compact story of the development of Marx's ecological views in the mid-nineteenth century, when many of the foundations of an ecological critique of capitalist society were being laid, *The Return of Nature* is an odyssey encompassing a considerably longer period when the modern ecological worldview, as we know it today, was first emerging tentatively into the light of day for all to see. It is about the role of numerous socialists and radical materialists, who played key roles in that critical enterprise. I chose to focus almost entirely on Britain, the country in which Marx and Engels had long resided, for five reasons: (1) my own family background and cultural heritage; (2) in Britain one can see the development of an intellectual heritage drawing directly on both Marx and Darwin; (3) the links between the Romantic movement, Marxism, and ecology were strongest in Britain, most notably in the life and work of Morris, but reappearing in a quite different way in Caudwell; (4) among the British Marxists, in particular, there was a strong strain of "emergentist Marxism," its roots going back to ancient Epicurean materialism, inspired in part by knowledge of Marx's own studies of Epicureanism; and lastly (5) a focus on Britain allows for coherence of historical narrative.³

The earliest, and in many ways most revolutionary development of Marxian ecology arose in the USSR in the 1920s and early 1930s. But the demise of the most creative period of Soviet ecology followed quickly upon the famous Second International Conference on the History of Science and Technology held in London in 1931. Nikolai Bukharin, N. I. Vavilov, Boris Hessen, and B. Zavadovsky—the four most influential figures in the Russian contingent at the 1931 conference—all fell prey within a few years to Joseph Stalin's purges. It was in Britain, therefore, where the very same conference marked a beginning point rather than an end point for Marxian natural science, that continuity in the emerging dialectic of socialism and ecology was mainly expressed.

The main advantage that socialist thinkers have always had in embracing an ecological worldview, when compared to their liberal counterparts, goes beyond their willingness to contemplate a different, more collective, and egalitarian form of society. Rather, it rests fundamentally on a *materialist and dialectical* critique, originating above all with Marx, that pointed to the alienated metabolism of nature and society under capitalism. It is this *method of ecological critique* arising out of the socialist critique of capitalist society that is seen here as most important, since it provides the indispensable means for a revolutionary dialectical ecology. Hence, the intent in this book is *not simply* to provide a history and genealogy of the interaction of socialism and ecology, though that is the outward form it takes. Rather, as Raymond Williams stated in *Culture and Society*, the

hope is that by reaching into the past we can discover how to “understand and act.”⁴

It is due to this focus on the emergence of ecological critique, and on the complex and necessarily contradictory search by materialists and socialists for a meaningful ecological praxis, that this work is able to escape many of the methodological traps that have plagued studies in the history of ideas, namely, adoption of one-sidedly internalist or externalist approaches; employment of rigid ideal types; reliance on a few isolated texts; and, above all, succumbing to the hegemony of the present, or what E. P. Thompson called “the enormous condescension of posterity.”⁵ As Quentin Skinner famously stated—claiming “we are all Marxists to this extent”—the only justifiable reason for carrying out studies in the history of ideas is not to demonstrate the inevitability or superiority of the present in relation to the past, but rather to demonstrate how “our own society places unrecognized constraints on our imaginations.”⁶

The chief protagonists in these pages exhibit a certain monotony of masculine gender, reflecting an age when women were largely shut out of intellectual life, as powerfully expressed at the time in Virginia Woolf’s *A Room of One’s Own*.⁷ It seemed all the more important therefore to make a conscious attempt to take note of gender questions, where they arose in the course of the argument, as well as to be cognizant of the women who entered, however tangentially, into the story, including such important historical figures as Phebe Lankester, Olive Schreiner, Eleanor Marx, Mary and Lizzie Burns, Jane Morris, Philippa Fawcett, Florence Kelley, Enid Charles, Lu Gwei-djen, Dorothy Moyle Needham, Charlotte Haldane, Jane Ellen Harrison, Virginia Brodine, Edna Gellhorn, Rachel Carson, and Hilary Rose. Issues of social reproduction and ecological reproduction are necessarily closely intertwined. Here too, as in ecology, the goal is to search for the emergence of radical views, all too often repressed, that hold the promise of a sustainable society rooted in substantive equality. Some attention to these areas is thus given in nearly every chapter. However, the book can claim no thoroughness in this respect, pointing rather to research that still needs to be done.

AN EMERGENTIST ECOLOGICAL MARXISM

Socialism and *ecology* originated as separate but closely related and often converging forms of critique in response to the industrial capitalism of the late eighteenth and nineteenth centuries. The term “socialism” first appeared in England and France in the 1820s and was directly associated with working-class struggles.⁸ The word “ecology” was first introduced by Ernst Haeckel in 1866 (the year before the publication of Karl Marx’s *Capital*), as a way of referring to Darwin’s notion of the “economy of nature.” It entered the English language

(as *oecology*) a decade later, in the 1876 translation of Haeckel's *History of Creation*, which was supervised and revised by Darwin's and Thomas Huxley's protégé as well as Marx's friend, Lankester.⁹ It was not until the early twentieth century that the term was used with any frequency in science, and it was not until the mid-twentieth century that it entered popular discourse, associated with a broad social and political movement.¹⁰ In the nineteenth century, other ecological concepts were frequently used, such as Darwin's "economy of nature," Lankester's "bionomics," and Justus von Liebig's broad application of metabolism to environmental relations, which helped to inspire Marx's notion of *social metabolism*.

From his earliest writings, Marx adopted what can only be described as a broad ecological worldview through his deep, radical conception of materialism in accord with dialectics. Marx found in what he called the "immanent dialectic" of Epicurus's ancient, emergentist materialism—the subject of his doctoral thesis—the means with which to begin to question the Hegelian system.¹¹ Together with his studies of Ludwig Feuerbach's philosophy, this enabled him to develop a full-fledged critique of Hegelian idealism. This new materialist dialectic began with human corporeal being, and the need to satisfy human sensuous needs through appropriation from external nature. This was a process in which the distinctly human species, as *homo faber*, could be seen as playing an active role through labor and production, both as agents of their own development and through the transformation of nature.

Human beings, in Marx's conception, related to nature practically through their labor (but also through their conceptions of beauty), involving the human-sensuous interaction with nature via production. This formed what he called the "the dialectic of sensuous certitude," requiring the training of the intellect—"the relation of sensuous knowledge to the sensuous."¹² "*Human sensuousness*," he argued in his dissertation on Epicurus, introducing a philosophical viewpoint that was to be fundamental to his own materialist dialectic throughout his life, "*is . . . embodied time, the existing reflection of the sensuous world in itself*." Mere perception through the senses is only possible because it expresses an active and therefore changing relation to nature and, indeed, a changing relation of nature to itself, since human beings are a part of nature. "In hearing," Marx wrote, "nature hears itself, in smelling it smells itself, in seeing it sees itself."¹³ The materialist dialectic, in this view, was based on the corporeal organization of human beings, who as objective, sensuous beings constituted a "part of nature," able to know natural conditions and processes through their interactions with them, as well as through their specifically human productive role, as conscious embodiments of nature engaged in transforming the world around them.¹⁴

Hence, for Marx, the materialist conception of history was inextricably bound to the materialist conception of nature, requiring constant studies of natural

science and the natural conditions of production as a crucial part of his critique of political economy. The labor process itself, he argued in the 1850s, was to be defined as the metabolism of humanity and nature. It was only in the 1860s, however, that this was to emerge, in his conception, as a central contradiction of the system associated with the growing concern over the robbing of the soil and the loss of soil nutrients; the resulting pollution in the cities and nutritive shortages in the diets of the population; the squandering of raw materials; deforestation and desertification; and the exigencies of the world food trade. It was in response to such issues that he developed his theory of metabolic rift, focusing initially on the destruction of the soil metabolism associated with industrialized capitalist agriculture, inspired by the 1862 edition of Liebig's *Agricultural Chemistry* with its critique of the ecological "robbery system."¹⁵

Engels's ecology complemented Marx's ecology in all of these respects, while extending the analysis in new directions. The young Engels provided an urban-environmental critique, focusing on "social murder," in his 1845 *Condition of the Working Class in England*.¹⁶ Decades later, he was to provide the outlines of a dialectical approach to nature/ecology in his 1878 *Anti-Dühring* and his unfinished *Dialectics of Nature*, written in the late 1870s and early 1880s.¹⁷ Engels was concerned especially with combatting mechanical materialism and providing an analysis that focused on evolutionary change, coevolution, emergence, and the unity of opposites. As a result, he pushed the analysis at every point in the direction of an interconnected, ecological analysis, employing in the process the full array of dialectical categories (including totality, mediation, contradiction, negation, transformative change, qualitative transcendence, the unity of opposites, etc.). His critique of the folly of a social system that treated nature as a "foreign people" to be conquered, leading to the "revenge" of nature, represents one of the most searing indictments of the destructive environmental logic of capitalism ever penned, right down to the present day.¹⁸ As ecosocialist Ted Benton put it, "Engels's position can be seen as a first approximation to a view of emergent properties consequent upon successive levels of organization of matter in motion."¹⁹

Conceiving the dialectics of nature in this way, Engels, in tune with Marx—and embodying a perspective that went back to ancient Epicurean materialism, which he, like Marx, was able to quote extensively by heart—emphasized that nature, or the material world, was complex, changing, contingent, contradictory, and coevolutionary.²⁰ As historian of science Thomas S. Hall wrote of Epicurus, in ways that were later applicable to Marx and Engels, natural phenomena are seen as an emergent consequence of organization: "The increasingly complex organization of higher life-forms permits the appearance (the emergence) in them of new modes of life, new functions or behaviors, impossible in less organized forms."²¹ Such a "dialectical conception of nature," particularly if given

the fluid form with which Marx and Engels approached dialectical evolution, was antithetical at one and the same time to mechanism, idealism, and dualism.²² For Engels, the natural world was in a process of constant transformation, and therefore so were our ideas of the physical world, which could never achieve completeness or take final form because that would mean that evolutionary change itself would have ceased. “Dialectics,” he wrote, “comprehends things and their representations, ideas, in their essential connection, concatenation, motion, origin, and ending. Such [natural] processes as those mentioned above are, therefore, so many corroborations of its own method of procedure. Nature is the proof of dialectics.”²³ When united with a rock-bottom materialism, such a perspective necessarily led toward an interconnected, ecological worldview.

For Engels, the relation between “freedom and necessity” had first been correctly understood by G. W. F. Hegel. As Engels was to express it, “Freedom does not consist in any dreamt-of independence from natural laws,” and hence the conquest of nature, “but in the knowledge of these laws, and the possibility this gives of systematically making them work towards definite ends,” which, however, must remain within nature’s laws as a whole. It was this that fed into Engels’s critique of capitalism’s transgression of nature’s laws and the resulting ecological destruction.²⁴

But if Engels’s powerful analysis of the dialectic of society and nature is little known today and needs to be recovered, even less attention has been given to the pioneering work of an array of thinkers whose conceptions were built directly or indirectly on the materialism of Darwin, Marx, and Engels: figures like Lankester, Tansley, Wells, Bernal, Haldane, Needham, Levy, and Benjamin Farrington—all of whom contributed in various ways to the development of an ecological worldview in relation to science.²⁵ Moreover, art as well as science was necessarily involved in this struggle of late nineteenth- and early twentieth-century socialism to generate a genuinely egalitarian and ecological worldview. This was shown by Morris’s extraordinary merging of Marx’s ecological critique with the Romantic-aesthetic critique, and by Caudwell’s synthesis of the Marxian ecological dialectic with a revolutionary Romantic aesthetic.

WESTERN MARXISM AND THE DIALECTIC OF NATURE

In the dialectic of nature we encounter a possible roadblock. For those versed in the philosophical debates surrounding Marxism, no question has been more contentious than the dialectics of nature, the adamant rejection of which has separated the philosophical tradition known as “Western Marxism” from the Marxism of the Second and Third Internationals, while also driving a wedge between Marx and Engels.²⁶ The result was an almost total abandonment of any connection to natural science (seen as inherently positivistic) within Western

Marxism, although, as we shall see, some thinkers within the natural sciences have continued to be influenced by, and even to rely on, the classical Marxist ontology up to the present day.

The birth of Western Marxism as a distinct philosophical tradition is commonly traced to Georg Lukács's 1923 masterpiece *History and Class Consciousness*, particularly to his famous footnote 6 in chapter 1, in which he appeared to reject any extension of the dialectical method from society to nature. As he stated:

It is of the first importance to realise that the [dialectical] method is limited here to the realms of history and society. The misunderstandings that arise from Engels' account of dialectics can in the main be put down to the fact that Engels—following Hegel's mistaken lead—extended the method to apply also to nature. However, the crucial determinants of dialectics—the interaction of subject and object, the unity of theory and practice, the historical changes in the reality underlying the categories as the root cause of changes in thought, etc.—are absent from our knowledge of nature.²⁷

Lukács suggests here that the dialectical method in its full sense (the dialectic as knowledge) necessarily involves reflexivity, the identical subject-object of history. Here the subject (the human being) recognizes in the object of his/her activity the results of humanity's own historical self-creation. We can understand history, as Giambattista Vico said, because we have “made” it.²⁸ The dialectic thus becomes a powerful theoretical means of discovery rooted in the reality of human praxis itself, which allows us to uncover the totality of social mediations. Yet, such inner, reflexive knowledge arising from human practice, Lukács indicates, is not available where external nature is concerned; there, one is faced with the inescapable Kantian “thing-in-itself.” Hence the “crucial determinants of dialectics” are inapplicable to the natural realm; there can be no dialectics of nature—as a method—equivalent to the dialectics of history and society.

The seriousness of the division that arose in Marxian theory between Western Marxism and Marxism more broadly on this basis can hardly be overstated. As Lucio Colletti observed in *Marxism and Hegel*, a vast literature “has always agreed” that differences over (1) the existence of an objective world independent of consciousness (philosophical materialism or realism); and (2) the existence of a dialectic of matter (or of nature) constituted “the two main distinguishing features between ‘Western Marxism’ and ‘dialectical materialism.’”²⁹ Philosophical Western Marxists, including the Frankfurt School and the entire critical theory tradition, were adamant in following what they viewed to be the position of Lukács in *History and Class Consciousness* and in imposing an interdiction on the dialectics of nature as a method. For Hebert Marcuse

in *Reason and Revolution*, “The dialectical totality . . . includes nature, but only in so far as the latter enters and conditions the historical process of social reproduction.”³⁰ Jean-Paul Sartre in the *Critique of Dialectical Reason* wrote: “In the historical and social world . . . there *really* is dialectical reason; by transferring it into the ‘natural’ world, and forcibly inscribing it there, Engels stripped it of its rationality.”³¹

Yet, major problems were to arise from the rejection of the dialectics of nature within Western Marxism, since it relied on the dominant neo-Kantian dualism that separated those *phenomena* that could be experienced from *noumena*, or things-in-themselves. This was then transposed in Western Marxism into the notion that social/historical sciences were reflexive, with an identical subject-object (the Vician principle), whereas natural science relied on a naive positivism, failing to recognize the inherent limitations of our knowledge of the physical world, and the impossibility of a dialectical reasoning where reflexivity did not apply. Thus, one of the criticisms leveled against Engels by Lukács in *History and Class Consciousness*, and by the subsequent Western Marxist philosophical tradition, was that he had gone too far in adopting, following Hegel, a concept of “so-called *objective* dialectics,” the reality of which Lukács himself did not expressly deny.³²

Among the first to raise the alarm with respect to the neo-Kantian character of Lukács’s criticism, later embodied in so-called Western Marxism, was Antonio Gramsci, who wrote in his *Prison Notebooks*:

It would appear that Lukács maintains that one can speak of the dialectic only for the history of men and not for nature. He might be right and he might be wrong. If his assertion presupposes a dualism between nature and man he is wrong because he is falling into a conception of nature proper to religion and to Graeco-Christian philosophy and also to idealism which does not in reality succeed in unifying and relating man and nature to each other except verbally. But if human history should be conceived also as the history of nature (also by means of the history of science) how can the dialectic be separated from nature? Perhaps Lukács, in reaction to the baroque theories of the *Popular Manual* [Bukharin’s *Historical Materialism*], has fallen into the opposite error, into a form of idealism.³³

Ironically, it was Lukács himself who was to emerge as the most powerful critic of Western Marxism’s wholesale interdiction of the dialectics of nature as a concept. Lukács, as he was later to insist, had not categorically rejected the notion of the dialectics of nature in *History and Class Consciousness*. He had written there of the “merely objective dialectics of nature,” as perceived by the “detached observer,” as having a partial validity.³⁴ For Lukács, what was lacking

in “merely objective dialectics” was the full “reciprocal relation in which theory and practice become dialectical with reference to one another.” But rather than restricting the dialectic to this form, Lukács insisted that dialectics could be seen in terms of a structured hierarchy in which one could speak of a “typology of . . . dialectical forms,” including the objective dialectic of nature as well as the dialectic of human history.³⁵

In *Tailism and the Dialectic*, written several years after *History and Class Consciousness* (and rediscovered only recently), Lukács remarked that even his famous footnote in *History and Class Consciousness* was far more nuanced than generally thought and was consistent with the view that “objective dialectics are in reality independent of humans and were there [that is, existed] before the emergence of people.”³⁶

But how is knowledge of *objective dialectics*, the dialectics of nature, to be obtained, when the subject-object reflexivity (the identical subject-object) does not pertain? In his later writings, Lukács emphasized that this occurs mainly in two ways, drawing on both Marx’s theory of social metabolism and Engels’s argument on the basis of experimentation. With respect to social metabolism, Lukács, following Marx, contended that “since human life [labor] is based on a metabolism with nature, it goes without saying that certain truths which we acquire in the process of carrying out this metabolism have a general validity—for example the truths of mathematics, geometry, physics and so on.”³⁷ Thus, as Farrington argued, the ancient Greek materialists had used the various forms of production that they were familiar with, representing the human-natural role, as guides to physical properties and laws, extending beyond human action.³⁸ All of science had arguably originated on this basis, moving from the transitive to the intransitive, as Roy Bhaskar explained in his dialectical critical realism.³⁹ In Lukács’s own terms, we can get closer to a comprehension of the ontology of nature only to the extent that we understand it historically and genetically, which means transcending the mechanistic views that have predominated in natural science.⁴⁰ With respect to experimentation Lukács argued, in line with Engels, that scientific experimentation, which involves interaction with nature under controlled conditions, can provide insights into nature’s own objective dialectic and its ever-changing laws, though knowledge derived from such experiments and from industrial practice had to be critically assessed as ideologically mediated.⁴¹

In his later attempts to understand this hierarchy of dialectical forms, Lukács addressed what he called—following the young Hegel—the dialectic of identity and non-identity, superseding the conception of the unity of opposites. Here changing material forms introduced emergent *novel* entities, such as the historical invention of the wheel, in ways that expressed the *unity* with nature and impossibility of entirely superseding natural processes. Thus the historicity of

nature, along with the historicity of society, became an essential proposition.⁴² Beginning with *The Young Hegel* and to a greater extent in *The Ontology of Social Being*, Lukács explored the role of “reflection determinations” in Hegel’s Doctrine of Essence as the key to a dialectical-realist ontology of reciprocal interaction and change. The overriding concern throughout this analysis was the relation between a “merely objective dialectics of nature” and a wider dialectics of social ontology.⁴³

Hence, for the later Lukács, the metabolism between humanity and nature was conditioned by nature’s dialectic, and at the same time was the source of the human comprehension of that “objective dialectic.” Insofar as humanity actively engages in the transformation of nature that “process takes place in the field of social being, as the metabolism between society and nature, the indispensable precondition which is of course the correct comprehension of the dialectic of nature.”⁴⁴

In various ways, the major socialist thinkers addressed in this book, all of whom were concerned with the social relation to nature, as mediated by science and art via labor and production, came to similar conclusions with respect to the dialectic in history, seeing this as the realm of “freedom as necessity,” in Engels’s sense.⁴⁵ They all sought to connect the materialist conception of nature and the materialist conception of history through an examination of the complex, changing material interconnections between nature and human history. In this they invariably adopted the materialist principle of *mors immortalis*, perceiving the alienated character of capitalist production (social metabolism) and its destructive effects on nature’s metabolism, as the basis of a negative, critical dialectic.⁴⁶ All of the Marxian scientists examined here embraced an emergentist, evolutionary view, extending back to ancient Epicurean materialism. Central to the outlook of most of these thinkers was the need for a synthesis of materialist views stemming from Darwin and Marx. Others, such as Morris, arrived at a similar perspective via the relation of art and labor, or through a theory of mimesis, drawing on Aristotle’s *Poetics*, as in Caudwell.

Ultimately, these interconnected socialist and ecological analyses pointed to a notion of dialectics, as the necessary intellectual expression of the reciprocal human relation to a complex, changing, and emergent natural-and-social ontology, of which the human species was itself a part. Dialectics, in this sense, superseded rationalism, mechanism, and teleology, since it took as its fundamental reality the ever-changing character—as well as resulting contradictions, negations, and qualitative transformations—of both the material world at large and the human condition within it. As Needham cogently wrote:

Marx and Engels were bold enough to assert that it [the dialectical process] happens actually in evolving nature itself, and that the undoubted fact that

it happens in our thought about nature is because we and our thought are a part of nature. We cannot consider nature otherwise than as a series of levels of organisation, a series of dialectical syntheses. From the ultimate physical particle to atom, from atom to molecule, from molecule to colloidal aggregate, from aggregate to living cell, from cell to organ, from organ to body, from animal body to social association, the series of organisational levels is complete. Nothing but energy (as we now call matter and motion) and the levels of organisation (or the stabilised dialectical syntheses) at different levels have been required for the building of our world.⁴⁷

Likewise, for Caudwell, “thought is naturally dialectical,” since human beings “live and experience reality dialectically,” that is, live in a complex state of contradiction, change, and emergence.⁴⁸ Dialectics thus served a heuristic purpose superior to rationalism, mechanism, or teleology in helping us comprehend the material world of nature, of which human production was a part. What made dialectics so crucial in Caudwell’s view was not the unity of humanity with the world, but its separation—life in an alienated society. “Either the Devil has come amongst us having great power, or there is a causal explanation for a disease common to economics, science, and art,” which only a dialectical criticism could reveal.⁴⁹ It was such an uncompromising radical standpoint that drove Caudwell in just a few years, still in his twenties, to an integrative-ecological critique.

THE MOVEMENT TOWARD ECOLOGY

The major socialist (and social-democratic) thinkers who constitute the focus of this book were all politically and socially active in developing a critical-materialist view rooted in ecology and dialectics that extended to science and/or art. Lankester stood as the foremost ecological critic within British science in the late nineteenth and early twentieth centuries. Morris, in his years in the Socialist League and as a leader of the Hammersmith Socialist Society, provided an epic synthesis of the Romantic and Marxian critiques of capitalism’s dark satanic mills. Engels sought a dialectics of nature and society aimed at a truly scientific socialism. Tansley and Wells introduced the concepts of ecosystem and human ecology. Hogben launched the first full-fledged materialist-ecological critique of “scientific racism” or eugenics. Bernal, Needham, Haldane, and Levy brought dialectics to twentieth-century natural science and dialectical natural science to the social history of science. Needham developed a Marxian approach to emergence through his theory of integrative levels and played the leading role in linking Western and Eastern ecological philosophies. Caudwell gave a powerful ecological cast to the final works in his *Studies and Further Studies in a Dying*

Culture.⁵⁰ Farrington worked at theoretically restoring Epicureanism within the philosophy of praxis. Bernal was a central figure in the first great ecological movement of the post-Second World War period, the movement against above-ground nuclear testing.

Hence, the premise underlying this work is that socialist thinkers provided systematic if uneven and sometimes contradictory ecological critiques of our present society that were crucial both in their day and ours—a legacy that we can no longer afford to do without in our age of combined ecological and social crisis. If ecology has often been seen as arising in a liberal universe, divorced from socialism, the analysis here shows that this received ideology is far from the truth and that ecology was at its inception deeply intertwined with struggles for human equality and the revolt against capitalist society.

Today, *The Return of Nature*—the rediscovery of the ecological roots of human society—is a crucial step in the necessary task of building an organic system of social metabolic reproduction based on substantive equality and ecological sustainability. Above all, this is what defines today’s global movement toward ecosocialism. If the thinkers addressed in this book developed their ideas long before ecosocialism emerged as a historically specific form of resistance in the 1980s, they nonetheless prepared the way for all that would follow, often in far more sophisticated ways, by drawing on socialist conceptions to develop the ecological critique and the ecological critique to develop socialism.

Here we need to draw on the past, not simply in a historical sense but because the results that were obtained but now forgotten are crucial to our struggles in the present. The tragedy in Homer’s *Iliad* was that the better hero, Hector, was defeated. Yet this came to symbolize a past that would not die and would return again and again.

The story told in this book is replete with its own historical contradictions. For example, in a number of instances and for short periods of time, some of the thinkers in this broad tradition of socialism and ecology seemed to fall prey to a Promethean ecological modernism and a regressive conception of progress, which in the 1940s and early 1950s had become a dominant force on the left as well as the right. Nevertheless, the overall direction of the various socialist thinkers treated in this book was toward an ecological socialism, recognizing the pressing need for a new socioecological metabolism in the “closing circle” of the world environment.⁵¹ In the end, there was no doubt about the ecological as well as social challenges posed by what we now call the Anthropocene. As Bernal declared in 1967: “If life is not to die, we have to see to it that we stop now the forces threatening its existence.”⁵²

PART ONE

Beyond Marx and Darwin

CHAPTER ONE

Ecological Materialism

The interment of Charles Darwin's mortal remains at Westminster Abbey in London at noon on April 26, 1882, a week after his death, was a magnificent state occasion. Attendees included numerous representatives of the British aristocracy, the speaker of the House of Commons, the chancellor of the University of Oxford, ambassadors of foreign countries, and the cream of British science. Fellows of the Royal Society present on the occasion included such famous figures as Francis Galton, Joseph Hooker, Henry Maine, Thomas Huxley, E. Ray Lankester, John Lubbock, and Alfred Russel Wallace. As the white unpolished oak coffin, covered with a black velvet pall edged with white silk, on which were laid wreaths of white flowers, was moved to the grave, "Beethoven's Funeral March" (now attributed to Johann Heinrich Walch) was played, followed by the more plaintive March in B-Minor by Schubert. The anthem by Handel, "His Body Is Buried in Peace, but His Name Liveth Evermore," was sung. The inscription on the coffin, laid in the northeast corner of the nave next to that of Sir John Herschel, read: "Charles Robert Darwin. Born February 12, 1809. Died April 19, 1882."

In an article that day in *Nature*, Thomas Huxley wrote:

In France, in Germany, in Austro-Hungary, in Italy, in the United States, writers of all shades of opinion, for once unanimous, have paid a willing tribute to the worth of our great countryman, ignored in life by the official representatives of the kingdom, but laid in death among his peers in Westminster Abbey by the will of the intelligence of the nation. One could not converse with Darwin without being reminded of Socrates. There was the same . . . belief in the sovereignty of reason; the same ready humour; the same sympathetic interest in all the ways and works of men. But instead of turning away from the problems of nature as hopelessly insoluble, our modern philosopher devoted his whole life to attacking them in the spirit of Heraclitus and Democritus. . . . There is a time for all things—a time for glorying in our ever-extended

conquests over the realm of nature, and a time [for] mourning over the heroes who have led us to victory. None have fought better, and none have been more fortunate than Charles Darwin.¹

The funeral of Darwin's great contemporary, Karl Marx, in London less than a year later was a far more modest, but no less notable occasion. Marx's body lay in state for a couple of days after his death on Wednesday March 14, 1883, and numerous people came to view him.² At noon on a windy, cold, cloudy, rainy Saturday, a small private group of more than a dozen mourners, consisting largely of close family friends and political comrades, followed the horse-driven hearse up to Highgate Cemetery east of Swain Lane where Marx was to be buried in a corner of the cemetery alongside the grave of his wife, Jenny.³ Among them were Marx's daughter, Eleanor Marx; the Marx family's housekeeper and family friend Helene Demuth; Marx's longtime friend and collaborator Frederick Engels; Friedrich Lessner and George Lochner, both comrades from the days of the Communist League; Marx's sons-in-law Paul Lafargue and Charles Longuet from France; Wilhelm Liebknecht, from the German Social Democratic Party; and Professor Carl Schorlemmer (chemistry) and Professor E. Ray Lankester (zoology), Fellows of the Royal Society of London. Three others known to be at the funeral were the London barrister and socialist poet Ernest Radford, part of Eleanor Marx's circle and a frequent visitor to the Marx home; Edward Aveling, Radford's co-editor at *Progress*, a popular lecturer on biology, and later the partner of Eleanor Marx; and H. B. Donkin, Marx's doctor and Lankester's close friend. Gottlieb Lemke laid two wreaths with red ribbons on behalf of the staff of *Der Sozialdemokrat* (Zurich) and the London Communist Workers Education Association. Engels then delivered in English his now famous "Speech at the Graveside of Karl Marx," followed by the reading in French by Longuet of three telegrams: one from the Russian socialists, one from the Paris Brotherhood of the French Workers' Party, and one from the Spanish Workers' Party. Liebknecht concluded with a memorial speech in German on behalf of the German Social Democratic Party.⁴

Engels spoke of Marx as a scientist and a revolutionary, comparing him to Darwin:

Just as Darwin discovered the law of evolution in organic nature, so Marx discovered the law of evolution in human history; he discovered the simple fact, hitherto concealed by an overgrowth of ideology, that mankind must first of all eat and drink, have shelter and clothing, before it can pursue politics, science, religion, art, etc. . . .

But that is not all. Marx also discovered the special law of motion governing the present-day capitalist method of production and the bourgeois society that this method of production has created. The discovery of surplus value

suddenly threw light on the problem in trying to solve which all previous investigators, both bourgeois economists and socialist critics, had been groping in the dark.

Two such discoveries would be enough for one lifetime. Happy the man to whom it is granted to make even one such discovery. But in every single field which Marx investigated—and he investigated very many fields, none of them superficially—in every field, even in that of mathematics, he made independent discoveries.

This was the man of science. But this was not even half the man. Science was for Marx a historically dynamic, revolutionary force. However great the joy with which he welcomed a new discovery in some theoretical science whose practical application perhaps it was as yet quite impossible to envisage, he experienced a quite other kind of joy when the discovery involved immediate revolutionary changes in industry and in the general course of history. For example, he followed closely the discoveries made in the field of electricity and recently those of Marcel Deprez.

For Marx was before all else a revolutionary. His real mission in life was to contribute in one way or another to the overthrow of capitalist society and of the forms of government which it had brought into being, to contribute to the liberation of the present-day proletariat, which he was the first to make conscious of its own position and its needs, of the conditions under which it could win its freedom. Fighting was his element.⁵

In reporting on Marx's death in a letter to Adolf Sorge on March 15, 1883, Engels referred to Marx's wont to quote Epicurus on mortality: "'Death is not a misfortune for him who dies, but for him who survives,' he used to say, quoting Epicurus."⁶

Despite the sharp contrast in their funerals, reflecting the widely different places they occupied in British society—Darwin, rich, famous, and celebrated; Marx, a German revolutionary exile—their deaths, like their lives, suggest a strong historical connection as materialist-scientific thinkers, revolutionizing their times, a connection that has attracted numerous commentators over the past century or more.

Huxley's memorial to Darwin stressed the materialist basis of his thinking, going back to the ancient Greek philosophers, Heraclitus and Democritus, even if Socrates was invoked in more personal and idealist terms. He drew attention to the long struggle that Darwin was consequently forced to fight in order to get his theory of "natural selection" accepted in British society and the world at large. For Huxley, Darwin's burial at Westminster Abbey was a sign of his triumph, even in death: "ignored in life by the official representatives of the kingdom, but laid in death among his peers in Westminster Abbey by the will

of the intelligence of the nation.” Darwin’s great achievement in evolutionary theory was a “victory” for which he had “fought” valiantly. He could thus be seen as a revolutionary scientific figure, who had nonetheless contributed to the strengthening of bourgeois society.

Engels began his memorial statement by comparing Marx’s chief discovery in social science to Darwin’s achievement in natural science. This fit with the idea that the materialist conception of history, of which Marx was the leading analyst, had its counterpart in the materialist conception of nature, in which Darwin was the greatest contemporary figure. But Marx, Engels argued, had not only uncovered the logic of historical development, he had also disclosed the secret of surplus value as constituting the basis of capital accumulation, the “special law of motion governing the present-day capitalist method of production.” Just as Huxley invoked Heraclitus and Democritus as ancient Greek materialist philosophers who had inspired the development of science, of which Darwin’s theory of natural selection was the supreme achievement, so Engels in his letter to Sorge called to mind Marx’s debt to the ancient Greek philosopher Epicurus, whose notion of “death the immortal” constituted a fundamental materialist principle.⁷ Nevertheless, Marx’s “real mission in life” was not simply the advancement of science in and of itself, but the revolutionary “overthrow of capitalist society. . . . Fighting was his element.” If Darwin’s revolutionary materialist science was meant, according to Huxley, to strengthen the existing order by expanding the “conquest” of nature, Marx’s revolutionary science and praxis, Engels explained, had to do with promoting “revolutionary changes . . . in the general course of history,” ultimately questioning capitalism’s so-called conquest of nature.

It is significant that one individual, E. Ray Lankester (1847–1929), then in his mid-thirties, was present at both Darwin’s and Marx’s funerals. Lankester was well over six feet tall and built to proportion, towering physically over others on both occasions. Combined with his strong intellect, Lankester was thus an extremely imposing figure. The novelist Olive Schreiner, who met him at a dinner party in 1881, wrote that Lankester was “the most powerful human being I ever came into contact with; he is like those winged beasts from Nineveh at the British Museum. What you feel is just immense force.”⁸

Lankester was a protégé of Huxley and Darwin, and the son of a fellow of the Royal Society. His father, Edwin Lankester, was a radical in politics and one of the most eminent scientific men of his day. Ray’s mother, Phebe Lankester, née Pope, was the daughter of a former mill owner. As a boy, Ray had ridden on Huxley’s back, while Darwin had told him stories of great tortoises. At the age of sixteen he published his first scientific article, and while still in his twenties was elected to the Royal Society. Ray Lankester was to emerge as the greatest evolutionary biologist in Britain in the generation after Darwin and Huxley.⁹ He was also a good friend of Marx and his youngest daughter, Eleanor, and was a

frequent visitor at the Marx family home in the last three years of Marx's life. He read Marx's *Capital* and, though not a Marxist, remained throughout his life a radical freethinker and a Fabian-style socialist.

Both directly and through his students such as Arthur Tansley, H. G. Wells, and Julian Huxley, Lankester was to play a crucial founding role in the development of the ecological critique in the late nineteenth and early twentieth century. In his own person and intellect, he symbolized a continuing, complex critical-historical relation between socialist and Darwinian thought, and between the materialist conception of history and the materialist conception of nature that was to play a major role in British science for half a century or more, and which marked the emergence of modern ecological materialism.

LANKESTER AND DEGENERATION

E. Ray Lankester was born in London in 1847, the year that Marx and Engels wrote *The Communist Manifesto* (published in 1848). He died in 1929 at age eighty-two, two months before the New York stock market crash that marked the beginning of the Great Depression.

Edwin Lankester (1814–1874), Ray's father, was the son of a builder who died of tuberculosis at age twenty-seven, leaving Edwin's mother with no property to speak of and four children to raise. At age twelve, Edwin was apprenticed to a country surgeon. In 1839, by then already a distinguished medical professional, he received his M.D. in Heidelberg, having first mastered German. He became a Fellow of the Royal Society; president of the Royal Microscopical Society; secretary of section D (biology and botany) of the British Association for the Advancement of Science; and president of the Public Health Section of the British Social Science Association. In 1850 he gained the chair in natural science at New College, London.

Edwin Lankester stood out among leading scientists of his day in that he was an English radical, though retaining strong, dissenting, religious beliefs for most of his life. Brought up as a Congregationalist, in his later years he would convert to the Church of England.¹⁰ The elder Lankester knew and admired Robert Owen. He made a diary entry on January 1839 that read: "Should things come to blows, the grand question is for each individual to choose his side. I am no Chartist, but there lies the interest of the masses, and the interest of mankind, should things come to a rupture, the side of the people will be my choice, however injudicious some of their movements may appear." He was a strong supporter of the North in the U.S. Civil War, backed the extension of the franchise to the poor, and supported Irish liberation. In the last decades of his life he devoted himself to public health and the conditions of the working class.

The elder Lankester was also an important scholar and writer, the author of numerous books and professional journal articles. Noted for his contributions to natural history, he was one of the leading early promoters of the modern aquarium. His 1856 book, *The Aquavivarium: An Account of the Principles and Objects Involved in the Domestic Culture of Water Plants and Animals*, was enormously influential. His 1857 work, *Half Hours with the Microscope*, was very popular and continued to be reprinted unaltered for more than fifty years.¹¹

In June 1849, Dr. Lankester was elected to the Vestry of the parish of St. James, Westminster. Although “civil parishes” were not formally separated from “ecclesiastical parishes” in England until 1866, by the 1850s the English parish, especially in the large cities, was fulfilling a major civil role, comparable to local government units in the United States and England. By this time, vestries were in specific charge of issues related to local public health. The Vestry of St. James, in particular, was nominally now a lay body, not directly connected to the church, which met at a separate Vestry Hall to the west of St. James Church. Dr. Lankester was active in the Vestry and was reelected in 1851 and in 1854, the year of the great cholera outbreak.¹²

It was in his strategic capacity as chairman of the Vestry’s Cholera Inquiry Committee that Edwin Lankester, together with Dr. John Snow and Reverend Henry Whitehead, played a key role in determining that cholera was a water-borne illness. It was partly through his offices that London’s worst cholera epidemic—centered in the Berwick Street-Golden Square district of Soho in the City of Westminster in West London, falling within St. James parish—was traced to the water pump on Broad Street fed by a 25-foot-deep well. Thus arose what was to be one of the most famous episodes in the history of epidemiology.¹³

In the last few days of August 1854, a major cholera epidemic broke out in Soho. By September 2, hundreds of residents, and sometimes whole families, were falling prey to the disease within hours of one another. Snow believed, contrary to the general medical opinion, that cholera was a water-borne disease resulting from an external agent in the form of a living organism. This was a time when the role of bacteria as a disease agent had not yet been established, and the only recognized case of a living organism causing a disease had to do with a fungus, affecting silkworms. Although Filippo Pacini in Italy isolated the cholera bacillus in 1854, the same year as the London epidemic, his work remained unknown to the larger scientific community. It was not until Robert Koch, working in India, reported his separate discovery of *Vibrio cholerae* thirty years later, in 1884, that the actual cause of cholera was fully recognized by scientists.¹⁴

Nevertheless, Snow, believing that an external agent was involved, concluded from investigations into the homes affected that the epicenter of the epidemic was a popular water pump on Broad Street. On September 7, he managed to

convince the Board of Governors of St. James Parish to remove the handle to the pump, which was carried out the next morning.¹⁵ On September 13, Marx, who lived with his family in Soho, noted in a letter to Engels that deaths on Broad Street from cholera were averaging three per residence. But within a few days, the death toll was subsiding. Nearly seven hundred people living within 250 yards of the Broad Street pump had died, while on Broad Street itself the death toll was more than 10 percent of the population.¹⁶

The end of the epidemic was followed by a careful investigation of its cause by the Vestry of St. James Parish under the direction of Edwin Lankester, and through the efforts of Snow and Whitehead. On November 2, Dr. Lankester issued a motion that a Vestry Committee be set up to investigate the causes of the epidemic. The motion passed later that month, and Lankester was made chairman of the committee. The Vestry Committee would hold fourteen meetings between November 1854 and July 1855. Its report, presented at length by Edwin Lankester to the Vestry on August 9, 1855, as Steven Johnson observes in *The Ghost Map: The Story of London's Most Terrifying Epidemic—and How It Changed Science, Cities, and the Modern World*, was “the first time an official committee investigation had endorsed the waterborne theory” of the etiology of cholera. “In the years and decades that followed,” Johnson writes, “the Vestry Committee report grew in influence as the story of the Broad Street epidemic was retold.”

Two years before the 1854 cholera epidemic, Dr. Lankester had carried out microscopical investigations into the water of the Thames, which supplied the poorer parts of the city, and into which flowed 209 public sewers, the refuse of slaughterhouses, and industrial waste. Like Snow, his neighbor and fellow medical professional, he argued that disease could spread other than through infection (known as the anti-contagion theory). In October 1854, soon after the epidemic ended, he conducted an examination of all the wells in the parish and was able to determine that only the well feeding the Broad Street pump contained detectable organic matter. He reported on the presence of organic matter in the well feeding the Broad Street pump in November, at about the time he was to issue his motion on the establishment by the Vestry of a Cholera Inquiry Committee.¹⁷

It thus was Edwin Lankester, as chairman of the Vestry Committee on the epidemic, who (1) conducted the investigations into the well water in St. James Parish; (2) brought Snow and Whitehead onto the committee, leading to Whitehead's discovery of the index (first) case of the epidemic associated with a cesspool at number 40 Broad Street that was flowing into the well feeding the Broad Street pump; (3) arranged the financing of a full epidemiological study; (4) contributed massively to the resulting 178-page report, which he presented to the Vestry; and (5) eventually took the lead in publishing the Vestry Committee report, which was to play an important role in the rise of

modern epidemiology. Two years later, he published in the *Quarterly Journal of Microscopical Science* the result of his investigations into the well waters of St. James Parish (Soho), showing the fungus (thought then to be the culprit) that had clouded the well water for the Broad Street pump. In 1860, he delivered a lecture on “Sanitary Defects and Medical Shortcomings,” in which he referred to his experience with the Cholera epidemic “in Westminster, in 1854, when the pump in Broad Street killed 500 persons in three nights” due to “organic impurities” in the water. In 1866, after another smaller outbreak of cholera in England, he issued a 92-page book, *Cholera: What It Is and How to Prevent It*.¹⁸

Edwin Lankester’s leading role as chairman of the Cholera Inquiry Committee led to his being appointed Medical Officer of Health for the St. James, Westminster, parish in 1856. From the first, in that role and then, beginning in 1862, as coroner for Central Middlesex, he led the battle against overcrowding, overwork, and poor sanitary conditions in workshops. He engaged in the struggle against the social-environmental conditions associated with high infant mortality, a very large portion, as he was to demonstrate, arising from infanticide, but which had deeper social causes.¹⁹ A very larger part of the blame, he argued, could be attributed to the oppression of women.

The 1855 report of St. James’s Vestry on the cholera outbreak, written by Edwin Lankester, strongly influenced John Simon, then the Medical Officer of London, and soon the Medical Health Officer for the General Board of Health (and when that was dissolved, for the Privy Council) and therefore the leading public health figure in Britain. Lankester was a close colleague of Simon in a number of scientific and medical capacities, including being appointed vice president of the Society of Medical Health Officers when Simon was president in 1857–59. Edwin Lankester’s investigations played a crucial role in getting Simon to conclude in his *Report on the Last Two Cholera-Epidemics of London, as Affected by the Consumption of Impure Water* (1856) that cholera was a water-borne disease and that the commercial companies that supplied London with its water had primary responsibility. Under the influence of these events, Simon gradually abandoned the miasma theory of disease and became a leading proponent of the contagion or germ theory. Marx and Engels had a deep admiration for Simon, whom Marx frequently quoted in *Capital*, for his battles on behalf of the working class.²⁰

Edwin Lankester’s concern with environmental conditions went beyond epidemiology and took into consideration the urban-rural divide. Like Marx later on, he was a strong proponent of Justus von Liebig’s notions of sustaining soil nutrients as a key to maintaining agricultural productivity and an adequate diet for the population.²¹

If Ray Lankester’s father, Edwin, was a remarkable figure in his day, his mother, Phebe, was no less so. Unusual in the Victorian Age, she too was a

scientist, with a background in biology and microscopy. Quite likely she was involved along with her husband—but, in those days, as a woman behind the scenes—in the microscopical examination of the water coming from the well on Broad Street. She was the daughter of Samuel Pope, a former mill owner and brother to the distinguished barrister (also named Samuel Pope). She was educated at the ladies' academy in Mill Hill, followed by private instruction. Among her numerous writings were works on botany, natural history, and public health, including *Wild Flowers Worth Notice* (1861), illustrated by J. E. Sowerby. Well versed in technical botany, she contributed substantially to J. T. Boswell Syme's *English Botany* (1861–63), writing around four hundred entries, and was a competent microscopist. Phebe was on friendly terms with George Eliot, whom Ray Lankester was afterward to remember as one of the most impressive women he had ever met. The Lankesters were also close friends of Charles Dickens, who often dined with them. They attended the Dickens's picnics and theatrical events until Dickens separated from his wife, Catherine, in 1858.²²

Darwin, soon to release *The Origin of Species* to the world, was a frequent guest at the Lankester home, as was Huxley. In his early teens, Ray attended John Tyndall's lectures on glaciers at the Royal Institution, along with as many of Huxley's lectures as possible. At the age of fifteen, in 1861, he published his first scientific writing in the form of a letter to *The Geologist*, and the next year his first full scientific paper appeared.²³ At nineteen, he was aiding his father in his cholera investigations, writing an appendix on microscopical investigations related to cholera for *Cholera: What It Is and How to Prevent It*.²⁴

Ray Lankester received his university education at Cambridge and Oxford. He rounded out this schooling with years of study in Vienna, Leipzig, Jena, and Naples. In Jena, he worked with Ernst Haeckel, and in 1876 supervised the translation of Haeckel's *History of Creation*, published in English.²⁵ In the early 1870s, his fame was rising so rapidly that Darwin wrote to him "I can clearly see that you will some day become our first star in Natural History."²⁶ In 1873, he began writing at Huxley's suggestion for the ninth edition of the *Encyclopædia Britannica*.²⁷ Two years later, at age twenty-eight, he was appointed to the chair of zoology at University College, London (later endowed as the Jodrell Chair). The same year he was made a Fellow of the Royal Society. Lankester remained at University College and at the Royal Institution, where he served as Fullerian Professor of Physiology, until 1890, when he took up the position of Linacre Professor of Comparative Anatomy at Oxford from 1891 to 1898, after which he became director of the Natural History Museum from 1898 to 1907, called by Stephen Jay Gould "the most powerful and prestigious post in his field."²⁸

The course of Lankester's career, however, was far from smooth, despite his obvious abilities, and the direct backing he received from Darwin and Huxley. This was due to his constant, controversial criticisms of Cambridge and Oxford

for the dominance exercised by theological doctrines and the emphasis placed on classical (Greek and Latin language) study. Throughout his career, he sought to reform British education. He was at all times a dedicated scientific materialist and a no less dedicated opponent of spiritualism, including that of Alfred Russell Wallace (the co-discoverer with Darwin of the theory of evolution by natural selection). In 1876, together with his close friend Dr. Horatio Bryan Donkin, then an assistant physician at Westminster Hospital, he created a storm in London society by publicly unmasking an American medium, Henry Slade. Lankester carted him off to the police to be prosecuted as a “common rogue,” then writing about it in the *Times* and elsewhere. Darwin contributed £10 to the prosecution of Slade, while Wallace, in contrast, spoke in the trial for the defense. (Slade was convicted and sentenced to three months in prison, but he was released on appeal and fled to the United States.)²⁹ So uncompromising and outspoken was Lankester on the subject of materialism that he constantly made enemies, including many within the upper-class British establishment.

In 1880, Lankester published what would be one of his most important contributions, *Degeneration: A Chapter in Darwinism*, first presented in 1879 as a lecture to the British Association for Science.³⁰ Here he rejected the popular notion of evolution as a unilinear process of progress from simpler to more complex forms, a rejection that can be considered the necessary starting point for any ecological critique. Instead, he explained that there were three possibilities in the evolution of species: balance, elaboration, or degeneration. For example, “with regard to parasites, naturalists have long recognized what is called *retrogressive metamorphosis*; and parasitic animals are as a rule admitted to be instances of Degeneration.” He defined degeneration as

a gradual change of the structure in which the organism becomes adapted to *less* varied and *less* complex conditions of life. . . . In Degeneration there is a *suppression* of form, corresponding to the cessation of work. . . . It is only when the total result of the Elaboration of some organs, and the Degeneration of others, is such as to leave the whole animal in a *lower* condition, that is, fitted to less complex action and reaction in regard to its surroundings, than was the ancestral form with which we are comparing it (either actually or in imagination) that we speak of that animal as an instance of Degeneration.³¹

Lankester argued that forms of adaptation that led to parasitism or immobility could facilitate degeneration, and this could equally apply to human systems. He thus raised the question whether “the white races of Europe” might be prone at some point to degeneration. But he tended to deemphasize race distinctions within the human species, stressing that degeneration in a human context applied to civilization itself (since natural selection had long ceased to

operate directly), whereas the educability of human beings and the progress of science constituted their main protection. Nevertheless, civilizational degeneration was a genuine concern:

In accordance with a tacit assumption of universal progress—an unreasoning optimism—we are accustomed to regard ourselves as necessarily progressing, as necessarily having arrived at a higher and more elaborated condition than that which our ancestors reached, and as destined to progress still further. On the other hand, it is well to remember that we are subject to the general laws of evolution and are as likely to degenerate as to progress. As compared with the immediate forefathers of our civilization—the ancient Greeks—we do not appear to have improved so far as our bodily structure is concerned, nor assuredly so far as some of our mental capacities are concerned. Our powers of perceiving and expressing beauty of form have certainly *not* increased since the days of the Parthenon and Aphrodite of Melos. In matters of reason, in the development of the intellect, we may seriously inquire how the case stands. Does the reason of the average man of civilized Europe stand out clearly as an evidence of progress when compared with that of the men of bygone ages? Are all the inventions and figments of human superstition and folly, the self-inflicted torturing of mind, the reiterated substitution of wrong for right, and of falsehood for truth, which disfigure our modern civilization—are these evidences of progress? In such respects we have at least reason to fear that we may be degenerate.³²

There were numerous instances of degeneration and fall of civilizations as in Rome and with the Maya of Central America. Moving from natural examples to human (civilization) analogues, he wrote: “Any new set of conditions occurring to an animal which renders its food and safety very easily attained seem to lead as a rule to Degeneration; just as an active healthy man sometimes degenerates when he becomes suddenly possessed of a fortune; or as Rome degenerated when possessed of the riches of the ancient world. The habit of parasitism clearly acts upon animal organization in this way.”³³

For Lankester, the threat to civilization was worth considering. It was possible, he wrote fancifully, that “we are all drifting, tending to the condition of intellectual Barnacles or Ascidians.” It was conceivable for a prosperous civilization “to reject the good gift of reason with which every child is borne, and to degenerate into a contented life of material enjoyment accompanied by ignorance and superstition.” The issues of the complex nature of the coevolution of humanity and external nature, along with specific threats to civilization that arose from destructive and degenerative forms of human ecology, were to be constant themes in Lankester’s writing throughout his life.³⁴

There was, however, a more ominous set of concerns with respect to the degeneration of civilization that Lankester did not express in *Degeneration* and which exists in unpublished notes from the same period. “Certainly, in the case of human societies,” he wrote, “it is to be supposed that ultimately a degenerate society would be beaten, repressed, and eventually annihilated by other societies. . . . The struggle is so close among civilized men that the possibility of a degeneration and permanent rest does not suggest itself. It is exceedingly probable that a community which aimed at degeneration would end in annihilation.”³⁵ Lankester’s *Degeneration* was later to have a direct impact on H. G. Wells, inspiring his 1891 article on “Zoological Retrogression” and his novel *The Time Machine* (1895).³⁶

LANKESTER AND MARX

Around 1879–80, when E. Ray Lankester was developing his influential ideas on degeneration in species and civilization, he became close friends with Karl Marx and his daughter Eleanor.³⁷ When and where the Lankesters and the Marxes first met is unclear. Sociologist Lewis S. Feuer suggested that it may have been through the offices of their common friend Charles Waldstein (from 1918 on, Charles Walston), a lecturer in archaeology and later a professor of fine arts at the University of Cambridge, and a close friend of Karl Marx. Waldstein is mentioned in the first extant letter from Lankester to Marx, dated September 19, 1880.³⁸ However, other possibilities suggest themselves. Lankester could have just as easily been introduced to Marx by Lankester’s colleague at University College, Edward Spencer Beesly, a professor of history and friend of the Marx family, who sympathized with the working class and the International Working Men’s Association.³⁹

It is even conceivable that the Marx and Lankester families were previously acquainted socially, as they lived in close proximity in Hampstead. It was a mere twenty-one minutes’ walk from the Lankester family home at 68 Belsize Park to the Marx family home at 41 Maitland Park Road. (Engels lived at 122 Regent’s Park Road, fourteen minutes’ walk from the Marx home.)⁴⁰

Both Edwin Lankester and Marx were members of the reform-oriented Society for the Emancipation of the Arts, Manufacture, and Commerce (usually shortened to Society of Arts), which also included in its membership the sanitary reformer, Edwin Chadwick, and the authority on industrial waste, P. L. Simmonds (a close associate of Edwin Lankester), who had nominated Marx for membership. In the 1860s the Society of Arts met at the Adelphi Building on the Thames, and it is possible that Marx and the elder Lankester became acquainted there.⁴¹

What is clear is that in the last three to four years of Marx’s life, Ray Lankester was a frequent visitor at Marx’s home and came, as he later recalled to H. G.

Wells, to know Marx “intimately.” Karl and Eleanor Marx visited Lankester at his home, and Eleanor Marx by herself visited the Lankester family.⁴² Lankester recommended his good friend H. B. Donkin as the doctor to attend Jenny Marx in her final illness. Donkin went on to treat Marx in his final years and later treated Eleanor Marx, after her father’s death.⁴³

Horatio Bryan Donkin, himself an important figure in British science, had been elected a Fellow of the Royal College of Physicians in 1880 and was much liked and esteemed by Marx. He became a leading neurologist, famous for his work on the inheritance of mental traits and on hysteria, directly influencing Sigmund Freud. Along with Lankester, he was to become a major critic of eugenics. In 1880, around the time he became the doctor to the Marx family, Donkin delivered a lecture, “Thoughts on Ignorance and Quackery,” to the Westminster Hospital Medical School, published the same year in the *British Medical Journal*. He insisted that medicine could not consist simply of anatomical and physiological knowledge with various drugs offered up as medicinal remedies; rather, it needed to address the individual as an individual in his/her environment in order to understand the nature of the patient’s maladies. This meant learning the patient’s entire history and “social surroundings.” Mental as well as physical conditions needed to be evaluated. Donkin criticized the growing tendency to overspecialization, with each ailment having its own medical specialist.⁴⁴

Also in 1880, Donkin published “Suggestions as to the Aetiology of Some of the So-Called System-Diseases of the Spinal Cord” in the British medical journal *Brain*. In the midst of this learned discussion of the diseases of the nervous system, he referred to the material basis of language, emphasizing that “impressions made on our individual brains” act on the “heredity capacity for articulate speech,” giving children the capacity to learn with ease each and every language if exposed early enough and “placed in similar native surroundings.” Here Donkin, a materialist and a radical, drew on Henry George’s political-economic study *Progress and Poverty*, which had discussed human speech capacity in these terms in “The Law of Human Progress.” Donkin referred to this language capacity as “one of the most important *differentia* of our species.”⁴⁵

The intellectual friendship between Marx and Ray Lankester, who visited the Marxes on numerous occasions, both with Donkin and by himself, was undoubtedly a formidable one. Although Lankester was the much younger man, he was by the early 1880s a confident figure, and as Darwin had said, the emerging “first star” in biological science. One of Lankester’s former students drew a vivid portrait of him as a lecturer (during the time he knew Marx):

He looked round the room, surveyed us (as we felt somewhat as if we were cockroaches), and gave for an hour a clear constructive account of forms and

conceptions wholly new to us, with such skill that we were unconscious of the marvelous scope and concentration of his lecture, and unconscious of the difficulty in the subject. At the same time, apparently without effort, he drew on his many blackboards with firm sweeps of wide lines clear diagrams which were left untouched during the day for those who were unable to copy as quickly as he drew. I have no recollection of seeing him refer to notes, except to dictate the definition of groups, or rarely for some drawing. For us, in 1881, he was infallible.⁴⁶

Marx no doubt found Lankester's thoroughgoing materialism and radicalism attractive. Indeed, as Joseph Lester writes: "It cannot be doubted that Lankester himself had radical political views that would have appealed to Marx."⁴⁷ Remarkably, Marx's description of the conditions of overwork and overcrowding in his chapter on "The Working Day" in volume 1 of *Capital* had drawn on descriptions of the conditions in workhouses published in several London papers in June 1863—based on the *Report of the Medical Officer of Health to the Parish Vestry of St. James* by Edwin Lankester. The newspaper reports dwelt on the elder Lankester's account of the death of twenty-year-old Mary Ann Walkley, employed in a dressmaking establishment run by Madame Elise, one of London's better-known millineries. Walkley, along with sixty other young women, had been forced to work 26 1/2 hours straight without a break, confined thirty to a room.

In addition to alluding to the details on Walkley's death, Marx in *Capital* also referred to Lankester's statement, quoted by the Children's Employment Commission (though attributed in a footnote in *Capital* to Dr. Letheby, the Consulting Physician of the Board of Health), that "the minimum air for each adult ought to be in a sleeping room 300, and in a dwelling room 500 cubic feet." Edwin Lankester had followed up inquiries into Walkley's death with repeated inspections of the sanitary conditions of the workrooms/sweatshops.⁴⁸ In the conclusion to his "President's Address in the Public Health Department of the Social Science Association" in 1865, he had strongly condemned "the sacrifice of holocausts of victims" among the working classes "every year"—though attributing this largely to lack of education in the principles of public health.⁴⁹

The young Lankester had no doubt learned of these horrendous workplace conditions from his father, and would have shared the latter's outrage.⁵⁰ In 1873 Ray declared in a letter to his mother: "I really believe that common property and free love, subject to certain regulations for the common good, will one day have a great development, perhaps not in these old lands, but in new ones, which will increase in population and prosperity as Europe dies of old age. I don't say that I should like to try the experiment in the midst of another kind of life, but it cannot be that men will go on, some deprived of proper food, education, and

all that makes life endurable.” In 1880, at the time of his friendship with Marx, Ray Lankester declared that the “Liberals are a sham” and “the conservatives genuine unpretending swindlers.”⁵¹

Marx and Ray Lankester’s friendship clearly extended to their respective intellectual endeavors. Marx, who had recently taught himself Russian, informed Lankester that *Degeneration* had been translated into that language, asking Nikolai Danielson in Russia with regard to its publication status on Lankester’s behalf. These actions suggest Marx was impressed by the intellectual importance of Lankester’s theory of degeneration, although his own opinion on it is not known. Marx gave Lankester, who read German, a copy of his great work *Das Kapital*, which would not be translated into English until after Marx’s death, and Lankester reported in May 1880 he was “reading it with the greatest pleasure and profit.”⁵²

Marx and Lankester certainly did not lack subjects in common to discuss, such as materialism, Darwin’s evolutionary theory (which fascinated Marx), the state of English and German science, and capitalism.⁵³ It was quite possible that Lankester introduced Marx to the work of his friend the Canadian naturalist Grant Allen, since Marx took detailed notes on Allen’s 1880 article on the role of coal deposits on urban development in Britain.⁵⁴

Marx was enthusiastic about the aquarium at Brighton, which he visited more than once and strongly recommended to Engels. Completed in 1872, it had the largest display tank in the world, holding 100,000 gallons. The main aquarium corridor was 224 feet long. One of the earliest attractions was a large octopus.⁵⁵ He thus may have known of Edwin Lankester’s book *The Aquavivarium*. The younger Lankester followed in his father’s footsteps in his devotion to aquariums as a way of understanding species within whole environments. In 1883, only months after Marx’s death, he was to propose the establishment of a Marine Biological Association and a Marine Biological Laboratory in Plymouth, of which he was to emerge as the principal founder.

It is noteworthy that Marx, in the years he knew Lankester, was also deeply involved in writing his *Ethnological Notebooks* in which he was exploring issues related to the discovery of ethnological time. He was also investigating the history of earth’s geology and its effects on species, including extinction related to (non-anthropogenic) climate change. In reflecting on Darwin’s *Origin of the Species* in the first volume of *Capital* Marx had written:

Darwin has directed attention to the history of natural technology, i.e. the formation of the organs of plants and animals, which serve as the instruments of production for sustaining their life. Does not the history of the productive organs of man in society, of organs that are the material basis of every particular organization of society, deserve equal attention? . . . Technology reveals the

active relation of man to nature, the direct process of the production of his life, and thereby it also lays bare the process of the production of the social relations of his life, and of the mental conceptions that flow from those relations.⁵⁶

Lankester, who had a fascination with, and later became involved in, archaeological controversies over prehistoric tools (the famous eolith dispute) would have been quick to engage in such discussions. He coined many of the terms used to describe stone tools within archaeology.⁵⁷ Both thinkers were broad-based system theorists with regard to society/nature who crossed disciplinary boundaries and developed ecological critiques.⁵⁸ Lankester's years of friendship with Marx were followed by a clear anti-capitalist sentiment that continually appeared on the margins of his work, as well as in pronounced socialist sympathies of a more Fabian kind.

Lankester left behind no reminiscences on his relation to Marx, upon which he was generally silent. In his article on "The Friendship of Edwin Ray Lankester and Karl Marx," published in 1979, Feuer went to lengths to develop an argument, based on little more than speculation, that Wells's vague critical portrayal of Marx in his 1926 novel *The World of William Clissold* had its source in information provided by Lankester. As Feuer put it:

From another source, however, we might possibly infer Lankester's view of Marx. Lankester indeed was probably the principal informant for the brilliant section entitled "Psycho-Analysis of Karl Marx" in H. G. Wells's novel *The World of William Clissold*. . . Wells believed that he was the first to have applied the psychoanalytical method to Marx and his doctrines. Probably he had often discussed Marx's personality with Lankester, for Lankester was the only man alive to have known Marx's medical and personal problems at first hand.⁵⁹

Feuer then quotes at length from Wells's long calumny against Marx in his novel. Feuer's thesis that Wells built his portrayal of Marx based on information from Lankester is demolished, however, by two letters from Lankester to Wells in September 1926, in response to Wells sending him the newly published novel. On September 3, 1926, Lankester wrote thanking Wells for the portrayal of himself (as "Rupert York") in the novel. In a subsequent letter on September 9, 1926, Lankester added in a postscript, in relation to Wells's portrait of Marx: "Did I tell you that I used to know Karl Marx and his wife and daughters intimately, and with him Engels—a rather rough specimen? Also Herzen—a son of Alex. Herzen"—Lankester is referring to Alexander A. Herzen (1839-1906), the physiologist and son of the Russian revolutionary populist Alexander Ivanovich Herzen (1812-1870).⁶⁰ It is clear from this letter that Lankester did not talk to Wells about Marx (certainly not in any detail) until *after* he received a published

copy of *The World of William Clissold*. He could not therefore have supplied Wells with information for the harsh portrayal of Marx in the novel.

Lankester, who was anti-Bolshevik (although he had welcomed the first stages of the Russian Revolution), is reported to have responded to an inquiry from David Riazanov, director of the Marx-Engels Institute in Moscow, that he had no letters from Marx and declined to provide any reminiscences. His planned memoir was never written.⁶¹

LANKESTER AND "THE WOMAN QUESTION"

In late nineteenth-century Britain, the socialist and women's movements arose in tandem, along with developments in science. There was in fact a general revolt against the complacency and narrow-mindedness of the Victorian Age and against the cultural and environmental destruction of capitalist industry. Yet, this same period saw the rise of overlapping, reactionary trends in the form of social Darwinism, biological determinism, and eugenics. In the early twentieth century, the British Eugenics Society was to include in its membership not only the founder of eugenics, Francis Galton, but also such noted, and generally seen as progressive, figures as H. B. Donkin, Havelock Ellis, Patrick Geddes, Julian Huxley, John Maynard Keynes, Harold Laski, Karl Pearson, and Margaret Sanger.⁶²

A failure to perceive the sheer complexity of this period of political, social, and scientific transition can lead to serious errors of interpretation. In "The Darwinian Gentleman at Marx's Funeral," Gould played up the seeming anomaly of Lankester's close friendship with Marx, suggesting that Lankester was far from politically progressive. Nevertheless, almost the only evidence that Gould could provide for his claim that Lankester leaned toward political conservatism, was the latter's opposition, when in his sixties, to the extension of suffrage to women. Extrapolating from this, Gould argued that Lankester's "elitist attitudes and fealty to a romanticized vision of a more gracious past" governed his political outlook, not only in his elderly years but when he was in his thirties as well.⁶³

Gould's sketch of Lankester's character conflicts sharply with his own main source, Joseph Lester's biography of Lankester, which had uncovered Lankester's history of political radicalism.⁶⁴ Indeed, Gould's political portrayal of Lankester as a conservative and conformist "Darwinian gentleman" goes against all that we know of Lankester's anti-capitalist, socialist, materialist, and overall unconventional social outlook. As Peter J. Bowler, who edited Lester's biography, has stated, Lankester was a "radical . . . on social issues."⁶⁵ Gould's interpretation also flies in the face of the well-known public scandals that Lankester was periodically caught up in due to his outright defiance of

authority, including his scandalous arrest and public trial for accosting police in the streets who were abusing prostitutes.⁶⁶ Although Lankester was to revert in his later years to patriarchal views of women (albeit views that were hardly extreme in his time), he was among the most virulent critics of eugenics and of biological determinism, and for most of his life, at least, a promoter of the extension of women's rights.

It is important to guard against simplistic judgments and ahistorical views in relation to the complex, contradictory reality of patriarchy that continued to affect the thinking of many otherwise radical thinkers in Victorian-Edwardian Britain, penetrating even into the socialist movement and Darwinian evolutionary theory. Patriarchal ideology obviously ran deep in the consciousness of the time, and the overturning of it was not the work of a day. Issues of the status of women overlapped in complex ways with questions of biological determinism, social Darwinism, racism, and eugenics.

British male progressive thinkers outside the socialist movement, and occasionally even socialists themselves, tended to be at best only mildly forward-looking where questions of men and women were concerned, however radical and unconventional they may have been in other respects. Darwinian science, while challenging some of the dominant sexual mores, also served in this period to reinforce aspects of the core patriarchal view.

In the years immediately following Marx's death, Lankester was linked through his friends and associates (including Eleanor Marx, Olive Schreiner, Donkin, and Karl Pearson) to various socialist and feminist circles, particularly the famous Men and Women's Club. In 1879, this "heterosocial" discussion group, known simply as "The Club," was formed in London. Engaged in a wide array of social problems, it originally consisted of some twenty individuals, mainly middle-class socialists and feminists geared to changing the conditions of workers and women. Such notable figures as Clementina Black (and her sisters Constance, Emma, and Grace), Ernest Radford, Caroline "Dollie" Maitland, Eleanor Marx, Amy Levy, Emily Ford, Isabella Ford, George Bernard Shaw, and Pearson participated in The Club's discussions. A considerable number of these participants, including Black, Radford, Maitland, and Shaw were close friends with Eleanor Marx. Black, Radford, and Maitland were visitors to the Marx home while her father was alive. Maitland, later Radford, having married Ernest Radford in 1883, served as the final president of The Club, and Black as the final secretary. The Club had a strong socialist orientation and a wide intellectual agenda, which included literary and cultural topics. It operated on the basis of the intrinsic equality of women and men, recognizing the need for women's emancipation.

In 1884, Black wrote to Pearson, who was a member of The Club but intermittent in his attendance, that, due to the changing commitments of current

members, it had to be reorganized if it were to continue. Pearson, recently appointed professor of applied mathematics at University College, London, and the future founder of biometrics, took it upon himself to direct the dissolving of the original Club and its formal reorganization as “The Men and Women’s Club.” All members of its executive committee, aside from Dollie Radford and Black, seceded along with Pearson in 1885, setting up the new Men and Women’s Club that year. However, only one woman among the original members of The Club continued to participate regularly in the new club. Though inspired by its predecessor, it was an altogether different group with a changed membership and a different purpose, that of discussing “the mutual position and relation of men and women.”

Eleanor Marx (beginning in 1884 known as Eleanor Marx-Aveling due to her common-law marriage with Edward Aveling) was asked by Donkin to join the new Men and Women’s Club early in 1886 but declined on the grounds that “probably, many of the good ladies in the Club would be much shocked at the idea of my becoming a member of it” (referring to her relationship with Aveling), and due to the growing demands on her in terms of socialist analysis and activism. She indicated that she was willing to participate on occasion as a guest.

It was at this time that the Socialist League, led by William Morris, was formed as a breakaway from H. M. Hyndman’s Social Democratic Federation. The Avelings and the Radfords threw themselves into the work of the Socialist League, while Clementina Black devoted herself to trade union organization. Eleanor Marx-Aveling’s supposition that her admission to the new Men and Women’s Club would be opposed by many of the “good ladies” in the club turned out to be correct. Strong opposition to her membership was voiced by Maria Sharpe (who was later to become Pearson’s wife) and presumably others as well.

Crucial to Pearson’s new Men and Women’s Club was the involvement of Olive Schreiner, already a well-known South African novelist as a result of her book, *The Story of a South African Farm*, which had taken London literary circles by storm. Schreiner joined the new club from its birth in 1885 and was to become one of its central movers. Eleanor Marx became Schreiner’s closest female friend when she arrived in London in the early 1880s, and they remained good friends after that. Donkin, Lankester’s longtime friend, and physician to the Marx family, was a member and active participant in the Men and Women’s Club during its first two years. Donkin fell in love in those years with Schreiner, proposing to her several times.⁶⁷

Lankester was himself a close friend of Schreiner’s and seems to have participated in some of the discussions around the Men and Women’s Club in its first two years (1885–86). He was invited to present a paper on the evolution of

sexuality. In an 1886 letter to Pearson, Schreiner described how on one occasion Lankester, his sister, and she were driving home, when Lankester had spoken of his admiration for Pearson, as a younger colleague at University College, and of his future intellectual prospects.⁶⁸ There is no doubt that Lankester initially thought highly of Pearson, his junior within the academy, and would probably have been familiar with his general approach to “The Woman Question,” which for all its many weaknesses recognized that it was a sociological and not a biological question.⁶⁹

Pearson dominated the new Men and Women’s Club. Four men, including Donkin, and six women attended the first meeting in 1885. The men were drawn from the professions (university professors, lawyers, and physicians were all represented), while the women were mostly without higher education and were older on average than the women who had been the force behind what was originally The Club. The Men and Women’s Club, in particular, lacked the younger socialist-feminist activists like Clementina Black, Dollie Radford, and Eleanor Marx-Aveling—which appears to have led Lankester and even Donkin to poke malicious fun at Pearson while at the Savile Club (to which they all belonged) for starting a club that mainly consisted of “a lot of old maids and manhaters,” as Schreiner, who obviously obtained her information secondhand, related it in a letter to Pearson.

Schreiner described herself “as probably the youngest woman there” and was concerned about the composition of the club. The majority of the women in it placed a strong emphasis on social respectability, rejecting the proposed name of “Wollstonecraft” for the Men and Women’s Club on the grounds that this would be disreputable in that it would suggest that the club had to do with feminist activism. Nevertheless, a number of younger, more dynamic socialist women remained connected to the Men and Women’s Club “through correspondence and papers, and as visitors,” sometimes delivering talks, including figures like Annie Besant and Eleanor Marx-Aveling.⁷⁰

In the first meeting Pearson presented his paper “The Woman’s Question,” which was printed for private circulation, and generated much discussion at the time.⁷¹ This was followed by another essay, “Socialism and Sex,” which he presented to the Men and Women’s Club in 1886 and published the following year. Pearson, who had been lecturing for a few years on the ideas of Lassalle and Marx, projected in these and other essays of the time a peculiar form of Darwinian “moral socialism” in which some signs of his future support of eugenics could be detected as well as his statist views, which demanded “veneration of the state.” He argued in “The Woman’s Question” that the emancipation of women would “ultimately involve a revolution in all our social institutions,” but where all of this was leading had to be determined scientifically and with respect to various “sexualogical problems.” Before women’s rights could be

meaningfully addressed, it was necessary “to settle what is the physical capacity of woman, what would be the effect of her emancipation on her function of race-reproduction.”

There was a general presumption in Pearson’s analysis that the emancipation of women should take second place to “the conditions needed for race-permanence.” Thus, depending on how it affected “race permanence,” he suggested, “the higher education of women may connote a general intellectual progress for the community, or, on the other hand, a physical degradation of the race.” The reason a highly intelligent woman like George Eliot was not allowed to vote while the “dullest yokel” among men could be rationally explained, he claimed, in terms of some other function than either intelligence or physical capability, namely childbearing, which made the full entry of women into public life potentially dangerous to the community. One thing that Pearson, who generally took a Malthusian view on the need to restrict population, was clear about was the need for sexual restraint for the good of the state: “If the growing sex-equality connotes sex freedom—a return to general promiscuity—then it connotes a decay of the state, and it will require a second Pauline Christianity and a second subjection of one sex to restore stability.”⁷²

Pearson promoted the social Darwinian notion of “the survival of the fittest” combined with a statist “socialism.” Sex relations and questions of sexual reproduction needed to be subject to the needs of the state, including limitations on population. The economic independence of women, within limits, was seen as a means to that end. Although suggesting that women were “at present” physically and intellectually inferior to men, he drew on the work of the Swiss jurist, historian, and archaeologist Johann Bachofen to suggest that this was a social condition that did not pertain to all periods of history, and could be remedied in large part through opening up education and employment to women, thereby allowing women to have the “economic independence” that was necessary for all human beings. He pointed to a certain plasticity in the social relations of men and women and even in their sexual (or what we now call gender) roles. Women, he went so far as to say, were the first to practice agriculture and to discover medicine. Technology could alleviate the unnecessary “home duties” of women, apart from childbearing. The “sex-relationship” would increasingly be regarded as “the closest form of friendship between man and woman” and no longer “in the first place [as] a union for the birth of children.”⁷³

Some of the women in the Men and Women’s Club, including Schreiner, were critical of Pearson’s tendency to reduce women to the status of a problem and to see their reproductive “function” as primary, while not examining the patriarchal role of men, and therefore excluding many of the questions raised by the emerging feminism. Pearson’s Darwinian functionalism led him to look

at women's advancement as subject to the larger needs of "the race" (implicitly identified with the needs of men. Novelist Emma Brooke dared to argue in the Men and Women's Club that Pearson's elitist approach to women was "in general unsocialistic."⁷⁴

Hence, there is reason to believe the more famous article, "The Woman Question," by Edward Aveling and Eleanor Marx-Aveling was a response in part to Pearson's earlier "The Woman Question," which they had undoubtedly seen. Published in the *Westminster Review* in 1886, their article was an expanded version of Eleanor's earlier review of the 1885 English translation of August Bebel's *Woman in the Past, Present, and Future* (first published in German in 1879 and better known as *Woman and Socialism*). Bebel had made a strong case for the equality of women as intrinsic to the socialist project, countering all arguments that women were inferior to men and that their role in society necessarily centered on childbearing. With this, along with Engels's more powerful 1884 *Origin of the Family, Private Property and the State* as their basis, the Avelings went on to argue that the problems were rooted in economic relations, that is, relations of labor, production, and exploitation, which they saw as encompassing both class relations between capitalists and workers, and patriarchal relations between men and women. As a result, society as a whole had to be changed. There were "excellent and hard-working folk who agitate for that perfectly just aim, woman suffrage; for the repeal of the Contagious Diseases Act, a monstrosity begotten of male cowardice and brutality; for the higher education of women; for the opening to them of universities, the learned professions, and all callings." Yet, three things, they argued, were found wanting. First, all of these issues were primarily deigned to benefit the well-to-do classes. Second, all were "based either on property, or sentimental or professional questions. Not one of them gets down through to the bedrock of the economic basis." Third, none of this agitation sought to promote any object "outside the limits of the society today." Connecting the forms of oppression and the necessary responses, they wrote:

The truth, not fully recognized even by those anxious to do good to woman, is that she, like the labour-classes, is in an oppressed condition; that her position, like theirs, is one of merciless degradation. Women are the creatures of an organised tyranny of men, as the workers are the creatures of an organized tyranny of idlers. . . . Both the oppressed classes, women and the immediate producers, must understand that their emancipation will come from themselves. Women will find allies in the better sort of men, as the labourers are finding allies among the philosophers, artists, and poets. But the one has nothing to hope from man as a whole, and the other has nothing to hope from the middle class as a whole.⁷⁵

In this view, the term “The Woman Question” drew its validity not, as in Pearson’s analysis, from the notion that the problem of women and reproduction in modern society needed to be “perfected” for the betterment of “the race,” but from its connection to the class struggle, and from the belief that women’s “emancipation will [necessarily] come from [women] themselves” as an end in itself. Looking toward a future beyond capitalism and patriarchy, Aveling and Marx-Aveling stated:

And now comes the question as to how the future position of women, and therefore of the race, will be affected by all of this. Of one or two things we may be very sure. . . . Clearly, there will be equality for all, without distinction of sex. Thus, woman will be independent: her education and all other opportunities as those of man. . . . Personally, we believe that monogamy will gain the day. There are approximately equal numbers of men and women, and the highest ideal seems to be the complete, harmonious, lasting blending of two human lives. . . . The contract between man and woman will be of a purely private nature. . . . The woman will no longer be the man’s slave, but his equal.⁷⁶

Lankester, in the general context of this sometimes heated discussion and debate arising out of the Men and Women’s Club, to which he had strong connections through Donkin, Schreiner, Pearson, and Marx-Aveling, and where he had been invited to speak, wrote Schreiner a long letter on “the woman question” in late 1885 or early 1886. There is no extant copy of Lankester’s letter, but it was quoted extensively by Schreiner, in a letter she wrote in response, which has come down to us as one of her most open, spontaneous, and passionate discussions of marriage and the condition of women.⁷⁷

Schreiner quotes Lankester as arguing, against Victorian mores, that marriage was “*not* the natural tendency of man, or rather not a necessary characteristic of the race.” In this, he appears to have suggested also that monogamy too had no definite natural basis. Lankester saw a permanent and perfect marriage, from a Victorian standpoint, as one in which the “man should obtain the very sweetest kind of service & attention viz. that which is bound up with genuine sexual love. It may not be of very intelligent help or it may be itself of a very high intelligence—that does not much matter—the great point being that it is happily & gladly rendered & that there is a feeling that what is given by the woman in her care to the man is returned by him in his larger but not less genuine care of the woman.” Such a marriage, however, he clearly recognized, and Schreiner admitted, was hard to obtain under present social conditions, precisely because women were not free agents. Since it was a question of the bourgeois family, this raised the dual questions of socialism and feminism. The woman, Schreiner

wrote back to him, “has to sell herself, whether into the bitter loveless childless deformed untender state of prostitution or into loveless marriage.”

Nevertheless, Schreiner argued for monogamy and marriage as natural, countering Lankester’s views. “There are some factors,” she wrote, “you seem entirely to lose sight of in this man & woman question.” Schreiner argued that human beings naturally sought to be of service to others and women especially to men, offering them love, devotion, and worship—these were things that could not be bought in the market.⁷⁸

In Schreiner’s perspective, as she told Pearson, Lankester was best viewed as “a vast engine without a driver.” She was particularly intent on finding a “woman friend” for him, who would fill all his needs.⁷⁹ These needs were demanding. Coming from a family in which both parents were scientists and shared radical political views, collaborating intellectually, as well as raising a large family, Lankester seemed to have expectations with regard to life relationships that went against the whole tenor of Victorian society. He indicated that what he wanted was a life partner who combined love and companionship with shared intelligence. In 1875, he had written to his mother: “If I could only find some woman who had a soul, a belief in things not believed in by society, and who could take a pleasure in existence apart from gossiping and empty distraction, and who would help me to do the same, I should be happy wherever I might be.”⁸⁰

Unable to meet his needs in a conventional way, Lankester was to remain single throughout his life; two engagements fell through. In 1876, he became engaged to Ethel Brodie, the daughter of Sir Benjamin Brodie, the Oxford Professor of Biology. However, he soon became disenchanted with her because of what he saw as her excessive piety, Victorian propriety, and “young-lady-ism.” Breaking off the engagement at the risk of scandal at Oxford, he wrote, “I don’t care if I never marry, if I can’t have what I want. I daresay I am very wrong, that is to say, my nature is perhaps a bad one. . . but there it is, and I will not do violence to it.” Eighteen years later, in 1894, he became engaged to Mary Eleanor Corbett, an American actress. Though the marriage date was set, it did not come off and Lankester later referred to it as “the fiasco.” The two had a quarrel and his fiancée apparently broke off the engagement not long before the marriage.⁸¹

The broken engagements and the fact that Lankester never married led Gould to speculate he may have been gay (although there is no definitive evidence one way or the other). As Gould put it:

One additional, and more conjectural, matter must be aired as we try to grasp the extent of Lankester’s personal unconventionalities . . . for potential insight into his willingness to ignore the social norms of his time. The existing literature maintains a wall of total silence on this issue, but the pattern seems

unmistakable. Lankester remained a bachelor, although he often wrote about his loneliness and his desires of family life. He was twice slated for marriage, but both fiancées broke their engagements for mysterious and unstated reasons. He took long European vacations nearly every year, and nearly always to Paris, where he maintained clear distance from his professional colleagues. Late in life, Lankester became an intimate platonic friend and admirer of the great ballerina Anna Pavlova. I can offer no proof, but if these behaviors don't point toward the love that may now be freely discussed, but then dared not speak its name (to paraphrase the great line written by Oscar Wilde's par-amour, Lord Alfred Douglas), well, then, Professor Lankester was far more mysterious and secretive than even I can imagine.⁸²

GENDER, SOCIAL DARWINISM, AND EUGENICS

When it came to gender, a kind of conservative "social Darwinism" penetrated into Darwin's thought and was carried forward in the subsequent development of Darwinian ideas. Hence, Darwinian evolutionary theory, rather than playing a consistently progressive role with respect to gender offered new support to conventional prejudices in relation to patriarchy, giving rise to social Darwinism and eugenics. In *The Descent of Man*, Darwin agreed with Galton (his cousin) in claiming that "if men are capable of decided eminence over women in many subjects, the average standard of mental power in man must be above that of woman"—which he attributed to the process of sexual selection. "Man," Darwin added, "is more powerful in body and mind than woman." He thus adamantly rejected the outlook that John Stuart Mill had expressed in *The Subjection of Women*, which represented the strongest argument then circulating within Victorian circles with respect to the natural equality of women with men in their mental powers.⁸³

Still, Darwinian evolutionary theory was somewhat tenuous in actually accounting for the difference in average intelligence between men and women. The emphasis, emanating from Darwin himself, was placed primarily on the perceived fact that men were more biologically variable in nearly every respect than women, and that the woman was the normal type, man, the abnormal. The male line was characterized by a greater share of geniuses, and by more mentally disadvantaged individuals. This argument was put forward influentially by American zoologist W. K. Brooks in "The Condition of Women from a Zoological Point of View," appearing in *Popular Science Monthly* in June 1879, a copy of which Lankester retained in his scientific papers. Brooks later followed this up with his *Law of Heredity* (1883), which presented the same arguments. "If there is this fundamental difference in the sociological influence of the sexes," Brooks argued in a biologically determinist way, "its origin must be sought in the physiological differences between them." For Brooks, "The

female organism is the conservative organism, to which is intrusted the keeping of all that has been gained during the past history of the race." Therefore, it followed that "the female mind is a storehouse filled with the instincts, habits, intuitions, and laws of conduct which have been gained by past experience. The male organism being the variable organism, the originating element in the process of evolution, the male mind must have the power of extending experience over new fields." This "progressive power of the male mind" was evident in its great capacity for "abstract thought," giving it its dominant role in science, poetry, and art. Ignoring sociological variables, Brooks declared simply, as if it constituted biological proof, that "it is as impossible to find a female Raphael or a female Händel as a female Shakespeare or a female Newton."⁸⁴ It was this view that Virginia Woolf was later to decry in her *A Room of One's Own*, in which she presented the fictional story of Shakespeare's sister in order to explain the barriers that stood in the way of women.⁸⁵

Havelock Ellis (who was an intimate friend/lover of Schreiner and a more distant admirer of Marx-Aveling) was to present almost identical views to those of Brooks in his extremely influential *Man and Woman* (1894).⁸⁶ Ellis was an active participant with Schreiner, Shaw, and William Carpenter in the small bohemian club, the Fellowship of the New Life, devoted to pacifism, vegetarianism, and simple living.⁸⁷ Ellis trained as a physician (although he never practiced) and was to become best known for his research on sexuality. *Man and Woman* was regarded as expressing the scientific consensus on sexual matters in his day.⁸⁸ Not surprisingly, it also reflected Victorian patriarchal prejudices. "There can be little doubt," he proclaimed, "that the smaller size of women as compared to men is connected with the preservation of a primitive character."⁸⁹ He promoted the notion of greater male variability—invoking the precedence of Darwin—up through the sixth edition of *Man and Woman* in 1926. Ironically, it was Pearson, Ellis's rival for the heart of Schreiner, who was to be Ellis's chief opponent with respect to male versus female variability, resulting in an intense debate between the two at the turn of the century.

Ellis argued that with the exception of literature, where figures like Jane Austen, George Eliot, and Charlotte Brontë had excelled, women generally lacked genius at the higher level of the arts. Although women were purported to be capable of reaching the highest level in the writing of novels, this did not apply to poetry. He claimed to have done empirical research on English men and women of genius (based on *The Dictionary of National Biography*), through which he had determined that women represented only 5.3 percent of geniuses. (The first and dominating editor of the *Dictionary of National Biography* was Leslie Stephen, father of Virginia Woolf, whose *Science of Ethics* [1882] attempted to wed evolutionary theory to ethics.) Women were said to be good at all practical tasks, including politics and business, but lacking in

those intellectual realms relying on high levels of abstraction. Women, according to Ellis's *Man and Woman*, were "nearer to the child-type." He insisted that it was their conservatism, rather than their radicalism, that ostensibly drew them to socialism to a greater degree than men.⁹⁰ Known for his unconventional beliefs and a defender of women's rights, Ellis nonetheless came perhaps closer than any other reputed scientific thinker of his time in defending the subjection of women as a necessary part of the subjection of nature. This reflected the merging of gender and nature prejudice within the dominant Western culture, so strongly criticized by Carolyn Merchant in *The Death of Nature*.⁹¹ As Ellis wrote in *Man and Woman*:

Men have had their revenge on Nature and on her *protégée* [women]. While women have been largely absorbed in that sphere of sexuality which is Nature's, men have roamed the earth, sharpening their aptitudes and energies in perpetual conflict with Nature. It has thus come about that the subjugation of Nature by Man has often practically involved the subjugation, physical and mental, of women by men. The periods of society most favourable for women appear, judging from the experiences of the past, to be somewhat primitive periods in which the militant tendency is not strongly marked. Very militant periods, and those so-called advanced periods in which the complicated and artificial products of the variational tendency of men are held in chief honour, are not favourable to the freedom and expansion of women. Greece and Rome, the favourite types of civilization, bring before us emphatically masculine states of culture.⁹²

Such strong patriarchal views go against Rachel Holmes's characterization of Ellis, in her biography of Eleanor Marx, as one of the men who made "major contributions to feminism" in the Victorian age, and who were "genuinely interested in challenging universal patriarchy."⁹³ It also points to the complexity of these issues. Although Ellis was clearly sympathetic to a degree with the women's struggles and sexual liberation, he retained deep reservations about the equality of women. In the 1929 edition of *Man and Woman*, he was to intone: "When women enter the same fields as men, on the same level and to the same degree, their organic constitution usually unfits them to achieve the same success, or they only achieve it at greater cost. Woman's special sphere is the bearing and the rearing of children, with the care of human life in the home."⁹⁴ As Cynthia Eagle Russett was to declare in her *Sexual Science: The Victorian Construction of Womanhood*, "If Pearson and Ellis were friends of woman, she hardly needed enemies."⁹⁵

Scarcely less influential than Ellis's *Man and Nature* was *The Evolution of Sex* (1889) by Scottish biologists Patrick Geddes and J. Arthur Thomson, both

of whom were to contribute notably to the development of ecological theory. Geddes and Thomson downplayed Darwin's sexual selection and attempted to develop a chemical essentialism, using the concept of metabolism, to differentiate between men and women, introducing the terms "anabolic" (in this case meaning passive) and "katabolic" (active and variable) for the differing metabolisms of women and men, respectively. In this view, as opposed to the Darwinian one, what distinguished the sexes was quite fixed. Men were more active and variable, women less active and more constant. "What was decided among the prehistoric *Protozoa*," they opined, "can not be annulled by Act of Parliament," that is, women's suffrage.⁹⁶

Lankester, in contrast, seems to have been relatively free for most of his life, particularly in his youth, of such Victorian era prejudices, present even in free-thinking and scientific circles in his day. He clearly despised the extremely narrow-minded, oppressive sexual morality of the day, among them the views: "That copulation is especially a wrong thing. . . . That women are inferior creatures, used by the devil to bring men to misery."⁹⁷ He was involved in his thirties in the promotion of women's rights. In 1884, he fought hard to force the medical faculty at the University College, London to open Lectures on the Course of General Biology to women. Although he eventually succeeded, the medical faculty fought back and formally excluded Lankester from their faculty in retaliation. Lankester argued, unusually for the time, that not only "sons" but "daughters too" should be provided with a "reasonable instruction in science" from primary education through college. He had great admiration for his student Philippa Fawcett, who studied at University College and later went on to Cambridge University, where she astounded the university and the nation with her mathematical abilities, scoring first—far outreaching all others—in the 1890 Mathematical Tripos exams.⁹⁸

In a famous 1895 case, leading to a public trial that shocked and amused London society, Lankester, coming out of the Savile Club, had openly challenged police on the street for the abuse of a prostitute. He was arrested and charged with disorder. He enlisted in his defense the famous barrister Sir George Lewis who had helped him in the prosecution of Slade. The dramatic event once again brought the issue of police brutality in the treatment of prostitutes to public attention. Rudyard Kipling, on the occasion of Lankester's fiftieth birthday party at the Savile Club in 1897, was to make light of Lankester's relations with the police, giving the whole event a kind of legendary character.⁹⁹

Nevertheless, Lankester retreated into a conservative, patriarchal view in the opening decade of the twentieth century, writing in response to the 1908 attempt of suffragettes to storm Parliament a column titled "Votes for Women," in which he strongly opposed the extension of the vote to women. Then in his sixties, he sought to justify his resistance by referring to the scientific consensus

of his day. He declared it was a settled fact that the intellectual capacity of the average woman was naturally somewhat less than that of the average man, and sought to back this up by fallaciously pointing to women's smaller brain size, while neglecting to relate this to overall body size (a common error in the craniology of this era). Lankester coupled this with the notion of women's physical inferiority. He went so far as to invoke the age-old principle of "paterfamilias" in which the man was the head of the household and the role of women was "to serve him and crown his life." Women, he declared, "should be prepared to accept their natural duties as wives and mothers."¹⁰⁰ A few years later, in a letter to H. G. Wells's wife, he indicated that he opposed the suffragette cause on the grounds that women, as long as they were uneducated and "ignorant," should be denied the vote—a principle he thought should ideally be applied to men as well. However, here at least he appeared to be referring to educability rather than innate ability.¹⁰¹

Lankester fell prey here to what Gould, in the title of his famous book, called *The Mismeasure of Man* (or, in this case, mismeasure of woman). In this, of course, he was not alone. Such perspectives could be found among some British socialist men in the late nineteenth and early twentieth centuries. Prominent figures in the Social Democratic Federation, like Ernest Belfort Bax, though unrepresentative of the movement as a whole, exhibited strong patriarchal—in Bax's case even misogynist—views.¹⁰²

Though opposing the extension of the suffrage to women in his later years, and even invoking strong patriarchal justifications in this context, Lankester nonetheless continued to oppose Victorian strictures on women's actual freedom and to defend the rights of women in economic and sexual liberation. Thus, around the same time as he was questioning the extension of the vote to women, he also came out strongly in support of his friend H. G. Wells who was under attack for his novel *Ann Veronica* (1909). Wells portrays the eponymous Ann Veronica as a twenty-one-year-old feminist who not only took part in the storming of Parliament on behalf of women's suffrage but also brazenly initiated a sexual relationship with a married man. The book was roundly condemned in British society, with the *Spectator* (London) stigmatizing it as "capable of poisoning the minds of those who read it."¹⁰³ Lankester, along with others, stood by Wells, helping protect him from social ostracism.

Moreover, at the same time he seemed to be backtracking in some respects, adopting conservative views with respect to "the woman question," Lankester, in his usual fiery way, was engaged in a virulent struggle against eugenics, which had become prominent among British professional elites in the period. For Lankester, who was a sharp critic of naive notions of progress, and a proponent of what we would now call an ecological worldview, a line had to be drawn with respect to the often racist understandings of eugenicists, like those presented

by Darwin's cousin, Francis Galton, and by Pearson, who all too frequently pointed to a physically degenerating humanity as a justification for "purifying" the human race. Such thinkers advocated restrictions on the breeding of those seen as feeble-minded or embodying unfavorable physical characteristics (often based on racial characteristics).

Pearson in later years was to abandon his early mechanistic-socialistic views, becoming an idealist, a follower of Galton and a strident advocate of eugenics, to which he gave a pseudo-scientific basis through his biometrics.¹⁰⁴ It was this idealist and social Darwinist Pearson of whom V. I. Lenin declared in 1908 (somewhat mistakenly, given Pearson's earlier cursory studies of Marx and Engels): "Pearson fights materialism with great determination (although he does not know Feuerbach, Marx, or Engels)."¹⁰⁵

Much of Pearson's authority derived from the fact that he occupied the Galton Professorship of Eugenics at University College, established by Galton himself.¹⁰⁶ In this capacity he argued strongly in favor of limiting the breeding of the "feeble minded," with Lankester becoming his fiercest opponent in this respect. For Lankester, in advancing eugenics, Pearson was confusing the biological conditions with the "special form of political organization" that dominates modern life, failing to recognize that it was not biological evolution that was now the crucial factor in human progress but the degree of social change and intellectual development. Hence, Lankester vehemently opposed Pearson's claim in the latter's *National Life from the Standpoint of Science* (1905), that warfare was a way of advancing biological evolution, arguing rather that there was "no warrant . . . coming from the standpoint of science" for such claims. Pearson, he scornfully stated, "should tell us more clearly what he means by 'human progress' before he asks us to accept it as the end which justifies human warfare." Sharply differentiating himself from Pearson and eugenics, Lankester proclaimed: "I, for one, do not despair of humanity."¹⁰⁷

Lankester was particularly incensed when such eugenicist ideas penetrated the general socialist movement. On January 24, 1908, leading social democrat Henry Hyndman (who claimed to be a follower of Marx, but whom Marx disdained) wrote an article for the *Times* titled "The Socialist Victory" in which he referred, as part of his argument for social democracy, to "the physical degeneration of large masses of our population." Lankester had an antipathy for Hyndman, and had no doubt identified to some extent with his friends Morris and Eleanor Marx in the development of the Socialist League, when they broke with Hyndman's Social Democratic Federation. On January 27, he wrote a pointed letter to the *Times*, run under the title "Physical Degeneration and Socialism," asking what Hyndman meant by "physical degeneration," and whether he was contending that there was a definite deterioration of the human "stock" in the manner of Galton. Two days later, Hyndman replied, indicating

that “slum dwellers beget slum dwellers, and physical degeneration, under similar conditions, hands on physical degeneration together with accompanying mental and moral enfeeblement to the next generation in a still worse form.” Diseases like syphilis and tuberculosis had the effect, he suggested, of deteriorating the human racial “stock” for at least “one generation” and perhaps more. Lankester rebutted that Hyndman was confusing “injurious conditions” that had a negative effect on the population with the deterioration of the physical “stock” of humanity across generations, something for which there was no evidence and that contradicted known scientific knowledge. Lankester ended by saying that there were “many so-called ‘Socialists’ in these days [referring to figures like Hyndman and Pearson], but that socialism which is to prevail must be founded on a widespread and scientific knowledge of the facts as to human population and the physical laws of heredity, mixture and survival in human societies, and not upon erroneous assumptions and wild rhetoric.”¹⁰⁸

Indeed, turning the arguments of the eugenicists upside down on Darwinian selectionist grounds, Lankester suggested in other writings that, if the physical degeneration of humanity could be said to apply at all to civilized humanity, it was a product of the cessation of natural selection, and thus would apply mainly to the parasitic ruling classes in which the struggle for existence no longer applied, and not to the working class or the poor. As he put it, such physical degeneration was “more probable in the higher propertied classes than in the bare-footed toilers, whose ranks are thinned by starvation and early death.”¹⁰⁹

In contrast to Lankester, his good friend Donkin (the former Marx family doctor and a member of the Men and Women’s Club in the mid-1880s) was to join the British Eugenics Society, which included many of the major thinkers of the time. As a physician interested in mental disturbances, he later became Commissioner of Prisons. Nevertheless, Donkin was far from being a reactionary in the context of his times, and publicly argued in the *Times* against Pearson (and others such as Ellis), who insisted that criminality was hereditary.¹¹⁰ In his 1910 Harveian Oration *On Inheritance of Mental Characters*, he took a strong Darwinian view, rejecting entirely the Lamarckian inheritance of acquired characteristics, and adamantly opposing what he called “the so-called ‘criminology’” school of Cesare Lombroso, whose adherents argued for the inheritance of criminal traits. (An illustration from Lombroso’s *Criminal Man* was sharply criticized in Gould’s *The Mismeasure of Man*.) Donkin also objected to the views of Galton and Pearson, with their “positive eugenics,” or selective breeding. For Donkin, “the most important advance in psychology in recent years” had been made by Lankester in his argument that “the mind of the human *adult* is mainly a social product, and can be understood only in relation to the special environment in which it develops.” Human beings, Lankester adamantly claimed, did not transmit specific, acquired human mental characteristics by heredity but

rather passed on a capacity that he termed “educability,” which was affected by their natural and social environments. On this basis, Donkin concluded that the mind of the adult was much more *made* than it was *born*.¹¹¹

Donkin was even more scathing that same year (1910) with respect to Winston Churchill’s legislative plan for segregation, confinement, and sterilization of the feeble-minded for the good of the British “race.” Speaking then in his role as chief medical adviser of prisons, he called Churchill’s plan “the outcome of an arrogation of scientific knowledge by those who have no claim to it. . . . It is a monument of ignorance and hopeless medical confusion.”¹¹²

No doubt Lankester, given his utter contempt for “positive” eugenics, would have been, if anything, more harshly critical of Churchill. At all times, Lankester, with the exception of his 1908 article on “Votes for Women,” criticized biologically determinist notions of later human evolution, emphasizing educability and the social factor. It was failure to understand the role of educability, he contended, that led some mistakenly to adopt Lamarckian notions of the ability of human beings (and other organisms) to pass on acquired traits, using such erroneous views as the basis for claiming that the mass of the human population was physically degenerating. Changes in social organization by means of science and not eugenics constituted the only feasible path to diminishing and putting “an end to human suffering.”¹¹³

As Lester writes of Lankester’s struggle against eugenics, which he carried over into the *Daily Telegraph*:

He took the Eugenics movements to task. . . . What do we mean by “racial quality” and “improvement”? he asked. The supporters of Eugenics had not defined their terms, while the biometrical studies of Pearson and others confused inborn characters with those due to education. They had based conclusions as to the existence of a law of hereditary transmission on statistics concerning the frequency of characters reproduced by imitation and education. If the cessation of selection led to racial degeneration, then it was in the richer sections of the community where the effects would be most obvious, not in the “half-starved, struggling poor.”¹¹⁴

The real problem was the threat of *social degeneration* under the present social system and characterizing all class societies.¹¹⁵ As Lankester wrote in this vein in his preparatory notes for his 1905 “Nature and Man” talk:

The capitalist wants cheap labour, and he would rather see the English people poor and ready to do his work for him, than better off.

The country is bloodsucked and absolutely ruled; first by the Church, then by the King, then by the “governing class,” and now by this new terror the capitalist.

. . . Asses like the King and his ministers, whether Conservative or Liberal, must hate science, because it inevitably will abolish them and their likes.¹¹⁶

BIONOMICS/ECOLOGY

E. Ray Lankester was a zoologist, evolutionary biologist, and pioneer in ecology. At University College, and subsequently at Oxford University, he set up departments focusing on Darwinian selectionism. He followed Huxley in specializing in the comparative morphology of invertebrates. His signal contribution as a comparative morphologist was to demonstrate, in Gould's words, that "the ecologically diverse spiders, scorpions, and horseshoe crabs form a coherent evolutionary group, now called Chelicerata, within the arthropod phylum." This discovery had been presented in his article "Limulus an Arachnid," in the *Journal of Microscopical Science* in 1881. In confirming that Limulus, the horseshoe crab, despite all appearances, was not a crustacean, but more closely related to arachnids, such spiders and scorpions, Lankester had a big effect on the understanding of the origin, evolution, and the interrelationships among various animal types. But Lankester was an exceptionally broad scientist, whose work "ranged widely from protozoans to mammals" and dealt with such varied issues as degeneration, comparative longevity, and ecological relationships. His work on comparative longevity influenced Darwin in writing *The Descent of Man*. Lankester was in Leipzig when the book came out in 1871 and Darwin sent him a copy.¹¹⁷

In contrast to his mentor Huxley, whose comparative morphology was directed at dead material, leading some critics subsequently to refer to him as a "necrologist," Lankester insisted that to the extent possible animals be studied in their living environments among other species.¹¹⁸ The term *ecology* or "œcology" first appeared in English in 1876 in the Lankester-supervised and revised translation of Haeckel's *History of Creation*.¹¹⁹ Haeckel referred in this work to

*the œcology of organisms, the knowledge of the sum of the relations of organisms to the surrounding outer world, to organic and inorganic conditions of existence; the so-called "economy of nature," the correlations between all organisms living together in one and the same locality, their adaptation to their surroundings, their modification in the struggle for existence, especially the circumstances of parasitism, etc. It is just these phenomena in "the economy of nature" which the unscientific, on a superficial consideration, are wont to regard as the wise arrangements of a Creator acting for a definite purpose, but which on a more attentive examination show themselves to be the necessary result of mechanical causes.*¹²⁰

Lankester did not follow Haeckel in the use of the term “oecology,” however. Instead, he introduced, in his landmark 1888 article on “Zoology” for the ninth edition of the *Encyclopedia Britannica*, his own term: “bionomics,” which is still seen as synonymous with “ecology” as a field of study. The notion of bionomics was key to the development of Lankester’s wide-ranging ecological analysis, and it was to be influential in British science up until the first decade of the twentieth century.¹²¹

In June 1883, Lankester delivered a talk on science and fisheries at the International Fisheries Exhibition in South Kensington. The exhibition was designed to look at both the commercial and scientific aspects of the fishing industry. Huxley, who had years of experience as a scientific adviser helping to maintain the herring trawling on the coast of Scotland and in evaluating salmon fisheries, opened the exhibition with an inaugural address.¹²² But he made the mistake of claiming that

it may be affirmed with confidence that, in relation to our present modes of fishing, a number of the most important sea fisheries, such as the cod fishery, the herring fishery, and the mackerel fishery, are inexhaustible. And I base this conviction on two grounds, first, that the multitude of these fishes is so inconceivably great that the number we catch is relatively insignificant; and, secondly, that the magnitude of the destructive agencies at work upon them is so prodigious, that the destruction effected by the fisherman cannot sensibly increase the death rate.¹²³

Despite Huxley’s careful qualification with respect to “our present modes of fishing,” the shortsightedness of his view was apparent, and this was to go down afterward as one of the great blunders with regard to ocean conservation. In contrast, Lankester’s approach, no doubt influenced in part by his father’s aquarium studies, was altogether different. He emphasized in great detail the ecological complexity of fisheries and “interaction of the various organisms.” Indeed, so complex were the relationships that it required detailed knowledge of “the habits and life-histories of the animals concerned,” including their interactions with all other related species. In Lankester’s assessment, fisheries, due to the lack of scientific knowledge of environmental relationships, were far more destructive to species and entire life systems than was usually supposed. He demonstrated that all the stages of the development of fish were crucial to the other animals and plants in the marine environment; fish eggs were food for some small animals, which were the part of the food chain of larger animals. The fishing industry, in removing so many fish, also removed many young fish, not only affecting fish populations, but also other marine animal populations, that

were interdependent with them. The complexity of the marine environmental systems made them vulnerable.

Following in his father's footsteps, Lankester argued that what was needed was the establishment on the seacoast of England a major marine laboratory including aquariums for research in the environmental interactions of aquatic species. Three months later, in his presidential lecture on "Biology and the State" to the Biology Section of the British Association for the Advancement of Science in Southport, he carried the argument forward, calling again for the establishment of a national aquarium funded by the state. This led to the establishment of the Marine Biological Association in 1884, and the granting of funds from Parliament for the establishment of a marine biological laboratory in Plymouth that same year. The new marine laboratory came into operation in 1888. Huxley was the first president of the Marine Biological Association, with Lankester taking the position of honorary secretary. Huxley was to play a relatively minor role, however, and Lankester became in effect the acting president. Lankester is thus considered to be the "founding father" of the Marine Biological Association. He supervised the building of the Marine Biological Laboratory on Citadel Hill in Plymouth. Huxley stepped down as president in 1890 and was replaced by Lankester, who remained president until his death in 1929. Today, the Marine Biological Association has over 1,400 members worldwide. It has facilitated the research of twelve Nobel Prize winners and over 170 Fellows of the Royal Society. It is particularly famous worldwide for work on the ecology of plankton.

Writing in *Nature* in 1885, Lankester was severely critical of British industry for its failures in marine conservation: "Our fishery industries are still barbaric; we recklessly seize the produce of the seas, regardless of the consequences of the method, the time, or the extent of our depredations. . . . With the increase of population, and the introduction of steam fishing boats and more effective instruments of capture, there is reason to believe that some at least of our coast fisheries are being destroyed, and that others may follow in the same direction."¹²⁴

Lankester argued that the virtue of botanical gardens, such as Kew Gardens, was that it gave botanists an opportunity to view living things in their total environment, within a kind of laboratory setting, allowing for more complex forms of biological research. Zoological gardens, however, were much harder to establish and maintain and had not been an important part of zoological research since animals are difficult to keep under observation. The establishment of marine biological laboratories and aquariums offered chances for the "bionomist" to study the interrelationship of species and their environment in a more holistic context.¹²⁵ In the memoranda and letters he wrote as honorary secretary and then president of the Marine Biological Association, he insisted that it could

only serve its function by focusing on the total evolutionary environment of species, by prioritizing “a complete knowledge of the Fauna and Flora and of the exact conditions under which the various species therein included exist.”¹²⁶

It was with these considerations partly in mind that Lankester introduced the concept of bionomics. The *Oxford English Dictionary* defines “bionomics” in its current usage somewhat restrictively as “the ecology of a particular species or organism.” However, its original meaning, as noted, was equivalent to that of ecology itself, that is, “the branch of biology that deals with the relationships between living organisms and their environment. Also: the relationships themselves, esp. those of a specified organism.” In a long review essay of Alfred Wallace’s *Darwinism* in 1889, Lankester saw bionomics as fulfilling the need that Wallace had raised in his book for “the study of ‘the external and vital relations of species to species in a state of nature,’ or in one word ‘bionomics.’” Lankester noted in his review that the greatest deficiency in biology was that “there are not such facilities for the study of bionomics as are provided in our laboratories for the study of histology, embryology, morphography, and the physics and chemistry of living bodies.”¹²⁷

Lankester saw bionomics as a practical and theoretical discipline emerging, on the one hand, out of “thrematology” (meaning “the thing bred”), related to the lore, with respect to heredity and variation, “of the farmer, gardener, sportsman, and field naturalist,” and, on the other hand, the science of organic adaptations or evolution (exemplified by Wallace and Darwin). Darwin had opened *The Origin of Species* with a discussion of breeding and had gone on to connect this to the larger conditions of natural evolution. It was Darwin, Lankester contended, who “founded the science of bionomics” in the full sense, which hardly existed prior to him, except in the case of Buffon in the eighteenth century. For Lankester, Buffon represented the bionomic or ecological point of view in that he “deliberately opposed himself to the mere exposition of structural resemblances and differences of animals, and, disregarding classification, devoted his treatise on natural history to a consideration of the habits of animals and their adaptations to their surroundings, whilst a special volume was devoted by him to the subject of reproduction.”¹²⁸

In terms of Darwin’s (and Wallace’s) contemporaries and followers in the period after the publication of *The Origin of Species*, Lankester singled out Fritz Müller, called by Darwin “the prince of observers,” as a leading representative of bionomics. Müller had been a medical student in Germany, a member of a radical reading and discussion group in Greifswald in Prussia known as the “Circler,” in which they studied and debated the writings of left Hegelians Ludwig Feuerbach, David Strauss, Max Stirner, and Karl Marx. Müller renounced the Church and became a “radical rationalist.” In the 1848 Revolution in Germany, Müller was secretary of the People’s Union, consisting mostly of students and

workers. In 1852, following the defeat of the revolution, he emigrated with his wife to the German settlement in Blumenau and Santa Catarina in Brazil. There he became a world-famous naturalist, a correspondent of Darwin's, and one of Darwin's chief defenders in his remarkable work *Facts and Arguments for Darwin* (1864; the 1869 English translation was sponsored by Darwin). He later attributed his development into a Darwinian thinker to the radical debates in the left Hegelian circle of his student days, which generated a materialist perspective (and no doubt an awareness of dialectics). In the 1860s, he was to name a genus of orchids that he discovered in Brazil after Feuerbach.

In a detailed treatment of bionomics, the Scottish naturalist Thomson, who had co-authored *The Evolution of Sex* with Geddes, declared that Müller "was preeminently an observer of the web of life, of the interrelations of living creatures," encompassing "the mutual adaptations of plants and animals." According to Thomson, Müller adhered to the principle that "to abstract the plant or animal from the particular *milieu* in which it lives is like trying to understand man apart from society."¹²⁹

Others built on this same legacy. Geddes, as Thomson recognized, was one of the most prominent proponents of Lankester's concept of bionomics. In his 1893 *Chapters in Modern Botany*, Geddes argued that bionomics constituted "the study of natural history in its widest aspects." It meant recognizing within the botanical sphere that "each plant, in fact, like man himself, has many relations to the world around, and the botanist thus becomes a biographer of each; yet though materials abound, the full life-history even of the commonest plants has still to be written." It was this bionomic or ecological sense of things, Geddes explained, that caused Darwin to write *The Various Contrivances by which Orchids Are Fertilised by Insects* (1877). As Mark Largent indicated in his 1999 article "Bionomics": "Geddes wrote *Chapters in Modern Botany* to encourage readers to see nature scene by scene, as it appeared to Darwin's eyes."¹³⁰

This bionomic way of thinking, Thomson explained, had its roots not just in Darwin but was in some ways preceded in chemistry and physiology by the great work of Justus Liebig in 1840 in his *Organic Chemistry in Application to Agriculture and Physiology* (1840; seventh edition, 1862). It was Liebig's work, Thomson noted, that marked "the first concrete realization of the 'circulation of matter'" and the basis for the analysis of "nutritive chains"—to be discovered, for example, in the way in which freshwater fish in a pond depend upon the supply of small crustaceans in the pond, and these in turn "on the bacteria which cause the putrefaction of the dead organic matter," so that "there is circulation of matter from one level of life to another." The environmental changes had to be seen in relation to evolutionary changes in the "metabolism of the organism."¹³¹

Indeed, what distinguished the work of Darwin, Lankester, Müller, Geddes, and other leading representatives of bionomics from that of the general run of

biologists, according to Thomson, was the extent to which they dialectically encompassed both “the organism’s action upon its environment” (illustrated by Darwin’s 1881 work on earthworms) and “the action of the environment upon organisms.” Following Liebig, they stressed the relation between inorganic and organic nature. It was this that constituted the promise of the new science of the “infinite web of life”—or bionomics. “So far as we know,” Thomson wrote, “the only other expressive term [for these relations other than bionomics] is that of Ecology, which Haeckel proposed in 1869,” defining it as “the relations of the animal to its organic as well as to its inorganic environment, particularly its friendly or hostile relations to those animals or plants with which it comes into direct contact . . . those complicated mutual relations which Darwin designates as conditions of the struggle of existence.”¹³²

Although Lankester’s bionomics and Haeckel’s ecology were concerned with the same set of problems in describing the evolution of the web of life, it was the latter term that was to triumph in the early twentieth century. Thus, in his survey of “The Rise and Progress of Ecology” for *Science* in 1903, V. M. Spalding was to write: “The word ecology has come to stay. Personally, I should have preferred bionomics, which has the advantage of indicating in its composition that living things are its subject-matter. This latter term is at all events an acceptable synonym, and as such may properly be used as occasion requires. The question of a name, therefore, is settled and may be dismissed.”¹³³ Nevertheless, though the term ecology largely supplanted bionomics by the early twentieth century, it remains true, as Bowler wrote in his *Science for All*, that Lankester, together with others in his generation of academic biologists, “combined technical evolutionary morphology with an interest in wild nature through topics such as animal behavior and what came to be known as ecology.”¹³⁴

NATURE’S REVENGE

More than any other thinker of his time, Lankester emphasized in his writings that humanity was walking an ecological knife’s edge. This is most obvious in his 1911 book *The Kingdom of Man*, consisting of his Romanes lecture at Oxford in 1905 titled “Nature’s Insurgent Son,” his 1906 presidential address to the British Association of the Advancement of Science, and his article “Nature’s Revenges: The Sleeping Sickness,” reprinted from the *Quarterly Review*—all of which present a kind of radical Baconian view toward nature.

Lankester’s lecture “Nature and Man,” later better known in its printed version as “Nature’s Insurgent Son,” was delivered in the Sheldonian Theatre in Oxford to a very distinguished and fashionable gathering. It started off by emphasizing that human beings, while priding themselves on their increasing dominance over nature, were themselves a part of nature. Nature was to be

viewed as the entire cosmos of which humanity is nothing more than an “insurgent son.” Evoking his general theme, he wrote: “If we may, for the purpose of analysis . . . extract Man from the rest of Nature of which he is truly a product and part, then we may say that Man is Nature’s rebel.”¹³⁵

In attempting to exert more and more control over nature in the pursuit of human ends, humanity as nature’s rebel does not free itself of nature, but, in the process of changing it, creates ever more colossal ecological contradictions threatening humanity’s own survival. As Lankester put it: “Man whilst emancipating himself from the destructive methods of natural selection, has accumulated a new series of dangers and difficulties with which he must incessantly contend.” The biggest indication was the spread of disease. “In the extra-human system of Nature,” he contended, “there is no disease and there is no conjunction of incompatible forms of life, such as Man has brought about on the surface of the globe. . . . It seems to be a legitimate view that every disease to which animals (and probably plants also) are liable, excepting as a transient and very exceptional occurrence, is due to Man’s interference.” For Lankester, this had to do in part with the growth of human population, but even more important to social organization in a system dominated by “markets” and “cosmopolitan dealers in finance” with all the irrational consequences that ensued, including the opposition to the genuine progress of science.¹³⁶

Lankester argued in “Nature’s Revenges” that “before the arrival of man—the would-be controller, the disturber of Nature—the adjustment of living things to their surrounding conditions and to one another has a certain appearance of perfection. . . . Anything like the epidemic diseases of parasitic origin with which civilized man is unhappily familiar seems to be due either to his own restless and ignorant activity, or, in his absence, to great and probably somewhat sudden geological changes—changes of the connexions, and therefore communications, of great land areas.” He provided a wealth of examples, related to contacts between human beings and species from various continents, including the intermingling of species that this generated. All this, he explained, was related to the spread of epidemic diseases, both with respect to humanity and other species, in which the disease vectors were able to exploit various vulnerabilities resulting from previous lack of contact.

What especially worried Lankester was the growth of mass epidemics, such as trypanosomiasis, the sleeping sickness that killed hundreds of thousands in Uganda and along the lower Congo River between 1901 and 1906. Although scientific research on the spread of epidemics had rapidly progressed (Lankester was a friend of Louis Pasteur and a frequent visitor at the Pasteur Institute), epidemics seemed to be spreading even faster, particularly in Africa. “We are justified,” he wrote,

in believing that until man introduced his artificially selected and transported breeds of cattle and horses into Africa there was no nagana disease. The *Trypanosoma brucei* lived in the blood of the big game in perfect harmony with the host. So, too, it is probable that the sleeping-sickness parasite flourished innocently in a state of adjustment due to tolerance on the part of aboriginal men and animals of West Africa. It was not until the Arab slave raiders, European explorers, and India-rubber thieves stirred up the quiet populations of Central Africa, and mixed by their violence the susceptible with the tolerant races, that the sleeping-sickness parasite became a deadly scourge.¹³⁷

This was a “disharmony” in nature (and in the relation between human beings and external nature) that was blindly “accumulated” by society in the very process of its commercial accumulation, generating what Lankester called “nature’s revenges.” Through “his greedy efforts to produce large quantities of animals and plants . . . man has accumulated unnatural swarms of one species in field and ranch and unnatural crowds of his own kind in towns and fortresses.” Monocultures and urban congestion associated with capitalist development created grounds for the spread of epidemics.

Humanity, in breaking with original natural selection, had created a situation in which human evolution proceeded mainly through the evolution of human society rather than biological species. There was therefore no option of a return to nature. Nor was there any possibility of proceeding on the basis of the blind, capitalistic exploitation of nature. This simply invited ecological catastrophe. “The world, the earth’s surface,” he wrote, “is practically full, that is to say, fully occupied.”¹³⁸ Society is more and more undermining preexisting natural conditions. Under these circumstances, humanity

must either go on and acquire firmer control of the conditions or perish miserably by the vengeance certain to fall on the half-hearted meddler in great affairs. We may indeed compare civilized man to a successful rebel against Nature who by every step forward renders himself liable to greater and greater penalties, and so cannot afford to pause or fail in one single step. Or again we may think of him as the heir to a vast and magnificent kingdom who has been finally educated so as to fit him to take possession of his property, and is at length left alone to do his best. . . . No retreat is possible—his only hope is to control, as he knows he can, these dangers and disasters.¹³⁹

The penalty for society failing to create a more sustainable relation to nature, “controlling” it, as Francis Bacon said, by learning to follow nature’s laws, would be to perish in the struggle. Hence, the only recourse lay in the promotion of social and environmental relations in accordance with knowledge and

science. Indeed, science, not commodity relations, would be the essence of civilization. In order to achieve this, as Lankester emphasized in his presidential address to the British Association, science would have to have state support and the state would need to be responsive to science. There was a distinct threat that if present social-environmental relations persisted, the result would be the emergence (over centuries) of “a desperate humanity, brutalized by over-crowding, and the struggle for food.” To prevent this, it was necessary that science and education—the latter no longer to be devoted at the higher levels primarily to the ancient classics—should be allowed to do their job and usher in a true “Kingdom of Man” (*Regnum Hominis*).¹⁴⁰ “Science,” he wrote in his notes for his Romanes lecture, “is not the golden key by which treasure and luxury are opened to capitalists, and ease and plenty rendered widespread among the masses. . . . Science is the increase of understanding, the essential condition for rational philosophy and the conduct of the community.”¹⁴¹ He strongly believed that “nature’s revenges” resulted from the failure of society, organized around commercial interests, to follow the path of education and reason, as laid out in the great public health triumphs of the past, in which he listed John Simon first, ahead of Edwin Chadwick.¹⁴²

The peculiar evolutionary heritage of human beings as the result of increased brain size was greater plasticity of behavior. Inherited instincts were less important than what Lankester called “educability” or “the power of being educated,” and evolution was at this stage in human development more social than biological. Human beings were distinguished by their extra-corporeal and economic activity. “Man,” Lankester wrote, “is the one highly ‘educable’ animal.” Humanity, then, could choose to develop socially in accordance with knowledge and science rather than as the result of any fundamental biological determinism. As a result, a more sustainable human relation to nature was possible. Humanity, he explained many years later, commenting on his Romanes lecture, may be regarded not so much as “nature’s rebel” as “nature’s pupil.”¹⁴³

Lankester’s *Kingdom of Man* was enormously influential among socialists. In *The Profits of Religion: An Economic Interpretation* (1918), Upton Sinclair referred extensively to Lankester’s analysis, using it to argue that science pointed to the need for human self-emancipation and self-determination, “the regime of man the creator.”¹⁴⁴

THE EFFACEMENT OF NATURE BY MAN

Lankester’s *Kingdom of Man*, though raising radical ecological views, did so primarily in a form that was tempered by a Baconian, anthropocentric framework, no doubt in an effort to exercise influence as a leading representative of British science. Added to this was that the public face Lankester presented at the time

he prepared the manuscripts that made up *The Kingdom of Man* was necessarily constrained by his position as director of the Natural History Museum. Not only did he leave his critical notes on capitalism out of his Romanes lecture on “Nature’s Insurgent Son,” but he also held back on some of his more critical views on the human relation to external nature. However, in 1907 he was dismissed as director of the Natural History Museum—over the objections of many of his scientific colleagues—apparently due to his unrestrained attacks on the museum establishment, including the governors of the museum, and his continual (if muffled) espousal of incendiary views. Seeking a new source of income, Lankester immediately took up the offer to write a regular, weekly nature column for the *Daily Telegraph*, which was to result in nearly four hundred articles for the *Telegraph* alone between 1907 and 1914 (and for a few months in 1919), as well as other articles in *Field*, *Country Life*, and the *Illustrated London News*. Selections of Lankester’s essays were collected in a whole series of popular science books. In these essays, he not infrequently espoused controversial views. It is here that he emerged as possibly the strongest critic of the ecological depredations of humanity in the opening decades of the twentieth century.

Several years before he began writing these popular essays, Lankester had delivered the Royal Institution Christmas Lectures of 1902–1904 on the subject of “Extinct Animals.” This was turned into an illustrated book in 1905 aimed at young people, with lantern slides reprographically converted into half-tone or “process blocks.” *Extinct Animals* was extremely popular and became the basis for Arthur Conan Doyle’s 1912 book *Lost World*, in which Lankester was referred to by name along with the title of his book, with the irascible “Professor Challenger” modeled after Lankester himself.¹⁴⁵ In this way, Lankester brought to public attention the problem of extinction, not simply as a phenomenon of the remote past, but also as an increasingly frequent occurrence in the present resulting from the actions of human beings. “It is obvious, in many cases,” he wrote, “that another animal, Man, interferes. He either kills and eats animals or takes their food from them, or occupies their ground, or cuts down the forests in which they live, and so on.”¹⁴⁶

“It is only too true,” Lankester wrote in *Nature* in 1914, “that man is slowly but surely destroying the beautiful wild animals and plants of the world, and is substituting for them queer domesticated races which suit his convenience and his greed, or else is blasting whole territories with the dirt and deadly refuse of his industries, and converting well-watered forest lands into lifeless deserts by the ravages of his axe.”¹⁴⁷

Lankester’s position on ecological depredations introduced by humanity was put most eloquently in his powerful article “The Effacement of Nature by Man.” “Very few people,” he observed, “have any idea of the extent to which man . . . has actively modified the face of Nature, the vast herds of animals he

has destroyed, the forests he has burnt up, the deserts he has produced, and the rivers he has polluted.” It was true, he pointed out, that nature (independent of humanity) generated extinctions in its process of “slow, irresistible changes,” including such forces as climate change and geological shifts. But above these forces of extinction, especially in the modern world, was “a vast destruction and defacement of the living world by . . . both savage and civilized man which is little short of appalling.” Today, the “reckless greed and the mere-insect like increase of humanity” was endangering life throughout the earth. In North America the bison had been nearly exterminated; while Europe had long since decimated its larger animals. “Progressive money-making man” through mining and manufacturing had destroyed trout streams. At its foulest, “the Thames mud was blood-red (really ‘blood-red,’ since the colour was due to the same blood-crystals which colour our own blood) with the swarms of a delicate little worms like the earth-worm, which has an exceptional power of living in foul water and nourishing itself upon putrid mud.”¹⁴⁸

Like Darwin (and like Engels), Lankester pointed to the decimation of the ecology of St. Helena through the clearing of woods and the introduction of invasive species.¹⁴⁹ Similar, carefully documented examples of ecological destruction in islands could be seen in Christmas Island, two hundred miles South of Java, where Chinese laborers were imported to dig up 15 million tons of phosphate for a profit of a guinea a ton in order to fertilize the despoiled soil of Europe. In New Zealand too the introduction of invasive species had destroyed the greater part of the native species.

Lankester depicted the desertification resulting from the cutting and burning of forests—“wherever man has been sufficiently civilised and enterprising to commit” this “folly”—as a leading example of ecological depredation. It was through the elimination of forests, he observed, that

man has done the most harm to himself and the other living occupants of many regions of the earth’s surface. . . . Forests have an immense effect on climate, causing humidity of both the air and the soil, and give rise to moderate and persistent instead of torrential streams. . . . Sand deserts are not, as used to be supposed, sea-bottoms from which the water has retreated, but areas of destruction of vegetation—often (though not always), both in Central Asia and North Africa (Egypt, etc.), started by the deliberate destruction of forest by man, who has either by artificial drainage starved the forest, or by the simple use of the axe and fire cleared it away.¹⁵⁰

Lankester here was echoing similar observations made by the German botanist Matthias Schleiden (1804–1881) and the German agronomist Carl Nikolas Fraas (1810–1875), who had explored these issues in depth. Marx too, who

was familiar with the work of Schleiden and Fraas, had noted that civilization “leaves deserts behind it,” pointing to ancient Mesopotamia and Persia, but also suggesting the connection to the modern period.¹⁵¹

In these ecological writings, Lankester referred bitterly to the “pecuniary profits to the capitalists” that governed all such processes of nature’s destruction and modification. The corporations or “enterprises of combined capital” that dominated modern economic life were “mere impersonal mechanisms ‘driven by the laws of supply and demand.’”¹⁵² One could point to the mass killing and in some case extinction of whales, sea turtles, bison, and other species. In Norway, he wrote, they had built factories around the killing and processing of whales. Wherever possible he recorded the profits that were made through such “revolting butchery . . . carried on solely for the satisfaction of human greed.” The Norwegian shot harpoon, “the most deadly and extraordinary weapon ever devised by man for the pursuit of helpless animals,” was, he explained, “a commercial, not a scientific discovery!”¹⁵³

Given that the full force of bourgeois civilization was behind the rapid degradation of the environment, there were only two possibilities that offered hope of arresting this deadly process: an “overwhelming catastrophe” of environmental origins, such as a new glacial age or a force of “cosmic origin,” that would check human progress, or else “an unforeseen awakening of the human race to the inevitable results of its present recklessness” due to the closing circle of environmental pressures. Still, “whatever may be the ultimate fate of the life of the earth under man’s operations,” Lankester argued, “we should at this moment endeavour to delay, as far as possible, the hateful consummation looming ahead of us.”¹⁵⁴

Lankester was a strong advocate of nature reserves to protect the fast disappearing “wilderness,” but understood their limitations in face of the relentless expansion of commercialism and colonialism. Like Morris, with whom Lankester was on friendly terms, he tried to defend Epping Forest outside of London. He backed the creation of reserves in what remained of Britain’s “ancient nature” and commended the creation of Yellowstone in the United States. Yet there were, he insisted, no “absolute nature reserves” in the face of encroaching civilization. This was evident by the mere fact that such reserves themselves needed to be artificially preserved, controlled in terms of the spread of disease, protected from poachers, etc. “In reality a true ‘nature-reserve’ is not compatible,” he wrote, “with the occupation of the land, within some hundreds of miles of it, by civilized, or even semi-civilized, man.” Nothing but isolation from society by oceans or high mountain ranges would make that possible. Lankester had been appointed to an international committee on the creation of reserves to protect large game animals in Africa. Hitherto, he argued, malaria had kept Europeans largely out of the African interior. But with

the increasing means of fighting malaria, the penetration of Africa was occurring under European colonialism, dooming African wildlife. "If Africa," he indicated, "is to be the seat of a modern human population and supply food to other parts of the world, the whole 'balance of Nature' there must be upset and the big wild animals destroyed. There is no alternative. The practical question is, 'How far is it possible to mitigate this process?' Can a great African 'reserve' of 100,000 square miles be established in a position so isolated that it shall not be a source of disease and danger to the herdsmen and agriculturalists of adjacent territory?"¹⁵⁵

This deep ecological understanding extended to other areas as well. Lankester wrote of the vast pollution generated by coal, and that oil supplies would peak sooner. He discussed human brutality toward animals (writing a fanciful piece on bullfighting from the standpoint of the bull, who was gifted with intelligence and human speech). He influenced Darwin through his work on earthworms.¹⁵⁶

Lankester's dialectical and ecological view of both humanity and the earth system was revealed in his general conception of the evolution of life. In the 1870s, in "The Part Played by Labour in the Transition from Ape to Man" (a work not published until the early twentieth century), Engels had put forward the materialist argument that erect posture had allowed the early hominins to develop the hand for tool-making, which led, along with language, to the development of the human brain. Hence, contrary to the dominant idealist conceptions of the time, the brain had not evolved first, but developed only in the context of labor, that is, human efforts to transform their environment, marked by tool-making. Lankester developed a similar argument in his *Daily Telegraph* articles, emphasizing, however, not so much the role of the hand in tool-making as its role in "delicate exploring operations" in the coevolution of human beings with their environment.¹⁵⁷

THE RADICAL CRITIQUE OF PROGRESS

Ecology only arises as a social concern once the naive conception of progress that has generally characterized bourgeois society is dispensed with. Although socialists have sometimes adopted many of the same teleological notions of progress, their critique of the existing society, and awareness of its contradictions, have again and again—as exemplified by thinkers such as Marx, Morris, and Rosa Luxemburg—led them to an awareness of the threats of social regression and ecological destruction.

As shown in Lankester's early pioneering study on *Degeneration*—which he doubtless discussed with Marx, and in which the latter was interested—he had from the beginning a complex, critical view of the relation of evolution to human "progress," distinguishing him from most scientists in his time. As he was to

suggest in his later writings, history offered no simple, unilinear story of unending progress; nor could evolution be viewed in teleological terms. If one were to look back at the evolution of human ancestral (hominin) species, one would, of course, see the gradual elaboration of more complex forms—until the point at which modern humans appeared. This could be seen as a kind of “progress” in natural evolution from a human-centered standpoint. Yet the path was the result of chance and not the fulfillment of final ends. The story of evolutionary descent could not without distortion be turned into a simple story of the steady ascent of humanity.

Moreover, once modern humans arose with a fully developed brain, the dialectic of human evolution assumed a different form. It was no longer dependent principally on *natural* evolution of the human corporeal structure, but rather on *social* evolution, rooted in the transmission through the human brain of the quality of educability and the cumulative products of culture. It therefore rested principally on development of science and knowledge and the accompanying changes in social organization. Aside from the Epicureans, Lankester noted, most ancient philosophers had seen human civilization as cyclical, associated with the rise and fall of civilizations. A consistent materialism, however, pointed to the *possibility* of continuing social advance, precisely because humanity now made its own history, though under biological and social conditions inherited from the past. What distinguished today’s human beings, he emphasized again and again, was above all their higher educability.¹⁵⁸

Given his overall ecological and socialist view, it is not surprising that Lankester remained throughout his life a strong advocate of social and (what we would now call) environmental justice (including the conservation of species), and an opponent of capitalism. He lost his position as director of the Natural History Museum due to his unwillingness to kowtow to moneyed interests. Although it is doubtful that he was ever associated directly with any socialist party, his socialist orientation (albeit of a more Fabian than Marxian variety) was clear. Hyndman spoke of Lankester’s strong socialist sympathies. He “knew and admired William Morris” and was on good terms with the socialist parliamentarian John Burns, giving a copy of *Extinct Animals* to Burns’s son. He sent a copy of his *Easy Chair* book to the well-known socialist and environmental thinker Robert Blatchford, author of *Merrie England* and editor of the *Clarion* (a follower of Morris). Blatchford in turn wrote a very favorable and extended review of Lankester’s book.

In his contribution to “The Making of New Knowledge” in Wells’s collection *The Great State*, Lankester argued against the control of universities and sciences by the upper classes and commercial interests, objecting to the institutions of knowledge being made into handmaids “of commerce, industry, and the arts of war.”¹⁵⁹ He followed in his father’s footsteps in this respect, retaining

a sympathetic view of the working class, including their intellectual powers. He considered workers to be more attuned to materialism and more immune to superstition than the English upper classes.¹⁶⁰ In terms of education, Lankester declared: "There is no reason to suppose that the quality of mind we look for is not as abundantly distributed among the poorer classes as the well-to-do. The State must cast its net widely so as to include the whole population without distinction of class or sex."¹⁶¹

Lankester was a strident critic not only of anti-materialist spiritualism and idealism, but of all teleological notions of progress. He emphasized the dangers of class-based social degeneration and human-generated ecological destruction. There were signs, he insisted, that human civilization was imperiling itself in relation to its environment.¹⁶² At all times he questioned what he had called in *Degeneration* "the tacit assumption of universal progress."¹⁶³

None of this, however, kept him from insisting on the possibility of general social advance through the unity of science and socialism (in the broad generic sense). Authentic historical progress was not a natural occurrence arising from bourgeois society as in the Whig view of history. Nor was it to be created artificially by means of eugenics. Instead, to the extent that it had any meaning at all, it was a result not of biological factors but of intellectual advance and of changing social relations—a product of the collective *social development* of human beings. What intervened decisively, forever separating the history of humanity from mere biological destiny, was the "new and strangely significant factor of oral and written tradition operative in civilized communities," and the exponential development of knowledge that this entailed.¹⁶⁴

In aesthetics, Lankester was attracted to the work of Dante Gabriel Rossetti and the Pre-Raphaelites, with whom he was personally acquainted. He clearly admired their emphasis on restoring sensual expression. His views of art thus appear to have overlapped in this respect with those of figures like Heinrich Heine, Marx, Rossetti, Morris, and the Romantic-revolutionary aesthetic tradition, which rejected the then dominant notions of modernity and progress. For Lankester, there was clearly reason to resist "this new terror the capitalist," in art as well as science.¹⁶⁵

Hope lay in a transformation of class relations and a shift toward a more rational society, rational not only in terms of human interactions but also interactions between human beings and the environment. "We retain in Britain," Lankester wrote in a draft of one of his "Easy Chair" articles, "in spite of all our revolutions and reforms, the structure of a conquered country ruled by the members of a privileged class."¹⁶⁶ This, he believed, had to change if society was to advance. He did not, however, put much hope simply in democracy itself, as long as the "masses," due to the deficiencies of the educational system, were "ignorant of the meaning and the need for making new science, new knowledge."¹⁶⁷

Given his early friendships with Marx and the younger Herzen, it is not at all surprising that Lankester welcomed the revolution in Russia in 1917, though he was later to develop a negative view of Bolshevism—as it was graphically portrayed to him by his friend Wells.¹⁶⁸

An organization in which Lankester was actively involved was the Rationalist Press Association, founded in 1899. Its annual gatherings and publications represented the views of Secularists, Radicals, and Socialists, bringing together such figures as Lankester, Donkin, Julian Huxley, Arthur Keith, J. B. S. Haldane, Bertrand Russell, J. A. Hobson, Geddes, H. J. Laski, and Wells. Lankester was made an Honorary Associate in 1914. For a number of years, the *Rationalist Press Annual* included as an epigraph at the top of each issue a statement by Lankester from May 1921: “There is no Association in this country which has done so much for intellectual progress in the past twenty years as has the R.P.A.” He wrote an article titled “Is There a Revival of Superstition?” for the 1922 issue of the *Annual*.¹⁶⁹

In October 1925, Lankester indicated in a letter to Wells that he was particularly impressed by a presentation by J. B. S. Haldane (then emerging as one of Britain’s leading scientists and socialist thinkers), whom he considered as perhaps the most promising young Darwinian biologist of his generation, due to Haldane’s thorough trouncing of Lamarckian views and his radical materialism. Lankester had just read Haldane’s “The Causes of Evolution,” which appeared in the *R.P.A. Annual*, 1926. He wrote to Wells that Haldane was a “well-trained biologist and mathematician,” and characterized his article as “a model of clear outlook and critical method.”¹⁷⁰

Haldane’s “The Causes of Evolution,” singled out by Lankester at the end of his life, represented a remarkable explanation and defense of Darwinian natural selection as the basis of evolution. It relied heavily on the concept of “degeneration,” as developed by Lankester and others, in order to counter simplistic conceptions of evolution as invariably taking the form of “progress.” There Haldane wrote: “We are . . . inclined to regard progress as the rule in Evolution. Actually, it is the exception, and for every case of it there are ten of degeneration.” Darwinian evolutionary thinking, according to Haldane, was able to consider an enormous variety of changes, including the numerous extinctions, as well as varying paths in the paleontological record, mutations, coevolution between hosts and parasites, and ecological complexity. For Haldane, Darwinian natural selection made it possible to understand how climate change could lead to the decline of all ecological habitats. “A small change of climate,” he wrote, “will lead to the disappearance of forests over a wide area, and with them of most of the animals highly adapted to life in them, such as squirrels, woodpeckers, wood-eating beetles, and so forth.” All such species were tied together in a complex ecological web. Darwin remained the key to understanding these

processes, and “no facts definitely irreconcilable with Darwinism have been discovered in the sixty years and more that have elapsed since the formulation of Darwin’s views.”¹⁷¹

These critical perspectives on evolution and ecology were closely akin to those that Lankester had long professed. According to Gould, “Lankester never told the young communist J. B. S. Haldane, whom he befriended late in life and admired greatly, that he had known Karl Marx.” Yet Haldane was strongly influenced by Lankester’s example as a materialist scientist, critic, and popularizer. He was to take Lankester as his model in writing popular science articles—though in Haldane’s case, for the *Daily Worker* rather than the *Daily Telegraph*.¹⁷²