Dark is the World to Thee: A Historical Perspective on Environmental Forewarnings

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ABSTRACT

Evidence of human impact on the natural world and of environmental degradation has existed from approximately the fifth century B.C. From time to time we find this evidence noted by a variety of sources ranging from the classical through to the medieval period. However, what we like to think of as our modern environmental consciousness was slow to form. We review and offer some analysis both of the evidence and of the responses to it over this period. The overall aim of the paper is to chart and to understand the contingencies of our predecessors' understanding of their environmental predicament, the better to understand and put in context the contingencies of our own understanding.

KEYWORDS

Environmental degradation, deforestation, environmental forewarnings, environmental consciousness

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INTRODUCTION

> Our universe is a sorry little affair unless it has in it something for every age to investigate. (…) Nature does not reveal her mysteries once and for all. We believe that we are all her initiates but we are only hanging around the forecourt
>
> Lucius Anneaus Seneca, *Natural Questions* VII.30

> The child, like a sailor cast forth by the cruel waves, lies naked upon the ground, speechless, in need of every kind of vital support, as soon as nature has spilt him forth with throes from his mother's womb into the regions of light
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> Lucretius, *De Rerum Natura,* Book V, 222–225.

In our time the life sciences offer us various indicators that signal impending environmental problems. Permanent and unwelcome repercussions of ecosystem alterations may be observed at different levels of biological organisation. Biochemical and molecular effects (changes in genes, cells, and body tissues) can be detected at sub cellular levels. Our ancestors did not have the advantages of molecular biology, nor of the *International Early Warning Program* launched by the United Nations in 2000. The only bioindicators they could rely upon were destroyed landscapes, eroded soils, abandoned pastures and villages, and deforested slopes. With regard to this last, the late Michael Williams wrote: 'It is a common misconception that deforestation is a recent occurrence, gaining momentum in the tropical regions of the world since about 1950. But its history is long, and stretches far back into the corridors of time when humans first occupied the earth and began to use fire deliberately, probably some half-a-million years ago.'[1]

However, the mere existence of evidence of environmental harms is not enough; in order to have some impact this evidence must also register as such in society at large. And history records an abundance of early forewarnings that were not listened to and did not penetrate the social fabric. They were present, although not always explicit, both in what we now think of as more 'philosophical' writings and also in (what we now think of as) more 'scientific' texts. Currently, there are an increasing number of analyses looking at the historical roots of modern environmental problems. However, there is a clear need to extend these reflections to include an investigation of the early signs of warning of serious environmental degradation, to see who registered them, how they were responded to by mainstream thought and policy, and what lessons those examples and attitudes might provide for the future.

We also should bear in mind that all human actions take place within the context of ecosystems, and interact with them in ways that differ enormously over time and space. Humans compete with other species of animals and also plants for resources like water and soil, the other species themselves being active agents of environmental transformations. Environmental factors such as a harsh

climate, together with the varying demands of the ecosystems to which humans must accommodate themselves, play a crucial part in the human-nature relationship. An excellent illustration is afforded by the history of the Mesopotamian region over recent millennia, as documented by Magnus Widell.[2] Here, plagues of locusts were among the main factors with which humans had to contend, closely followed by extremely cold winters and severe droughts.

Not surprisingly, the human intervention in natural processes that is unavoidable for our survival has permanently affected and in some cases irrevocably damaged many fragile natural ecosystems. A lack of ecological knowledge and the unplanned pattern of human development, exacerbated in some cases by uncompromising belief systems, have led to unexpected and unpredictable consequences. The environmental history of the Earth provides clear evidence of the inadequacy of our present knowledge, past judgments and future predictions. Many writers have noted the environmental degradation that started more than four thousand years before the rise of the Sumerian civilisation, even though their voices, restricted mostly to the small community of intellectuals, have been largely ignored. The most universal and ancient features of 'humanscapes' arise from a conscious strategy to improve food supplies, provisions, safety, and comfort – or perhaps to create the landscapes that we prefer, given our savannah ancestry. The domestication of species, the creation of open fields, the raising of crops and the building of shelters and settlements are the most obvious of intentional human activities, each practised for millennia.

The Marquis de Condorcet once argued that the lessons of the past could serve for the future – that we learn from the ancients by studying their mistakes and by properly applying scientific findings.[3] There are two major problems with this. One is that it presupposes a confidence in our 'present' understanding – whenever this 'present' might be – that is wholly unfounded. The other is that many of the environmental and climatic disasters of the past survive only as a dim reflection in our legends and myths. The memory of previous natural events like droughts, exceptional storms, excessive floods, unusual colds caused by climatic changes or human activity fade quickly with passing generations. Such evidence as there is can often only be indirectly and falteringly recovered through archaeological and other associated forms of investigation.

1. NOT THE FIRST AND NOT THE LAST

In recent years, investigation by archaeologists and geomorphologists working in southern Greece has brought to light compelling evidence for the destructive effects of human activities over the past 8,000 years. Deforestation and at times disastrous soil erosion triggered by escalating agricultural practices and growing human populations were already evident in pre-classical times, and continued through classical antiquity, challenging the belief that pre-industrial

peoples were better stewards of the natural environment than were peoples in later industrial western societies.[4]

In fact, environmental history has recorded many voices apparently warning of the effects of certain human activities on the environment. Plato and others refer repeatedly to the wooded hills and rich lands of the remote past. Whether the disappearance of this lush landscape, if it ever existed, was due to natural or human causes has been debated passionately since antiquity. Generally, it is true that landscapes have been reinvented by tragedians and comic poets to suit their dramatic purposes.[5] Yet, it is also a common misconception that deforestation is a recent occurrence, gaining momentum in the tropical regions of the world since about 1950. In fact its history is long, and stretches far back in time to the period when humans first occupied the earth and began to use fire deliberately, probably some half-a-million years ago. What has changed since the mid-twentieth century is that an ancient process has accelerated. The process of deforestation jointly with its consequences such as soil erosion and floods, well studied in the Mediterranean basin, was already evident, according to Williams,[6] in the 'deep' past around 1500 B.C. and became, as H.C. Darby suggests, 'probably the most important single factor that has changed the European landscape (and many other landscapes also)…'.[7] This happened in several phases and was regionally diverse. Mainly it was Greeks, Carthaginians and Romans, who were involved, and later, the Arabs, Venetians, Turks and Spaniards. The consequences were enormous: for example, the 'corn chambers' of the Roman Empire, such as modern day Tunisia, became virtual deserts.

2. CAUSES AND RESPONSES

How far was this due to human insensitivity and indifference to the environmental degradation that was occurring, and how far was it due to natural climate change? There has been long-standing debate on the causes and effects of Holocene erosion and alluviation in the Mediterranean lands. Van Andel et al., referring to the land use of the Southern Argolid, write:

> The soils of the gently rolling hill country of the southern peninsula (…) mainstays of agriculture during the 4th through 2nd millennia B.C. were not especially vulnerable to erosion (…). In the semiarid climate of the eastern Mediterranean, landscape stability is naturally maintained by the vegetation, and even after a major disturbance *maquis* and pine woods will quickly establish a protective cover provided that the disruption by burning, brush cutting, or overgrazing does not continue too severely.[8]

Vita-Finzi[9] indicated that Mediterranean landscape transformation was often characterised by 'punctuated-equilibrium' rather than being a process of prolonged and gradual change. However, recent studies suggest more complex

multi-causal explanations in which local interactions between environmental context, climate fluctuations and human impact are being envisaged as affording appropriate clarifications of landscape alteration. So, for example, and without contradicting that hypothesis, John Bintliff draws attention to the over-emphasis of the human factor and the exclusion of the equally important natural processes with regard to late Classical and early Hellenistic landscape transformation:

> It has been natural to blame human impact as the sole reason for these (coastal changes), which the plentiful historic sources for Classical Greek, Hellenistic and Roman Imperial times allow us to reconstruct in this way. (…) Major changes in depositional behaviour are often inferred to reflect major changes in settlement and land use, for which archaeological evidence is lacking or very circumstantial.[10]

Nevertheless, as early as the ninth century B.C. Homer compared the noise of the battle to a 'crashing sound where woodmen fell the trees' in 'mountain dells'. Although evidence for forest clearing is erratic, its consequences such as soil erosion have been more reliably documented. In the fourth century B.C. Plato understood and discussed the effects of deforestation. Equally, Theophrastus mentions the disappearance of *Tetraclinis articulata*, also known as the sandarac tree, from Cyrene by saying: 'There was an abundance of those trees where now the city stands, and people can still recall that some of the roofs in ancient times were made of it.'[11] Many other Greek and Roman thinkers were aware that the extensive exploitation of natural resources, depletion of biodiversity and changes of the environment could degrade the natural world and lead to unexpected consequences.

We have to acknowledge that the causes of environmental degradation have been a source of controversy, and that the examples of early warning voices that have been entirely ignored illustrate the difficulties that we have to confront when attempting to document our relationship with natural systems. The factual knowledge of our impact on natural systems, still deficient today, was little more than fragmentary at the earlier stages of human civilisation. And it is easy to imagine that the undiscriminating and irregular accumulation of facts, coupled with speculation rather than empirical research could be highly misleading. In addition, a lack of ecological knowledge, combined with a bewildering variety of myths and world visions, not to mention the simple economic necessities, are likely to have played a decisive role in ensuring that, for the most part, the warning voices fell on deaf ears.

The state of mere mortals is graphically captured in words that the ancient Greek playwright Aeschylus ascribes to Prometheus in his play *Prometheus Bound*:

> First of all, though they had eyes to see, they saw to no avail; they had ears, but they did not understand; but, just as shapes in dreams, throughout their length of days, [450] without purpose they wrought all things in confusion. They had neither knowledge of houses built of bricks and turned to face the sun nor yet

> of work in wood; but dwelt beneath the ground like swarming ants, in sunless caves. They had no sign either of winter [455] or of flowery spring or of fruitful summer, on which they could depend but managed everything without judgment, until I taught them to discern the risings of the stars and their settings, which are difficult to distinguish.

Yet, regardless of the many gifts and benefits that Prometheus had supposedly conferred on mortals, societies should not necessarily be taken to task for their lack of response to environmental alteration, in part because many changes did not appear obviously harmful in their early stages. Indeed, such changes might well have been regarded not as degradation but as simple transformations. It was only the accumulation of these imperceptible changes over time that led to major and visible environmental alteration. As van Andel et al. indicate, during the fourth and early third millennia B.C. we encounter no evidence that the spread of settlements and clearing of the land had a seriously destabilising effect on the landscape, even though, ultimately, damage was inevitable.[12] Human activity in the classical period had little immediate and adverse impact on the Mediterranean peoples. Therefore, there was no pressing need for them to be environmentally minded. They could view the spontaneously self-regulating order of nature as largely independent of human will.

3. IT IS BETTER TO LIGHT THE CANDLE THAN TO BLAME THE DARKNESS

> All things are easy for nature, (…) especially the things she has decided to do from the beginning, which she approaches not suddenly but after giving warning.
>
> Seneca, NQ, III, 29, 8–30.2

Williams wrote: 'That natural processes were accelerated with tree cutting and cultivation is obvious, but all in all, it is strange that in such a literate and observant world no evidence has arisen of consciences disturbed by the exploitation of forests, no general alarm about depletion, no treatise on forest management, nor examples of efforts to plant trees other than olive trees.'[13] Although some nature conservation practices date to the early days of our civilisation, like the hunting conservation of waterfowl in The Middle Kingdom in Egypt, these efforts were mostly restricted to wildlife reserves, and had as their objective the protection of bird and game for hunting and pleasure. The origins of what we might call 'real' nature conservation, or conservation for its own sake, cannot plausibly be dated earlier than the nineteenth century, when it emerged partly under the influence of the Romantic Movement and its views of the natural world.

The question which we now take up in more detail, of why – despite the various words of warning – humanity was to wait many centuries before ac-

knowledging and recognising the seriousness of environmental changes, does not have easy answers. But we begin with a clue which comes from distinguishing two types of what can be considered early admonitions: one, which comes out of theoretical reasoning and a broadly 'philosophical' outlook on nature; the other, although as well reflected in philosophical writings, was derived from everyday observation.

Landscape is a form of culture and history, the form in which culture and history have been absorbed. The intellectual belief in universal order, accordingly, was reflected in what people perceived, in their aesthetic taste, the pleasure of sight and senses. Given that Greek and Roman sensibility relied on symmetry, it is no wonder, therefore, that little value was attributed by them to the irregularity, variety and roughness of wild and disorderly nature, both spontaneous and capricious.

Nevertheless, the seeds of the 'precautionary principle', a strong feature of any modern analysis of environmental problems, were also sown a long time ago. Indeed, the fact that human activities bring about consequences which defy our original intentions, or that they lead to completely unexpected catastrophes, marked early Greek mythology and art. It was manifested in the mysterious games that capricious gods were thought to play with helpless human beings. Then, in the sixth century B.C. when more 'rational' approaches were beginning to emerge, it continued to modify the perceptions of Nature and the way Nature functions. 'You never step twice into the same river', wrote Heraclitus around 500 B.C. He believed that most natural processes are constantly in flux, that chance and change are the rule, and that the future is as unpredictable to other organisms as it is to us. It is a view plainly endorsed by modern ecology.[14] 'If you do not expect the unexpected you will not find it, for it is hard to be searched out and difficult to compass', he warned.[15] Thus the suggestion emerges that this view was a very early foreboding of the chaotic features of natural systems. In Plato's case too, though one might prefer to think his 'disenchantment' with the sensory world and retreat into the 'world' of forms to be due mainly to his experience of radical cultural instability, Aristotle, for one, thought it strongly influenced by Heraclitus' views on nature.[16]

However, even Heraclitus himself believed in a ceaseless recurrence; and in a deep-seated need for predictability the Greeks in general preferred to believe in intelligibility, perfection and order. It was a 'blasphemy' to assume the existence of chance events in the universe. But taking for granted the certainty of Nature's conduct helped to mask the unforeseen consequences of human impacts on the physical world. Marcus Tullius Cicero (106–43 B.C.) expressed a typical Roman, and Stoic, view when he wrote:

> When we (…) speak of nature as the sustaining and governing principle of the world, we do not mean that the world is like a clod of earth or lump of stone or something else of that sort, which possesses only the natural principle of cohesion,

> but like a tree or an animal, displaying no haphazard structure, but order and a certain semblance of design. [17]

In spite of the fact that already by around the year 500 B.C. Greek coastal cities had become landlocked as a result of deforestation and soil erosion, up to the time of the late middle ages people nestled in a stable social structure gave little heed to deforestation, soil erosion and invasive species. Weather, with its impact on human health, was perhaps the most apparent and, therefore, most debated variable.[18] Even though Theophrastus, who is considered by some the forerunner of ecological studies, reminded them that order should not be presumed in Nature, the Greeks rarely ventured into the fascinating world of change and chance. Nature as humans wanted to see it was governed by gods or reason according to some sort of a general plan. They maintained the view of the world as exhibiting both excellence and harmony, whose regularity was assured by a rational arrangement. As Aristotle noted: 'Absence of haphazard and the conduciveness of everything to an end are to be found in Nature's work in the highest degree…'[19]

The perception of a benevolent and harmonious Nature which was the product of heavenly design led to the belief in its capacity to return to its former state when disturbed. The concept of a 'balance of nature' can be found in the classical vision of a Mother Earth. It was introduced by Hesiod in his *Theogony* written about 700 B.C. Equilibrium theory discounted physical and geological and climatic forces such as fire, strong winds, rainstorms, and the impact of human activities. Any disturbance was a damage, which, it was believed, set in motion forces leading to a recovery. Nature's plan or Divine Order guaranteed a return to its original state once the stress factor was reduced. The philosophical faith in a steady nature was usually connected with the conviction that nature can never be destroyed. The first century (B.C.) Roman author Lucretius declares that everything in nature is continuously being renewed but nothing is ever irreparably damaged:

> For time changes the nature of the whole world, and one state of things must pass into another, and nothing remains as it was: all things move, all are changed by nature and compelled to alter. For one thing crumbles and grows faint and weak with age, another grows up and comes forth from contempt. So therefore time changes the nature of the whole world, and one state of the earth gives place to another, so that what she bore she cannot, but can bear what she did not bear before…[20]

This belief, repeated in the centuries ahead, was often instrumental in turning away attention from the human destruction of nature. Over and above popular belief in a world subject to the whims of a pantheon of gods, only one or two philosophers at most had seen nature as an unpredictable and mischievous troublemaker. In *De Causis Plantarum* Theophrastus avers that 'Anything which is contrary to nature is dangerous'. In the first century A.D. Lucius Annaeus

Seneca, traumatised by the earthquake that shattered Pompeii (later destroyed by the volcanic eruption in A.D. 79), accentuated nature's omnipotent powers: 'Any deviation by nature from the existing state of the universe is enough for the destruction of mankind' (NQ 3.27.3 cf. NQ 6 – '*de Terrae motu*'). In the modern age his conviction resounded in the neglected words of Francis Bacon that 'the subtlety of nature is greater many times over than the subtlety of argument…'.[21]

It has to be said, however, that the significance of the Stoic directive to 'follow nature' (e.g. Seneca, Letter 5) is hard to read. At first sight it may seem to imply the view of nature as a comfort zone, where all is 'for the best'. It can equally, and perhaps better, be read, however, as showing an acute awareness that the intelligent order of the universe encompassed many unwelcome events. These included both natural events, such as the death of a child, and humanly caused catastrophes, such as the fire which totally destroyed the Gallic town of Lyons (Seneca, Letter 91). And this awareness may well in part explain some otherwise unappealing directives. When your wife or child has died, says Epictetus (*Enchiridion* 3), say to yourself that a human being has died, and you will not be disturbed. Their loss is like the falling of the leaves, adds Seneca (Letter 104); even if they do not grow again, they are replaced. Perhaps it was only by adopting such an attitude that, in a world so full of threat, the dignity, tranquillity and freedom that they sought could be achieved.

4. EVERYDAY OBSERVATION

In the event, it was not philosophical rhetoric but the practical experiences and economic interests of people that gave rise to some kind of environmental consciousness and to a string of conservation laws and regulations. Methods of remediation tended to be adopted because they answered economic and social needs rather than environmental or ecological ones. Sometimes, for example, recommendations were made about how to conserve scarce natural resources like timber but again the conservation efforts respond mostly to economic requirements and were put into effect mainly for their instrumental and practical value. Even in the sphere of practical observation, however, there were limitations. For the most part the Mediterranean peoples understood very well the changes of the seasons, with their associated weather patterns, and arranged their crops and grazing in view of that. But they did not, for example, comprehend the hazards of irrigation such as the gradual salinisation of soils. Moreover, natural processes, including those that occur in the wake of human activity, are slow and local, and mostly invisible because they are natural.

Nevertheless, there are hints in the literature of recognition of some of the more unwelcome repercussions of human intervention. Pliny, for example, was aware of the increased incidence of floods as a result of deforestation. He notes how:

> It frequently happens that in spots where forests have been felled, springs of water make their appearance, the supply of which was previously expended in the nutriment of the trees. This was the case upon Mount Hæmus for example, when, during the siege by Cassander, the Gauls cut down a forest for the purpose of making a rampart. Very often too, after removing the wood which has covered an elevated spot and so served to attract and consume the rains, devastating torrents are formed by the concentration of the waters. It is very important also, for the maintenance of a constant supply of water, to till the ground and keep it constantly in motion, taking care to break and loosen the callosities of the surface crust: at all events, we find it stated, that upon a city of Crete, Arcadia by name, being razed to the ground, the springs and water-courses, which before were very numerous in that locality, all at once dried up; but that, six years after, when the city was rebuilt, the water again made its appearance, just as each spot was again brought into cultivation.[22]

According to Meiggs, 'destruction by flood became a well worn *topos* in Greek and Roman literature'.[23]

A contrasting example is provided by the Greek traveller and geographer of the second century A.D., Pausanias, in his famous *Description of Greece*. Here, he writes that the reason why the Echinades islands have not been made part of the mainland by the Achelous was because the Aetolian people had been driven from their homes and all their land had been laid waste: 'Accordingly, as Aetolia remains untilled, the Achelous does not bring as much mud upon the Echinades as it otherwise would do. My reasoning is confirmed by the fact that the Maeander, flowing through the land of the Phrygians and Carians, which is ploughed up each year, has turned to mainland in a short time the sea that once was between Priene and Miletus.' [24]

As early as the fourth century B.C. Plato observed the deforestation of Attica and contrasted it with the state of plenty that characterised ancient Athens in its Golden Age. In an often-quoted passage of *Critias* he wrote that 'what now remains compared to what then existed is like a skeleton of a sick man, all the fat and the soft soil having wasted away, and only the bare framework of the land being left'.[25] True, we should take into account Glacken's cautionary note that Plato's assessments 'can be accepted neither as factual nor as evidence of deterioration of the Mediterranean landscape owing to natural and man-made catastrophes from the remote past to Plato's time'. But he goes on to add the important rider that: 'There is, however, clear evidence here of the recognition by Plato that natural erosion and human activities – such as deforestation – may in their cumulative effects change a landscape throughout time'.[26] Theophrastus too recorded human induced climate changes caused by land drainage and deforestation. He observed that:

> in the country around Larisa in Thessaly, where formerly, when there was much standing water and the plain was a lake, the air was thicker and the country warmer;

> but now that the water has been drained away and prevented from collecting, the country has become colder and freezing more common. In proof the fact is cited that formerly there were fine tall olive trees in the city itself and elsewhere in the country, whereas now they are found nowhere, and that the vines were never frozen before but often freeze now.[27]

We see then clear hints of awareness that human activities had been producing undesirable results, degrading ecosystems and causing soil and water pollution. These are summed up by Seneca in his *Natural Questions* where he remarks: 'If we evaluate the benefits of nature by the depravity of those who misuse them, there is nothing we have received that does not hurt us… You will find nothing, even of obvious usefulness, such that it does not change over into its opposite through man's fault.'[28]

However, we should not fail to bear in mind that the history of human culture is very much a history of human relationships with a harsh and demanding natural environment. Accordingly, the various descriptions of a golden age when people were supposed to have lived in harmony with nature, like most generalisations, are subject to numerous objections. According to Ehrenberg, in the time of Aristophanes (fifth to fourth centuries B.C.) the Attic farmer, almost naked, worked soils which 'to a large extent [were] poor, stony and often still uncultivated'. The realities of that time were much less idyllic than Aristophanes describes.[29] Closer to the truth was Pliny the Elder who, in his *Natural History* (VII, Preface), remarked that Nature 'asks a cruel price for all her generous gifts, making it hardly possible to judge whether she has been more a kind parent to man or more a harsh stepmother'.[30]

Mediterranean ecosystems have always been fragile, and intensive agricultural activities combined with difficult natural conditions tend to have damaging and unpredictable impacts. As indicated by Williams, 'compared to the deciduous forests of northern Europe the evergreen forests were easier to clear, but their regeneration was more difficult because of the marked seasonality of the regional climate, combined with the prevalence of fire and overgrazing by stock, particularly goats.'[31] It was only in Egypt, where conditions were rather different, that humans developed a more sustainable system of agriculture that lasted for at least several thousand years. [32]

5. PRACTICAL MEASURES

Undoubtedly, agricultural activities over the span of thousands of years have wrought permanent damage on the various regions of the world. The reckoning has been slow to come, and it is in the realm of practical politics and lawmaking that we find the most obvious 'wake-up calls' to the importance of acknowledging the constraints on human dealings with the natural world. Thus in approximately 430 B.C. the Athenian authorities enacted a decree that was

to prevent the pollution of drinkable water by the dye industry. Livio Rossetti cites this law as evidence that classical Athens was aware of the causal connection between environmental degradation and certain daily activities. The enactment expressly intended to eliminate pollution of the river Ilissus: '(It is not allowed) to put skins (in the river), and thus to pollute the Ilissus by the mount of Heracles' temple, or to practise tannery and dispose of waste in the river.'[33] In the Platonic dialogue *Phaedrus* Socrates describes the riverbanks of the Ilissus of his days: 'In the name of Hera, what a lovely heaven! The plane tree is tall and bushy. The osier next to it is tall and beautiful. Its flowers are full of life and there is a sweet fragrance all over the place. Under the plane tree, the cold sparkling water flowing from the charming spring cools my bare feet…' (230 BC) Were we to take it literally, this fragment could indicate that the entire area was cleaned up and water quality improved and restored to purity and beauty in the space of about twenty years.

Further evidence in Plutarch,[34] in *Laws* by Plato and in Aristotle's *Politics* suggest an understanding of the importance of water quality for the healthy city. Plato in *Laws* book VIII describes the reasons for penalties against water pollution. We may assume that he was both aware of the problem and held these rules important and necessary. In *Laws* 761 he describes the use and protection of water resources: the administrators

> shall provide against the rains doing harm instead of good to the land, when they come down from the mountains into the hollow dells; and shall keep in the overflow by the help of works and ditches, in order that the valleys, receiving and drinking up the rain from heaven, and providing fountains and streams in the fields and regions which lie underneath, may furnish even to the dry places plenty of good water.

Among the duties of the wardens of the city was the protection of 'the waters, which the guardians of the supply preserve and convey to them, care being taken that they may reach the fountains pure and abundant, and be both an ornament and a benefit to the city' (763). Further on, Plato suggests the penalties to be imposed in the event of water pollution:

> And let this be the law: If anyone intentionally pollutes the water of another, whether the water of a spring, or collected in reservoirs, either by poisonous substances, or by digging, or by theft, let the injured party bring the cause before the wardens of the city, and claim in writing the value of the loss; if the accused be found guilty of injuring the water by deleterious substances, let him not only pay damages, but purify the stream or the cistern which contains the water, in such a manner as the laws of the interpreters order the purification to be made by offender in each case.[35]

Plato's writings, insofar as they represent or echo actual Greek law, clearly reveal attempts by lawmakers to control natural resource use and prevent en-

vironmental degradation. Plato, conscious of the danger of diminishing wood supply, also recommends penalties for the destruction of timber. Thus in *Laws* (VIII, 843) he writes: '…if anyone sets fire to his own wood and takes no care of his neighbour's property, he shall be fined at the discretion of the magistrates'. The conservation of the purity of air and water was also a preoccupation of Aristotle who in *Politics* (VII, 1330 B) recommended that special care be taken of the water quality: 'For the elements we use most and oftenest for the support of the body contribute most to health and among these are water and air.'

It is also worthy of mention that the intense polluting effects of metals had been more widely noticed from the early times of metal smelting than had the devastation caused by deforestation. The Greek historian and military leader Xenophon (430–355 B.C.), for example, thought that the silver mines in Laurion (Greece) were too polluted to allow a son of a friend to visit the city. (Memoirs of Socrates, Book 3, Verse 6). Later on, Lucretius (*De Rerum Natura*, Book VI, 808–817) wrote:

> Again, when they follow veins of silver and gold, rummaging with their tools the innermost secret places of the earth, what smells Scaptensula exhales from below! Or what mischief do gold mines breathe out, what do they make men look like, what colours! Do you not see or hear in how short a time they are accustomed to perish?

Workers in lead and mercury mines and smelters were known to suffer from the effects of the metals, according to Rome's famous engineer Vitruvius. In his book *De architectura* probably written between 27 and 23 BC, he commented on the extensive water pollution around mines (Book 8, verse 3):

> For it is obvious that nothing in the world is so necessary for use as water, seeing that any living creature can, if deprived of grain or fruit or meat or fish, or any one of them, support life by using other foodstuffs; but without water no animal nor any proper food can be produced, kept in good condition, or prepared. Consequently we must take great care and pains in searching for springs and selecting them, keeping in view the health of mankind.

He further remarks that:

> Springs should be tested and proved in advance in the following ways. If they run free and open, inspect and observe the physique of the people who dwell in the vicinity before beginning to conduct the water, and if their frames are strong, their complexion fresh, legs sound, and eyes clear, the spring deserves complete approval…

More evidence follows:

> And if green vegetables cook quickly when put into a vessel of such water and set over a fire, it will be proof that the water is good and wholesome. Likewise if the water in the spring is itself limpid and clear, if there is no growth of moss

> or reeds where it spreads and flows, and if its bed is not polluted by filth of any sort but has a clean appearance, these signs indicate that the water is light and wholesome in the highest degree.

And finally, in chapter 7 of book VIII, on the *Water Supplies*, Vitruvius mentions that water brought to Rome through the aqueducts can be harmful to people due to its lead content (lat. *cerussa* – carbonate of lead, $PbCO_3$).

As part of his naturalist observations, Pliny (23–79 A.D.) was also concerned that the emissions from mining activities were unhealthy to all animals. He and Strabo likewise pointed out the harmfulness of sulphur dioxide SO2 emissions from melting ovens, though its effects were only local then.[36] The Roman poet Horace was not alone among his contemporaries in detesting 'the smoke, the wealth, the noise of Rome...', and lost no time in retreating to his Sabine farm in the hills as often as he could. The ancient Romans, as residents of what had become the largest city in the world, were well aware of the problems of air and water pollution, caused by garbage, sewage and the runoff from industries such as smelting and tanning. Therefore, in the year A.D. 80 the Roman Senate passed a law to protect water stored during dry periods so that it could be used later on for street and sewer cleaning.[37] Sextus Julius Frontinus, who was water commissioner in the capital under Trajan and Nerva, writes proudly of his achievements as follows: 'Not even the waste water is lost; the appearance of the City is clean and altered; the air is purer; and the causes of the unwholesome atmosphere (*gravioris caeli*), which gave the air of the City so bad a name (*infamis aer*) with the ancients, are now removed.'[38] And when the Roman emperor Justinian issued a legal code in A.D. 535 the first entry read as follows: 'By the law of nature these things are common to mankind – the air, running water, the sea, and consequently the shores of the sea.'

6. REGISTERING THE IMPACTS

As we have seen, both Plato and Aristotle were aware of the importance of what we might call 'environmental quality' to the wellbeing of the city-state. And both were aware of how the cumulative effects of natural processes and human activities might change the landscape over time. We have already noted Plato's observations on the condition of Attica in his day. Aristotle for his part realised that there are natural processes that are constantly changing the surface of the earth. In *Meterologica* he describes the alteration of the Argive plain in this way: 'In the time of the Trojan wars the Argive land was marshy and could only support a small population, whereas the land of Mycenae was in good condition (and for this reason Mycenae was the superior). But now the opposite is the case… the land of Mycenae has become… dry and barren, while the Argive land that was formerly barren owing to the water has now become fruitful. Now the same processes that have taken place in this small district must

be supposed to be going on over whole countries and on a large scale'.[39] But for the most part they contented themselves with giving fairly accurate accounts of phenomena such as deforestation and soil erosion, and we look in vain for any broader interpretation of their significance. For more 'philosophical' musings, we must look elsewhere.

Writing in the year 360 B.C., Xenophon pens a rather striking passage in which he claims that the Earth has her own justice, a law deeper than human enactments, written in the nature of things: 'The earth, being a goddess, also teaches justice to those who can learn; for those who treat her best she recompenses with the most numerous benefits.... Well did he speak who said that farming is mother and nurse of the other arts, for when farming flourishes, all other arts also prosper, but when the earth is forced to lie barren, the other arts are almost extinguished, both on land and at sea'...[40] This hints at some kind of contract between farmer and the land he farms, with environmental degradation being construed as some kind of penalty should he farm the land unjustly. It also hints at the idea that a sound ecology is the basis of a sound culture.

Equally striking are the reflections of a Roman writer who shows a troubled awareness that the decline of agriculture and the depletion of earth's bounties is due to human abandonment, and he clearly rejects the pessimistic belief in the decay of nature due to its ageing. This is the Spaniard Columella (fl. 1st century A.D.) who wrote:

> Again and again I hear the leading men of our state condemning now the unfruitfulness of the soil, now the inclemency of the climate for some season past, as harmful to crops, and some I hear reconciling the aforesaid complaints, as if on well-founded reasoning, on the ground that, in their opinion, the soil was worn out and exhausted by the over-production of earlier days and can no longer furnish sustenance to mortals with its old-time benevolence. Such reasons... are far from truth; for it is sin to suppose that Nature, endowed with perennial fertility by the creator of the universe, is affected by barrenness as though with some disease; and it is unbecoming to a man of good judgment to believe that Earth, to whose lot was assigned a divine and everlasting youth... has grown old in mortal fashion. And, furthermore I do not believe that such misfortunes come upon us as a result of the fury of elements, but rather because of our own fault; for the matter of husbandry (*On Agriculture*, Preface)

As Columella also notes, Romans knew about the art of forestry, and were well able to plant coppices and work out the yields and labour required. He himself recommends cutting chestnut underwood at five years' growth and oak at seven years.[41] No wonder then that he has no patience with those who lay the blame on nature.

7. FACTORS IMPEDING ENVIRONMENTAL AWARENESS

Summing up our discussion so far, we have found a variety of factors militating against a full and widespread recognition of the environmental degradation being induced by human activities. In the first place, the understandable focus on securing the basic necessities of life was hardly conducive to sustained reflection on the possible consequences that might ensue. Add to this the fact that such changes were for the most part not immediate but rather, both gradual and often imperceptible. But perhaps the most significant factor was the array of prevailing worldviews that all but precluded any such recognition. From classical times through the Christian period and on into early modern times the dominant view was that of a cosmos governed by providence. The earth was seen as a physical system devised by, or even (on the Stoic view) constituted by, a supreme intelligence part of whose function was the sustenance of humankind. Within that context, even adverse environmental conditions could only be construed as a natural part of the cultural fabric, hardly matters that humans could hope to rectify, unless they were visited as punishments for human wrongdoing. Minority views, such as a fatalism that ascribed all ills to the whims of the gods, or a golden age narrative that saw current generations as inhabiting an ageing and decaying planet, likewise cast humans as helpless onlookers rather than primary agents of change. And even those deeper thinkers whose views were outside the comfort zone of providential design, such as Heraclitus and Lucretius, preached a gospel of recurrence and renewal. Hence, we must conclude that, contrary to Williams' claims, it is really not at all 'strange' that ancient consciences were not 'disturbed' by the environmental changes that they saw happening around them.

But we have yet to mention one further factor that was inhibiting the development of an environmental consciousness: a sense of the 'dreadfulness' of nature. Far back in history cultivation of soil was a symbol of civilisation, wilderness a dwelling place of evil. Even in the seventeen century, forest was regarded as 'dreadful', a gloomy, wild symbol of barbarism and fear. The wild nature we cherish was not always beautiful. The classical ideal associated beauty with fruitfulness, order and regularity. In the history of Western thought, Nature has been often viewed as wilderness in the worst sense, full of danger and evil, lacking forms of cultivated landscape:

> The world was certainly not made for us by divine power: so great are the faults with which it stands endowed. In the first place, of all that the sky covers with its mighty expanse, a greedy part is possessed by mountains and forests full of wild beasts, part rocks and vasty marshes hold, and the sea that keeps the shores of lands far apart. Almost two parts of these lands are robbed from mortals by scorching heat and constantly falling frost. Even the land that is left, nature would still cover with brambles by her own power, but that man's power resists, well accustomed to groan over the stout mattock for very life, and to cleave the soil with the pressure of the plough.[42]

This passage reveals not just a belief in the power of human action that is quite a characteristic feature of the classical world, but also the necessity to control nature in order to survive. The same author in a later passage emphasises the more benign aspects of human intervention:

> Day by day they made the forests climb higher up the mountains, and yield the place below to their tilth, that they might have meadows, pools and streams, crops and luxuriant vineyards on hill and plain, and that a grey-green belt of olives might run between (…); just as now you see the whole place mapped out with charming variety, laid out and intersected with sweet fruit trees and set about with fertile plantations.[43]

8. THE SPECIAL CASE OF TREES

At the same time, and especially with regard to the harvesting of trees, we find a more appreciative attitude to nature's bounty and an accompanying sense of the need for responsible use. The later Greek geographer Strabo, describing the region of Campania north of Naples wrote the following: 'Avernus is enclosed round about by steep hill-brows that rise above it on all sides except where you sail into it … at the present time they have been brought by the toil of man into cultivation, though in former times they were thickly covered with a wild and untrodden forest of large trees.'[44] Eratosthenes, a geographer of the Hellenistic period, relates deforestation to the need for fuel and building materials, timber for navigation and mining, and governmental land policy. The associated effects of forest clearings on landscapes and climate, already highlighted by the botanist Theophrastus, were later mentioned also by Pliny. And we can trace this awareness on into the Middle Ages with Albert the Great, and further into modern times as a theme of many travellers after the discovery of the Americas. Undoubtedly, deforestation has been a leading instrument of environmental change as far back as the Egyptian period. Some researchers view the attention of Egyptian rulers to tree plantation and cultivation as an attempt to 'combat the sometimes overly exuberant use of resources'.[45] Theophrastus noted that 'in Cyprus the kings used not to cut the trees, both because they took great care of them and husbanded them, and also because the transport of the timber was difficult'.[46] Like Strabo he discussed the cultivation of trees with reference to human use and economic value.

Pliny joins in this 'hymn to the trees':

> Long, indeed, were these last bounties of hers concealed beneath the ground, the trees and forests being regarded as the most valuable benefits conferred by Nature upon mankind. It was from the forest that man drew his first aliment, by the leaves of the trees was his cave rendered more habitable, and by their bark was his clothing supplied; even at this very day, there are nations that live under

> similar circumstances to these. Still more and more, then, must we be struck with wonder and admiration.[47]

However, the demand for fuel imposed by Roman industrial activity suggests that, at least in areas where woodland was sparse, it was likely to have been managed as a renewable resource. Some woodland management practices are described in Roman textual sources. Cato, writing in the mid-second century B.C., mentioned willow beds, coppice woods, orchards and 'mast-wood'. The latter could be oak or beech woods, both of which provided nuts for feeding pigs. He also mentioned the planting of poplars (*Populus*) and elms *(Ulmus minor* var. *vulgaris*) as a source of leaf fodder for cattle and sheep. References to coppice woods were also made by Columella who in the first century A.D. stated that the best woods for coppicing were oak and chestnut, chestnut being cut on a five-year cycle and the oak at seven years. He also described the planting of chestnut coppices.[48]

9. INTO THE MIDDLE AGES

If we continue our story into the high and late Middle Ages we find that an awareness that human activities cause undesirable consequences in the environment is constantly re-surfacing. And it is fair to say that the clearing of forests becomes the central theme around which most of the other anthropogenic alterations of the natural world revolve. The climate of northwest Europe differs considerably from the Mediterranean environment that nurtured classical culture. After the collapse of the Roman Empire (fourth and fifth centuries), it was the forest, with its ties to town and country life that became the most significant feature of the medieval period. According to Ruddiman, the most unequivocal evidence of early and extensive deforestation lies in a unique historical document – the Domesday Book. This survey of England, ordered by William the Conqueror, reported that 90 per cent of lowland natural forest was cleared as of 1086 A.D.[49] Compared with the other information provided by the Domesday Book, the evidence of clearing might be inexact, but it does show, as Darby noted, 'that along the Welsh Marches, and in East Anglia and in Kent, woodland was being cleared for one purpose or another; and there is no reason to believe that the same tendencies were not at work all over England'.[50] Indeed the great age of forest clearing extends from the fifth through the thirteenth centuries.

Simultaneously, yet at a much slower pace, arose the awareness of destruction. As in the ancient period, evidence of this awareness is found mostly in local charters, rules, and letters, in the body of rights, usages and customary laws. The Domesday Book records tilled lands 'which have been wasted' and 'all been converted into woodland'. In many other countries sections of the forest were protected for economic reasons (*afforestatio*), and as royal hunting grounds: 'That our *silva* and *foresta* be well guarded' says the thirty sixth article

of *Capitulare de Villis*- one of Charlemagne's decrees.[51] In the thirteenth century a document issued by a German king Henry the VII condemned cutting trees for agricultural purposes as calamity: 'harm had come to him and to the city of the kingdom in the destruction of the forest of the kingdom and in transformation into cultivated land'.[52]

Much of England was 'forest' in a more technical sense in the centuries following the Norman Conquest (1066) that is, country set aside as royal game preserves and subject to special forest law. Following the thirteenth century, forests attained more value as demand for timber for ship-building and for other industries was rapidly outstripping supply. As early as 1257 Henry III suspended timber exploitation in many English forests 'because of the destruction caused' (*Calendar of Close Rolls*).[53] And despite the various conservation measures, the fact remains that during the medieval period monasteries had been responsible for very considerable modifications of the landscape that involved the large-scale draining of marshes, the clearance of woodland, and the extension of sheep-farming on the chalk and limestone uplands. The monks (Benedictines and Cistercians) cut down the woods, stubbed them up and levelled them; bushes gave place to barley, willows to wheat, withies to vines.[54] Equally, massive use of charcoal on an industrial scale in Early Modern Europe prompted a new acceleration of the onslaught on western forests. British Renaissance poet Michael Drayton (1563–1631), in his *Poly-Olbion* offers a picture of the fallen state of forest by 'mans devouring hand (…)'. [55]

Accordingly, woodland conservation and management made economic sense, and forests were ruthlessly protected against 'wood stealers'.[56] The Norman kings turned huge stretches of the countryside into royal forests subject to distinctive laws. The term 'forest' was used in a legal rather than a descriptive sense, for the forests were wooded only in parts and contained land that was farmed by peasants. Within the forest boundaries, however, forest laws prevented the clearing of new land for farming and protected the deer and wild boar. The Forest of Knaresborough covered most of lower Nidderdale and was the largest of all the Yorkshire forests. The forests grew to their largest extent under Henry II (1154–89) but during the following century some were 'disafforested' and by the fifteenth century most had fallen out of use.[57] A document from the time of Henry VI (1422–1471) relating to Braithwaite, near Middleham, permits the cutting of underwood but 'saving evermore, abyding [remaining] and standing still there, alle okes, almes, esshes, holyns and crabtrees without any felling or hewyng down, or cropping or twisting of theym'.[58]

10. THE RENAISSANCE: CONFIDENCE AND CAUTION

At this point we encounter a further element in our account of the factors that were inhibiting a full-scale environmental awareness. The Renaissance is

marked by a growing belief in the human ability to control and transform the landscape through reason and technology. Yet amidst this consciousness the belief that our activities negatively affect the natural world lives on. Starting with late fifteenth-century Venice, the centuries that follow see a playing out of the conflict between these opposing tendencies. When Georgius Agricola (George Bauer) censures the idea that mining destroys nature he quotes the arguments of those who oppose it and maintain that mining devastates fields and damages the fertile land vineyards, and olive groves: 'They also argue that the woods and groves are cut down, for there is need of an endless amount of wood for timbers, machines, and the smelting of metals. And when the woods and groves are felled, then are exterminated the beasts and birds (…) Further, once the ores are washed, the water which has been used poisons the brooks and streams, and either destroys the fish or drives them away.'[59] Later on, the poet Abraham Cowley wrote: 'Woods tall and reverend, from all time appear/ Inviolable, where no Mine is near.'

Hence, in spite of the prevailing optimistic belief in human intellectual sagacity that brings about beneficial improvements of the environment, opposite voices were getting through. In the seventeenth century, the newly formed Royal Society asked John Evelyn to report on the problem of forest policy and the shortage of timber. The resulting work surveyed the destruction and its causes such as tillage, industry and shipping.[60] Following his findings Evelyn advocated the duty and necessity of planting trees to restore what had been wasted or used. Sustaining his arguments with the authority of classical writers like Virgil, Theophrastus, Pliny and Columella, he denounced the 'disproportionate spreading of tillage' and the inconsiderate human predisposition 'to extirpate, demolish, and raze, as it were, all those many goodly woods and forests, which our more prudent ancestors left standing for the ornament and service of their country.'[61] He continued: 'Truly, the waste and destruction of our woods has been so universal, that I conceive nothing less than an universal plantation of all sorts of trees will supply and well encounter the defect… '[62] Then again, while Evelyn put the accent on the necessity of tree planting for both aesthetic and economic reasons, he also accepted as true the belief that deeply forested areas produced moist and unhealthy air. In this context forest clearings had the beneficial effect of 'letting in the air and the sun and making the earth fit for tillage and pasture', making 'those gloomy tracks' of forest 'healthy and habitable'.[63]

Evelyn's work was not the first attempt to halt deforestation in England, since the earliest conservation efforts following the classical period date back at least to the seventh century.[64] The Magna Carta (1215) contains two sections that focus on environment-related problems. The Forest Charter establishes reforestation programmes in all royal forests and along all riverbanks.[65] Two centuries later, Henry VI passed a law intended to remedy degradation of marshlands and the 'Hurt that within short Time will happen'.[66] However, in the following centuries both domestic and industrial demands took a heavy toll of the remaining

woods. For quite a while, Evelyn's work positively influenced the reforestation process, and in 1758 the Royal Society of Arts offered gold and silver medals for the 'largest plantation of each kind of tree every year'.[67] It was unfortunate that much of the planting activity showed a lack of consideration for the native species, bringing about widespread use of new species or 'rubbish' as William Cobbett described them. William Wordsworth in his Guide to the Lake District (1835) shared this opinion when he mentioned ten thousand larch trees 'stuck in at once upon the side of the hill' and 'platoons' of Scots fir serving as poor surrogates for native vegetation.[68]

Facing the urgent necessity to confront the abuse of water and forests, Louis XIV proclaimed in 1669 the French Forest Ordinance. Colbert, his minister, appointed the commission to look into the abuse of forested areas, fearing that 'France will perish for lack of woods'. It penalised forest destruction and regulated cutting. It controlled the proper use of timber. It also controlled the use and penalised the abuse of the forest floor. It prohibited grazing animals in 'lands and heaths, or void and bare places on the borders of the woods and forests'.[69] The Ordinance was intended to repair the damage brought about by the destructive use of natural resources and the waste of royal forests. It was also meant to provide for future generations, since 'it is not enough to have re-established order and discipline, if we do not by good and wise regulations see to it that the fruit of this shall be secured to posterity.' [70]

The strict forest and timber legislation in England and France during the seventeenth century had been inspired by the historical evidence of natural resource destruction, and the growing awareness of the risks that accrued from human inflicted environmental changes. As James I remarked in 1610, 'If woods be suffered to be felled, as daily they are, there will be none left.'[71] The duty to reforest was written into many early customs, manorial regulations and local laws, especially in England. At the same time these practical attempts to save damaged natural areas for utilitarian, spiritual or ornamental reasons stand in contrast with the prevailing philosophical image of an increasing, technology driven, human capacity to control the natural world. As we have seen, evidence of the destructive effects of human action, and – here and there – regulations to remedy our reckless dealings with the natural world, had been emerging into view ever since ancient times. Evelyn's work dramatised the problem of disappearing woods caused by the widespread increase of agriculture and grazing. In 1811, the Enlightenment thinker, German naturalist and explorer Alexander von Humboldt, in his *Political Essay on the Kingdom of New Spain*,[72] glimpsed the universality of the phenomenon, writing about the *global* human impact on the environment. He talked of nature's alteration, disappearing forests, a spreading agriculture, monotonous landscapes, and the invasion of exotic plants. Along with Humboldt, philosopher and poet Johann Gottfried von Herder pictured humans as 'a band of bold though diminutive giants, gradually descending from the mountains, to subjugate the earth and change climates with their feeble arms'. [73]

Nevertheless, awareness of the human power to control nature, also clearly visible in the works of Count Buffon, overshadowed all the warnings and evidence of undesirable changes in natural systems. Some writers who focused on climatic change indicated the possibility of some unexpected local temperature changes due to human activities. Noah Webster wrote: 'The clearing of lands opens them to the sun, their moisture is exhaled, they are more heated in summer, but more cold in winter near the surface; the temperatures become unsteady, and the seasons irregular.'[74] However, our dealings with nature were for the most part based on the optimistic view that the human mind and human technical skills could modify the environment at discretion. In addition, preconceived views of an orderly and teleological nature (despite the ontological doubts of Kant and Hume), coupled with insufficient knowledge, continued to obscure the long-term consequences of environmental modification. What is more, many intellectuals applauded the beneficial results of draining wetlands and clearing forests. Montesquieu assumed that ocean fisheries were inexhaustible, 'that coal pits could happily replace forests, and that more exploitation was needed'.[75] In the eighteenth century, the English poet Alexander Pope, in An *Essay on Man* (lines 281–294) captures this cavalier spirit:

> All nature is but art, unknown to thee;
> All chance, direction, which thou canst not see;
> All discord, harmony not understood;
> A partial evil, universal good:
> And, spite of pride, in erring reason's spite,
> One truth is clear, WHATEVER IS, IS RIGHT.

It was Count Buffon who documented the physical effects of human action on the land in more detail than any other scientist before George Perkins Marsh. However, the French Count, like some of his counterparts in the ancient period, considered these changes beneficial for the progress of civilisation. 'Wild nature is hideous and dying; it is I, I alone, who can make it agreeable and living'.[76] Yet, in spite of his belief in the inexhaustible power of Nature, and his conception of human beings as a geographical agent, like many writers before him, he warned about the threats of deforestation, thus embodying both the conflicting tendencies already noted. He encouraged the conservation of remaining forests and the reforestation of 'a part of those we have destroyed'. Following Evelyn's proposal Buffon emphasised the need for a science of forestry; for, 'Nothing is less known; nothing more neglected. The forest is a gift of nature which it is sufficient to accept just as it comes from her hands'.[77] Fifty years later Marsh in his book *Man and Nature* (1864) argued that deforestation could lead to desertification. Referring to the clearing of once-lush lands surrounding the Mediterranean, he asserted: 'the operation of causes set in action by man has brought the face of the earth to desolation almost as complete as that of the moon'. In response, he called for the restoration of devastated forests, soils,

and rivers through human co-operation with nature. After having travelled the world, he came to the conclusion: 'I know no more important practical lessons in this earthly life of ours… than those relating to the employment of the sense of vision in the study of nature.'[78]

11. CONCLUSIONS

As Heraclitus pointed out: 'Eyes and ears are poor witnesses for men if their souls do not understand the language' (Fragment 107). Centuries later, Tennyson the English poet and enthusiast for nature and her laws, in his poem *The High Pantheism*, echoes this sentiment with: 'And the ear of man cannot hear, and the eye of man cannot see'.

One might be tempted to ask; 'What would it take for men's souls fully to "understand the language"?' We eschew this question, at least insofar as it assumes that there can be some finality and completeness in our own understanding. In one of its reports,[79] the European Environment Agency complains that in trying to reduce current and future risks the lessons of history have rarely been used. But what these lessons might be is a thoroughly moot point. We should not confuse history with science. History does not normally supply us with data, on the basis of which we can make predictions. What it does do is give us some understanding of our past that we can use to gain a better understanding of our present predicament. So far as the environment is concerned, perhaps the most we can learn from the past is an understanding that the natural and mysterious world around us is in a constant turmoil even though, sometimes, the constant processes can come to an imagined impasse. This state of momentary equilibrium presents us with the illusion of an island of stability in a turbulent universe. Unfortunately, we do not, and cannot have even incomplete fore-knowledge of future events. The sad truth is that, as Peter Bernstein writes in his challenging book, *Against the Gods. The Remarkable Story of Risk*:

> The past seldom obliges by revealing to us when wildness will break out in the future. Wars, depressions, stock-market booms and crashes, and ethnic massacres come and go, but they always seem to arrive as surprises. After the fact, however, when we study the history of what happened, the source of the wildness appears to be so obvious to us that we have a hard time understanding how people on the scene were oblivious to what lay in wait for them.[80]

There is another aspect to this statement. We should not forget that 'nature resists imitation through a model' as Schrödinger once wrote, and apparently successful predictions that make some theory plausible, will not necessarily prove accurate in future. Today's physics and life sciences offer us totally new ways of looking at Nature. But Nature continues to defy easy capture. Arguably, ecology itself is more history than science. A plurality of causal factors combined with ever-

changing sets of initial conditions make it very difficult, if not impossible, to determine the cause of any given phenomenon, not to mention its consequences. The 'science' of ecology does not offer unifying solutions nor produce clear-cut predictions upon which decisions and actions could be based. The most it can teach us is that life is always capable of expressing and elaborating new and unexpected potentialities. We can never predict what these will be, though we can be pretty certain that they will occur.

A more modest and more appropriate question to ask, therefore, and one which makes no assumptions of finality or completeness so far as our own understanding is concerned, is simply how modern environmental consciousness came about. For our discussion does suggest a number of key ingredients that had to be in place before our current environmental conscience could be fully awakened.

First, in contrast with notions of renewal and recurrence, there has probably needed to be a conception of the planet or biosphere as a singular, finite entity with an open ended but finite history. The sense of urgency that characterises the modern sensitivity depends in no small measure on the belief that much environmental 'damage' is irreparable – that is, is unable to be repaired either by human ingenuity or through natural processes of renewal. And clearly, among the figures who were historically responsible for the awakening of this sense we should count the likes of the geologist Charles Lyell, exponent of James Hutton's theory of uniformitarianism and, of course, Darwin.

Second, and in contrast with the belief that nature is providentially protected, there has probably needed to be a sense of the vulnerability of nature, not excluding humans. Here, it is interesting to note that Darwin's message has mixed implications. For whilst emphasising the transience, as opposed to the permanence, of forms of life, it is emphasising at the same time that succession, or 'descent', is built into the processes of natural selection. And this, of course, is seized upon by those who find themselves at odds with the prevailing environmental conscience. Hence, in response to concerns about the 'loss' of biodiversity they are apt to remark that extinctions are all part of the natural process. Equally, whilst there is growing evidence of human induced climatic change, it has to be kept in mind that the climate system varies naturally on different time scales.[81] We should remember that climate change, often of far greater magnitudes than anything human beings have seen, has been taking place throughout not only all of human history but virtually throughout the entire history of the Earth.

Third, and in contrast with the confidence in human abilities that characterises Renaissance and Enlightenment thinking, there has needed to be a real and profound grasp of human limitations, both at an intellectual and socio-political level. How this confidence has been undermined is too complicated a story to attempt here, but Freud and – again – Darwin would no doubt feature strongly. But as a footnote to that story we would venture the thought that perhaps it

took a century which saw two world wars before utopian dreams of indefinite progress could be fully laid to rest.

Finally, and in contrast with 'piecemeal' views of the human race, often resting on a range of dichotomies – Greek/barbarian, male/female and so forth – we would argue that the rise of humanism, bringing with it a sense of a common humanity and of a common human agency was another essential pre-condition. For although it brings various forms of anthropocentrism in its wake, which are not usually associated with environmental sensitivity, and although it coincided with the rise of a form of science that fuelled the optimistic belief that all problems could be overcome, it was also an essential pre-condition for the development of a sense of a common human responsibility.

NOTES

[1] Michael Williams, 'The History of Deforestation', *History Today* **51**,7 (July 2001): 30–37.

[2] Magnus Widell, 'Historical Evidence for Climate Instability and Environmental Catastrophes in Northern Syria and the Jazira: The Chronicle of Michael the Syrian', *Environment and History* **13** (2007): 47–70.

[3] Marie-Jean-Antoine-Nicolas Caritat, M. de Condorcet, *Outlines of and Historical View of the Progress of Human Mind* (Philadelphia, printed by Lange and Utrick, 1798).

[4] See Michael Williams, *Deforesting the Earth: From Prehistory to Global Crisis* (Chicago and London: University of Chicago Press, 2003).

[5] John Salomon and Graham Shipley (eds.), *Human Landscapes in Classical Antiquity: Environment and Culture* (London: Routledge, 1996).

[6] M. Williams, 'Dark Ages and Dark Areas: Global Deforestation in the Deep Past', *Journal of Historical Geography* **26**,1 (2000): 28–46.

[7] Ibid., 28.

[8] Tjeerd. H. van Andel, Curtis N. Runnels and Kevin O. Pope, 'Five Thousands Years of Land Use and Abuse in the Southern Argolid, Greece', *Hesperia* **55**,1 (1986): 103–128.

[9] C. Vita-Finzi, *The Mediteranean Valleys: Geological Changes in Historical Times* (Cambridge: Cambridge University Press, 1969).

[10] John Bintliff, 'Time, Process and Catastrophism in the Study of Mediterranean Alluvial History: A Review', *World Archaeology* **33**,3 (2002): 417–435.

[11] Theophrastus, *Historia Plantarum*. 5.3.7.

[12] Andel et al., 'Five Thousands Years of Land Use', 113.

[13] Michael Williams, *Deforesting the Earth: From Prehistory to Global Crisis* (Chicago: The University of Chicago Press, 2003), 97.

[14] William Holland Drury Jr., *Chance and Change, Ecology for Conservationists* (Berkeley, Los Angeles: University of California Press, 1998), 7.

[15] Fragment 18, Clément Stromates, II,17,4 in G.S. Kirk, J.E. Raven and M. Schoffield, *The Presocratic Philosophers, A Critical History with a Selection of Texts*, 2nd edn (Cambridge: Cambridge University Press, 1995).

[16] See, Aristotle, *Metaphysics*, Book 1, translated by W.D. Ross (The Internet Classics Archive, http://classics.mit.edu/)

[17] Marcus T. Cicero, *On the Nature of the Gods*, translated by H. Rackham, Loeb Classical Library (London: Heinemann, 1933), II: 82.

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