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THE ENVIRONMENTAL MOVEMENT: FULFILLMENT OF THE RENAISSANCE PROPHECY?

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Mankind is driven by the need to create order from chaos. Man creates order and bestows meaning to life by imposing a world view—a set of assumptions pertaining to the environment that allows it to be perceived in a consistently meaningful manner.

This need probably extends back to the very distant past, when survival depended on cohesion within the group or tribe. Social structures provided these vital forces of cohesion which were essential to survival. This process not only must have facilitated the acceptance of tribal law but also created the need for a mythical explanation of nature. Given the immense selective importance of such social and religious structures over such vast stretches of time, it is difficult not to believe they must have made an imprint on the human psyche. Although this process of "world view formation" appears to be common to all peoples since time immemorial, it has masqueraded under a number of different guises, including mythology, religion, theology, philosophy, and yes, science.

Although qualitatively different in its approach, science springs from the same well of psychic need and represents only one of the many world views. Indeed, within our own Western culture, science has so molded our view of the cosmos that "truth" has become synonomous with "scientifically verifiable." Once a mere intellectual endeavor indulged in only by the most erudite (or otherwise removed from any practical confrontations with life), science has evolved into a way of life. In short, it now portrays reality.

It is in this light that we may analyze the significance of the interaction between scientific development and the environmental movement of late.

ORIGINS

From the Caves To The Greeks

The development of science has been anything but uniform in time and place. Periods of sporadic advance have been accompanied

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by longer periods of stagnation. The roots of early scientific thought can be traced to the ancient cultural centers of Babylonia, Egypt, India, and Greece.

It must be kept in mind, however, that the time span between the last caveman and the first Greek philosopher was anything but short. Indeed, agricultural societies began to develop around the close of the last ice age—10,000-12,000 years ago.[1] The people inhabiting these cultures lived a life much the same as those found in the rural areas of the world today and they saw no need to write much down. Seen in this light, the "dark" or "middle ages" were essentially a resumption of the way of life momentarily interrupted by Greek culture.[2]

Thus, in order to comprehend the roots of the next great "cultural interruption" (better known as the Age of Enlightenment, the Scientific Revolution, or the dawning of the modern world), we are thrust back to the Greeks and their counterpart, the Babylonians. For both of these cultures a reasonably continuous scientific tradition can be discerned until the last few centuries B.C. More specifically, the Babylonians developed a tradition concerned with numerical representation and arithmetic while the Greeks evolved a more logical, geometrical and pictorial scientific model.[3]

> Greek science had an altogether different character from that of the early civilizations; it was far more rational and abstract but it remained as far or farther removed from technical considerations. . . . Mathematics, especially geometry, was the field which the Greeks esteemed most highly and where their methods of deduction and proof are those we still use.[4]

The gulf between Greece and the Near East ended as a result of the conquests of Alexander the Great beginning in 334 B.C. It was through Alexander that Greek culture was diffused throughout the entire eastern Mediterranean world. As a result, one begins to discern the entry of methods into Greek mathematics and astronomy so arithmetical and foreign to the Greeks that they could have been lifted only from Babylonian roots.[5] Greece eventually became the common heir for all ancient Near Eastern cultures, and in Greece we see the underpinnings of science as we know it today, principally as a result of the fortuitous combination of Greek logic and Babylonian arithmetic.[6]

1. L. BROWN & G. FINSTERBUSCH, MAN AND HIS ENVIRONMENT (1972).
2. R. PIRSIG, ZEN AND THE ART OF MOTORCYCLE MAINTENANCE (1974).
3. D. PRICE, SCIENCE SINCE BABYLON (1975).
4. J. BERNAL, SCIENCE IN HISTORY 114 (1954).
5. PRICE, *supra* note 3.
6. *Id.*

We must be careful here to distinguish between the early or Golden Hellenic period (before the conquests of Alexander) and the later Hellenistic. The art, philosophy, and literature of the Golden Hellenic age are overshadowed by the tremendous scientific vitality of the later Hellenistic period. In the words of Robert Pirsig:

> Early Greek philosophy represented the first conscious search for what was imperishable in the affairs of men. Up to then, what was imperishable was the domain of the Gods, the myths. But now, as a result of the growing impartiality of the Greeks to the world around them, there was an increasing power of abstraction which permitted them to regard the old Greek mythos not as revealing truth but as imaginative creations of art. This consciousness, which had never existed anywhere before in the world, spelled a whole new level of transcendence for the Greek civilization.[7]

The new mythos enshrined was that of philosophy. Its principal difference from all previous mythos was that it no longer considered the "Immortal Principles" the exclusive domain of the gods. As a result, an ever-growing number of philosophers became deeply interested in theories concerning nature; their ideas have been transmitted to us by Plato and Aristotle, but with the exception of the latter, members of this school of thought did not attain the scientific mentality as we know it today.[8]

Socrates, Plato, and Aristotle marked the culmination of Greek philosophical development and paradoxically signaled its arrest. As the classical city-states began their decline, the progression of thought began to decay. The mystical idealism espoused by Socrates and Plato gave way to a growing conformity of thought spurred on by the continuous deterioration of the social order. The teachings of Aristotle especially reflected the increasingly mundane concerns of philosophy. A vivid example of this is Aristotle's idea of "final causes," which taught the acceptance of life as it was and had nothing to offer to those who found it intolerable, except that their sufferings were inevitable and were part of the great order of nature.[9]

Although both Plato and Aristotle posited the *a priori* existence of immutable and external "truths" or "ideas," the philosophy of Plato was much more preoccupied with the metaphysical qualities of existence (i.e. with the "ideas" per se). Aristotle was less concerned with the actual "ideas" and more concerned with their mortal appearance. He held that the appearances of ideas had to cling to something

7. PIRSIG, *supra* note 2, at 366.
8. A. WHITEHEAD, SCIENCE AND THE MODERN WORLD (2d ed. 1967).
9. BERNAL, *supra* note 4.

which was independent of them and this "something" he named "substance."[10] It was at that moment that the dichotomy between mind and matter, inner and outer, and subjective and objective was established, and our scientific understanding of reality was born.[11]

From The Romans To The Renaissance

The Hellenistic Age came to an end when the Romans conquered the Eastern empires Alexander had established. The Romans had been engaged in a slow but persistent conquest of the entire Mediterranean world for nearly 500 years. The year 31 B.C. is usually taken as the end of the Roman Republic and the beginning of the Roman Empire.[12]

The decadence of Roman culture as it developed under the empire held no real place for scientific advancement. The accumulation of great power and wealth in the hands of a few combined with Stoicism to create an atmosphere in which there was little incentive for science, save the perpetuation of certain general ideas of Greek origin which supported the prevailing "class rule" society.[13] Consequently, the major contribution to the development of science made by the Romans was that of effectively spreading the ideas of the Greeks throughout the Mediterranean world.

With the establishment of a second capitol at Constantinople and the subsequent division of the empire into two parts—the western part governed by Rome and the eastern part by Constantinople—we begin to witness increased tension between East and West. The differences were aggravated as Constantinople successfully resisted barbarian attacks and preserved the continuity of classical culture, while the Western empire broke up and was so reduced that it was centuries before many of its territories were recaptured.[14] As a result, most of the legacy of knowledge handed down from the Greeks was lost by Europe and the heritage of Greece returned to the East from which it had come. In Syria, Persia, India, and even China, new breaths of science stirred and came together in a brilliant synthesis under the banner of Islam.[15] From the eighth century through the 13th, the fire burned bright and much was added in all fields of learning.

After the fall of the Western empire, scientific inquiry did not

10. PIRSIG, *supra* note 2.
11. *Id.*
12. BERNAL, *supra* note 4.
13. *Id.*
14. H. BUTTERFIELD, THE ORIGINS OF MODERN SCIENCE (1957).
15. BERNAL, *supra* note 4.

cease in Europe—it simply turned once again towards mysticism and religion derived from the more mystical aspects of Plato's idealism. Various forms of Gnosticism were highly prevalent during this time.[16] Feudalism was the economic system throughout most of Europe during the Middle Ages. The Roman Catholic Church provided the intellectual expression during this period, in addition to serving an important administrative function. As a time when men looked not to this world but to the hereafter for salvation, the Middle Ages furnished little positive incentive for bona fide scientific development (although scientific inquiry did persist among the rich in a limited capacity).[17]

Consequently, the roots of modern Western science originate not from medieval Europe, but instead can be traced to Byzantium and the many other cultures which come to form the world of Islam.[18] Two factors were critically important in the conversion of scientific leadership from East to West. First, the descendants of the Asiatic invaders responsible for the fall of Rome nearly 1,000 years before, now were putting great pressure on Constantinople and all of the East. A succession of invading hordes, including the Huns and Avars, eventually culminated in the Mongol invasions of the thirteenth century, and the conquests of the Ottoman Turks shortly thereafter.[19] From the 10th century on, these same Asiatics were unable to break into Europe again, though for centuries they had tried to carry their depredations as far west as possible. The 10th century, therefore, represents something like a restoration of stability. It represents the time from which Western civilization begins to make its remarkable advance.[20]

The second factor crucial to assumption of scientific leadership in the West can be traced to the 12th century and the translation of Arabic, Islamic, and Greek scientific works into Latin. This so-called "age of the great translators" stemmed primarily from the linguistic and cultural melting pots of Sicily, Toledo, and a few other places in Moorish Spain.[21] Thus, the corpus of classical learning with its vast Islamic overlays became known in European universities during the 12th and 13th centuries and led immediately to a furious upswing in academic activity.[22]

16. *Id.*
17. *Id.*
18. BUTTERFIELD, *supra* note 14.
19. *Id.*
20. *Id.*
21. PRICE, *supra* note 3.
22. *Id.*

From that point on, the dominant philosophical influence in Europe was that of Aristotle.[23] The rediscovery of Aristotle and the translation of the leading Islamic thinkers brought to the Christian medieval thinkers, for the first time, a developed system of thought which owed nothing to Christianity. Indeed, Aristotle came to be known as "the philosopher" and his system came to be synonomous with philosophy itself.[24] This phenomenon occurred not so much because of preference for Aristotelianism, but because it was the only great system of philosophy of which the medievals possessed extensive knowledge.

The rediscovery of Aristotle raised the problem of the relationship between theology and philosophy in a far more acute manner than it had previously assumed in the early Middle Ages.

> When some of the theologians in the thirteenth century adopted a hostile attitude to Aristotle and regarded his philosophy as being in many respects an intellectual menace, they were rejecting independent philosophy in the name of the Christian faith. And when St. Thomas Aquinas adopted in great measure the Aristotelian system, he was giving a charter to philosophy. He should not be regarded as burdening Christian thought with the system of a particular Greek philosopher. The deeper significance of his action was that he recognized the rights and position of philosophy as a rational study distinct from theology.[25]

It can be said, therefore, that the rediscovery of Aristotle in the Middle Ages and its subsequent reconciliation with Christian theology in the 13th century by St. Thomas Aquinas was the distant preparation for later scientific advance. By condoning the pursuit of knowledge in areas completely separate from Christian theology (although by no means accepting its validity), Aquinas paved the way for increasing amounts of study which transcended the scholasticism of earlier medieval thought.

Indeed, one can go even further and say that the development of Greek philosophy under the Christian doctrine of the world's creation by God provided a *theological* preparation for the advancement of science.[26] For if the world is a creation, and if matter is not evil but good, then the material world is obviously worth investigation. But scientific investigation could not develop until the right method was found; and for that, Christian Europe had to wait many centuries.

23. F. COPLESTON, HISTORY OF PHILOSOPHY: LATE MEDIAEVAL AND RENAISSANCE PHILOSOPHY (1963).
24. *Id.*
25. *Id.* at 239.
26. COPLESTON, *supra* note 23.

SCIENCE, RELIGION & ENLIGHTENMENT

A common feature of the religions that dominated the ancient world was the belief that all natural objects and places possessed "spirits." These "genius loci" had to be honored in order to insure the religious sanction of a given activity, and before using natural objects for human use, man was required to placate the spirits through gifts and ceremonies.[27] The Judeo-Christian religions, however, maintained that "spirit" was not intrinsic to objects of nature but instead, ruled them from without. It also taught that to some extent, man shared God's transcendence of nature.[28] Indeed, the Book of Genesis announced the sovereignty of God over the universe and concomitantly, the dominion of man over earth.

Thus Lynn White in his article, "The Historical Roots of Our Ecological Crisis," concludes that "the spirits in natural objects which formerly had protected nature from man evaporated. Man's effective monopoly on spirit in this world was confirmed, and the old inhibitions to the exploitation of nature crumbled."[29] Although White's observations certainly appear to be plausible, he fails to recognize the prevailing attitudes of the early European Renaissance, nor does he take into account the novel characteristics of the emerging form of scientific inquiry—that of natural or experimental philosophy. Through the work of early Renaissance "scientists," natural philosophy came to occupy a place alongside theology and philosophy. As it grew, the common definition of "knowledge" began to shift gradually. In keeping with this trend, interest in things of this world became more pronounced at the onset of the Renaissance. And as a result a more self-conscious and self-confident attitude toward artisanship, invention, and technology began to emerge.[30]

Despite changing attitudes, however, Aristotelianism continued to be a dominant force in shaping men's attitudes toward nature, particularly his doctrine of "final causes." As Clarence Glacken explains:

> [M]ost of the great names in early modern science did not deny design in nature nor the validity of final causes, but there were differences in the enthusiasm with which these were applied to immediate problems. The Copernican theory had not called the creation into question; the cosmic system was a product of divine design and order. Galileo deftly said that to prohibit the teachings of Copernican astronomy would be but to censure a hundred passages

27. White, *The Historical Roots of Our Ecological Crisis*, 155 SCI. 3767 (1967).
28. W. LEISS, THE DOMINATION OF NATURE (1972).
29. WHITE, *supra* note 27.
30. C. GLACKEN, TRACES ON THE RHODIAN SHORE (1976).

> of Holy Scripture which teach us that the glory and greatness of Almighty God are marvelously discerned in the open book of Heaven.[31]

Kepler and Newton held similarly strong teleological beliefs concerning the scientific investigation of nature (i.e. the belief that all things are moving in an immutable fashion towards predetermined ends). Indeed, teleology was one of the great preoccupations of Western theology, philosophy and science.[32]

Hence for the early Renaissance scientist, the surrounding world of nature held a purpose entirely apart from its function as the material basis of human activity; it was a divine creation and therefore sacred. The earth's value as a source of satisfaction for vital human needs was tempered by the realization that nature was a visible testimony of God's providence and therefore must be treated with some semblance of care.[33] And, although the epistemological foundations of theology and natural philosophy were becoming more and more distant, the prevailing influence of the Christian faith was still so strong it totally colored both the content and intent of scientific investigation.

FRANCIS BACON AND THE METHODOLOGY OF HUMAN BETTERMENT

Compared to the corpus of knowledge available to Europe in the 12th and 13th centuries, the amount of sustained scientific investigation was rather small. However, by the early 16th century, interest in such pursuits as natural philosophy and scientific research had grown tremendously. And there can be little doubt that what rescued scientific learning was the invention of printing and its rapid growth in Europe from 1470 onwards.[34]

As the pace of scientific investigation quickened it also fought to separate itself from the prevailing practices of magic, alchemy, and astrology. This was especially true of the areas of mathematics, astronomy, and physics. Aristotle's ancient theories of motion and cosmology had been all but supplanted by the discoveries of Copernicus, Kepler, and later Galileo. The purpose of these great intellectual inquiries, however, continued to be religious in nature and associated with the wisdom of the Creator, His individual productions of nature, and the interrelationships He had established among them.[35]

31. *Id.* at 377.
32. GLACKEN, *supra* note 30.
33. LEISS, *supra* note 28.
34. PRICE, *supra* note 3.
35. GLACKEN, *supra* note 30.

There was, nonetheless, a growing optimism throughout the Renaissance that man's accumulating knowledge was increasing his control over the creation.[36] Of all the Enlightenment thinkers, none had a greater impact on the nature of scientific investigation than Sir Francis Bacon.

> For Bacon, science was not a luxury to be indulged in after human needs were satisfied, a detached contemplation, or an aspiring towards truth. This, however, was the picture which had come down through the centuries, and if the paint had worn a little thin in places, it was still basically the same. Aristotle was the most coherent exponent of this view of science which stemmed from the economic structure of society where slaves made mechanical devices unnecessary or even useless, and where contempt for the worker was extended to the work itself, depriving it of all cultural value.[37]

Indeed, technological applications traditionally were considered lower class, empirical, and action-oriented while natural scientific investigation was considered aristocratic, speculative, and intellectual in intent.[38]

For Bacon, the purpose of scientific research was neither to acquire fame nor to produce miracles, but to improve the conditions of human existence, and he believed that this could be achieved through the systematic application of scientific theory to technology.[39] Bacon aimed at changing prevailing cultural and philosophical attitudes in addition to affecting drastic institutional reforms. His acrimonious condemnation of classical philosophers as well as their imitators of medieval and Renaissance times attested to his novel concept of "truth." He did not wish to replace the old ways with a new philosophy based on the same principles but instead, he sought an entirely new attitude toward nature involving new principles and different aims–in short, a new ethic.[40]

According to Bacon, philosophy is the work of human reason and falls into three main divisions. The first is concerned with God, the second with nature, and the third with man. The divisions of philosophy, he said, are like the branches of a tree united in a common trunk. This "one universal science," which is the mother of the rest, is known as "first philosophy."[41]

Bacon divides the philosophy of nature into speculative and opera-

36. *Id.*
37. P. ROSSI, FRANCIS BACON: FROM MAGIC TO SCIENCE 25 (1968).
38. WHITE, *supra* note 27.
39. LEISS, *supra* note 28.
40. ROSSI, *supra* note 37.
41. COPLESTON, *supra* note 23.

tive natural philosophy. Speculative natural philosophy is subdivided into physics and metaphysics. Physics treats efficient and material causes while metaphysics treats formal and final causes. Operative natural philosophy is the application of the former and it falls into two main parts: mechanics and magic. Mechanics is the application of physics in practice, while magic is applied metaphysics.[42] Thus, Bacon wedded God, nature, man, formal and final causes, and efficient and material causes into one integrated philosophical system.

At the same time, however, Bacon's preoccupation with the practical improvement of the human condition led him to declare that "inquiry into final causes is sterile and like a virgin consecrated to God, produces nothing."[43] He saw the blind allegiance to the philosophical systems of antiquity as the major stumbling block to human betterment. In his own words: "It is idle to expect any great advancement in science from the superinducing and engrafting of new things upon old. We must begin anew from the very foundations, unless we would revolve forever in a circle with mean and contemptible progress."[44]

Bacon's perception of the problem extended to the very heart of the classical notion of truth—the process of deduction:

> There are and can be only two ways of searching into and discovering truth. The one flies from the senses and particulars to the most general axioms, and from these principles, the truth of which it takes for settled and immovable, proceeds to judgment and to the discovery of middle axioms. And this way is now in fashion. The other derives axioms from the senses and particulars, rising by a gradual and unbroken ascent, so that it arrives at the most general axioms last of all. This is the true way, but as yet untried.[45]

Although Bacon called for the establishment of a system of knowledge based on true induction, he did not deny that some sort of induction had been known previously and employed. What he objected to was rash and hasty generalization, resting on no firm basis in experience. Bacon explained:

> In establishing axioms, another form of induction must be devised than has hitherto been employed, and it must be used for proving and discovering not first principles (as they are called) only, but also the lesser axioms, and the middle, and indeed all. . . . For the lower axioms differ but slightly from bare experience, while the highest

42. *Id.*
43. *Id.* at 108.
44. F. BACON, THE NEW ORGANON 46 (1960).
45. *Id.* at 43.

> and most general (which we now have) are notional and abstract and without solidity. But the middle are the true and solid and living axioms, on which depend the affairs and fortunes of men.[46]

In essence then, Bacon rejected the process of deduction on the grounds that true knowledge must rise in the observation of things, of particular facts or events. This was totally in keeping with the generally anti-rationalistic mood of the Renaissance, which stressed the return to stubborn fact and called for the overthrow of the stringently rationalistic characteristics of medieval scholasticism.[47]

Bacon not only called for the reorganization of scientific investigation methods, but also envisioned the establishment of "organized scientific research" based on the induction process. This landmark idea possessed him for his entire life. He had drafted several proposals for such an operation during his years in government before finally setting down, in old age, his vision of the ideal research establishment in *New Atlantis* (1627). Within 50 years of Bacon's death, educational reformers influenced by *New Atlantis* began organizing technical schools to facilitate the instruction of the mechanical arts. The Royal Society (chartered 1662) as well as the Academie des Sciences in France both acknowledged the inspiration of Francis Bacon.[48]

Bacon's concept of the "mastery of nature" through scientific research, although readily acknowledged by modern scholars as the most fundamental element in Bacon's philosophy, unfortunately is the least understood of all of his doctrines. When modern man attempts to understand Bacon's idea of the "mastery of nature," he unavoidably imposes his own world-view of 20th century technocracy, international pollution problems, and potential nuclear annihilation. What he does not understand is just how steeped with moral obligation and deep religious conviction Bacon's new philosophy really was.

As observed above, Bacon's philosophy of nature was intimately intertwined with Christian theology. In his view, the fall of man from Paradise was of decisive importance in the subsequent history of both man and nature. Religion and science were engaged in a mutual effort to compensate for the damage incurred as a result of the fall: "For man, by the fall, fell at the same time from his state of innocence and from his dominion over creation. Both of these losses, however, can even in this life be in some part repaired; the former by

46. *Id.* at 98.
47. WHITEHEAD, *supra* note 8.
48. LEISS, *supra* note 28.

religion and faith, and the latter by arts and science."[49] Thus, science was reconciled with God's plan. The religious frame of reference provided the guarantee that the proposed expansion of the arts and sciences would not lead to uncontrollable upheavals.[50] We see this idea in the following passage from *New Organon:* "Only let the human race recover that right over nature which belongs to it by divine bequest, and let power be given it; the exercise thereof will be governed by sound reason and true religion."[51]

Indeed, there is no hint by Bacon that the environmental changes wrought by "conquering" nature ever might be undesirable:

> I would address one general admonition to all–that they consider what are the true ends of knowlege, and that they seek it not either for pleasure of the mind, or for contention, or for superiority to others, or for profit, or fame, or power, or any other of these inferior things, but for the benefit and use of life and that they perfect and govern it in charity.[52]

It thus seems that Bacon saw the religious application of science as being nothing but potentially beneficial: "The end of our foundation is the knowledge of causes, and secret motions of things; and the enlarging of the bounds of human empire, the effecting of all things possible."[53]

A measure of Bacon's success is indicated by the fact that his concept of "conquering" nature by means of science and technology has become a commonly accepted notion in modern society. As I suggested above, however, the actual meaning of the phrase has shifted gradually over the centuries and now elicits an entirely different set of responses than it did in the early 1600s. This shifting context of religious, political, and economic factors has resulted in a modern frame of reference which serves to effectively detract from the initial humanitarian, moral, and religious aspects of Bacon's great methodological synthesis.[54]

THE SECULARIZATION OF SCIENCE

The outstanding achievement of the various proponents of new methodologies such as Bacon, Descartes, and Galileo was that their

49. BACON, *supra* note 44, at 247-48.
50. LEISS, *supra* note 28.
51. BACON, *supra* note 44, at 119.
52. F. BACON, THE GREAT INSTAURATION 15 (1901).
53. F. BACON, THE NEW ATLANTIS 119 (1901).
54. *See* Skinner, *Meaning and Understanding in the History of Ideas,* 8 HIST. & THEORY 3 (1969) for a discussion of historical interpretation.

formulations of the concept of human mastery over nature were much clearer than those that existed before.[55] And as a result of the prominence of these men, science was gradually wedded to the predominant cultural force of the time—Christianity. The precise way in which Bacon reformulated the scientific method was crucial in this respect since Christianity's hold on the European consciousness remained strong even as the traditional social basis of organized religion was being eroded by capitalism.[56] By casting his thesis for scientific and technological progress in a familiar religious mold, he succeeded in winning wide acceptance of his novel concept. But at the same time he unknowingly charted a course of resource exploitation, environmental degradation, and world power struggle for later generations as the decline of Christian influence led to the eventual secularization of his ideas:

> If we look for the root of the error that was in him—the cause that was perhaps behind the other causes—it lay in his assumption that the number of phenomena, the number even of possible experiments, was limited, so that the scientific revolution could be expected to take place in a decade or two.[57]

In this sense, the "mastery of nature" was to Bacon a finite conversion process—a conversion from what he perceived to be the culturally inherited ignorance of the ancients to the religious application of truth that was at the heart of his new methodology.

The gradual realization that the scientific revolution was not a discrete process of conversion, but rather an infinite process of accretion and revision, had a profound impact on the eventual role of science. The idea of truth established by Bacon as a finite and immutable set of laws revealed by the proper execution of scientific method was transformed into an elusive process of infinite possibilities. This realization materialized in the "philosophy of doubt" which began with Descartes and reached its full development in Cartesian doubt.[58] In direct contrast to Greek philosophy, in which reality was revealed through the contemplative glance of the beholder, the outstanding characteristic of Cartesian doubt was that nothing—no thought and no experience—could escape it.[59] It could only be a matter of time before Cartesian doubt was carried directly to the heart of the Christian faith itself. Indeed, the introduction of doubt

55. LEISS, *supra* note 28.
56. *Id.*
57. BUTTERFIELD, *supra* note 14, at 116.
58. H. ARENDT, THE HUMAN CONDITION (1958).
59. *Id.*

to the realm of religious belief by Pascal and Kierkegaard, two of the greatest religious thinkers of modernity, served to undermine the Christian faith in a way not easily refutable by traditional theology—through the doubting concerns with salvation of genuinely religious men.[60]

The linear and historical nature of the Judeo-Christian tradition also becomes exceedingly important at this juncture. Whereas most archaic religions believe in the cyclical nature of time (i.e. cosmic cycles), the Judeo-Christian tradition perceives time as having a beginning and an end. As a result, historical events take on religious significance and "history" becomes "sacred history."[61] But as the idea of linear time becomes secularized, it takes on a wholly different character. In fact, it has been suggested that the modern idea of "progress" owes something to the fact that Christianity had provided a meaning for history and a grand purpose to which the whole creation moved. In other words, the idea of "progress" represents the secularization of an attitude, initially religious, which looked to a fullfillment in some future, far-off event, and saw history, therefore, as definitely leading to something.[62]

By the beginning of the 18th century, we begin to notice the manifestation of this secularization process as, more and more, doubt is cast on the implications of "final causes" and its efficacy as a tool for the advancement of science. The writings of Hume, Goethe, and Kant all argue in varying degrees against the held belief of teleology in nature, and they posit new ideas concerning man's relation to it.[63]

Of all the writings of this period, Kant's ideas had the greatest impact upon the prevailing man-nature ideology set down by Bacon, Descartes, and other 17th century natural philosophers. Kant's most penetrating arguments concerning the order, design, and place of man in nature are found in his *Critique of Teleological Judgment* (1790). He essentially called for the rejection of the cosmological and teleological proofs of natural philosophy. For Kant, the increasing intervention of man in nature cast increasing doubt on the traditional teleological explanation. As Kant said, "the freedom of man's causality enables him to adapt physical things to the purposes he has in view."[64]

If nature as a whole were governed by final causes, Kant argued, then every part of nature would demonstrate this. "But a more exact knowledge of the constitution of this basis of all organic production

60. *Id.*
61. M. ELIADE, THE SACRED AND THE PROFANE (1959).
62. BUTTERFIELD, *supra* note 14.
63. *Id.*
64. I. KANT, CRITIQUE OF JUDGMENT 214 (J. Bernard trans. 1951).

indicates no other causes than those working quite indesignedly, causes which rather destroy the favor the production of order and purpose."[65] Kant therefore concluded that regardless of the many fortuitous conveniences of nature in supporting life, the physical phenomena were not the result of purposeful design but result instead from "the effects of volcanic eruptions or of inundations of the oceans."[66]

The writings of these 18th century philosophers of "secondary causes" were at the heart of the emerging disciplines of natural history and later, positivism.[67] Natural history was distinct from natural or experimental philosophy in that it completely dispensed with any notion of final causes and in doing so, effectively secularized scientific investigation from any religious, moral, or ethical encumbrances which were the very crux of the methodology set down by Francis Bacon. The sustained effect of this process of "demythologizing" into modern times ended by stripping the cosmos of all inherent purpose. Nature, for example, becomes a collection of bodies in eternally lawful motion whereas once it had represented an omnipresent mystery of great religious significance. Mircea Eliade elaborates on this in his book, *The Sacred and the Profane:*

> For the non-religious men of the modern age, the cosmos has become opaque, inert, mute; it transmits no message, it holds no cipher. . . . Their religious experience is no longer open to the cosmos. In the last analysis, it is a strictly private experience; salvation is a problem that concerns man and his God; at most, man recognizes that he is responsible not only to God but also to history. But in these man-God-history relationships, there is no place for the cosmos. From this, it would appear that even for a genuine Christian, the world is no longer felt as the work of God.[68]

Carl Jung also offers some interesting thoughts pertaining to the secularization of science:

> The conflict between science and religion is in reality a misunderstanding of both. Scientific materialism has merely introduced a new hypothesis, and that is an intellectual sin. It has given another name to the supreme principle of reality and has assumed that it created a new thing and destroyed an old. Whether you call the principle of existence "God," "matter," "energy," or anything else you like, you have created nothing; you have simply changed a symbol.[69]

65. *Id.* at 277.
66. *Id.*
67. LEISS, *supra* note 28.
68. ELIADE, *supra* note 61, at 178-79.
69. C. JUNG, THE PORTABLE JUNG 483 (J. Campbell ed. 1976).

In this sense, man has simply supplanted religion with science as the life force of modern society. The consequence of this view is to set the relationship of man and the world in the context of *domination;* man either must submit to these natural laws or attempt to master them; since they possess no purpose, or at least none we can understand, there is no possibility of reconciling his objectives with those of the natural order.[70]

In summary then, when the concept of the conquest of nature is thoroughly secularized, the ethical limitations implicit in the pact between God and man lose their efficacy. The religious casing in which Bacon and other Enlightenment reformers embedded their ideas gradually fell away under the onslaught of subsequent scientific and philosophical endeavor, but the idea itself emerged intact and, in secular dress, sparked the widespread practices of exploitation found in later periods.[71] What concealed the crisis until the 20th century was the continued importance of religion, which managed to keep the structure of moral values in some state of repair despite the changing social and intellectual climate. But the overwhelming success of the marriage between industry and the new science, and the growing authority of the scientific methodology, spelled inevitable defeat for the traditional scheme of religiously based ethics.[72] For Bacon and his contemporaries, religion had provided the framework for understanding science as a human activity. The failure of that link in modern times is largely responsible for the world-wide political, social, and environmental crises we are faced with today.

SCIENCE AND THE NEW WORLD

The widespread acceptance of science as a tool for human betterment, discussed above, was paralleled in time by the opening of the New World by European explorers. In fact, it can be said that the new Western frontier provided the fuel for the emerging technological machine. As Walter Prescott Webb explains in his book, *The Great Frontier:* "[T]he sudden acquisition of land, and other forms of wealth by the people of Europe precipitated a boom on Western civilization, and the boom lasted as long as the frontier was open."[73] The institutions established during this boom, Webb points out, therefore were adapted to boom conditions. "It was in this atmosphere and under these conditions that democracy, capitalism, and

70. LEISS, *supra* note 28.
71. *Id.*
72. *Id.*
73. W. WEBB, THE GREAT FRONTIER 413 (1964).

individualism of the modern type come to their dominant position."[74]

When one couples the declining influence of religion with the exploding importance of technology, it is evident just how instrumental the resource pool of the New World (especially America) was in determining the future characteristics of industrial society. Therefore it is not surprising that the closing of the western frontier in the late 1800s had a decided effect on a civilization that had based its culture on perpetual expansion, achieved through the implementation of seemingly inexhaustible resources from the New World frontier.[75] Hence, we observe in the United States the emergence of the Progressive Conservation Movement sparked by Gifford Pinchot and Theodore Roosevelt—a movement derived from "the fear of running out of resources and losing the competitive edge in international politics."[76] Thus, the Progressive movement was basically an elite scientific movement geared toward the efficient use of resources to guarantee sustained economic well-being; it was not particularly concerned with the more general questions of quality of life or the quality of the environment.[77]

It is not until the 1960s that we observe a new and much different impulse concerning the environment and man's relation to it.

THE ENVIRONMENTAL MOVEMENT

Although the term "ecology" had been used for decades by professional people, it became a household item only in the late 1960s. The explosion of popular concern over environmental issues provided the impetus for a new environmental movement unprecedented in its approach to problems of man and his relation to nature.

The roots of this movement are as diverse as they are numerous. However, in the broadest sense, ecological thinking came down from Darwin, who gave in his *Origin of Species* (1859), a never-to-be-forgotten example of the relatedness of apparently unconnected organisms.[78] Darwin's concept of the "web of life" served as a harbinger for the infant discipline of ecology.

With the rudiments of a science set down to deal with the relationship of living things to their environment, what emerged next was the

74. *Id.*
75. *See* W. BURCH, DAYDREAMS AND NIGHTMARES (1971).
76. R. NASH, WILDERNESS AND THE AMERICAN MIND 251 (1973).
77. S. HAYS, CONSERVATION AND THE GOSPEL OF EFFICIENCY (1959).
78. Fleming, *Roots of the New Conservation Movement*, 6 PERSPECTIVES AM. HIST. 7 (1972).

clear perception of a problem. In this context, the appearance in 1864 of George Perkins Marsh's *Man and Nature* marked a turning point in man's conception of his own actions. Better summarized by its subtitle, "The Earth as Modified by Human Action," Marsh's treatise was the catalyzing force in the conversion of the realization that human activities might have adverse environmental consequences into an organized movement. If Darwin and Marsh provided the ecological and practical bases for developing environmental concerns, the transcendantalists, best exemplified by Emerson and Thoreau, provided the ethical justification. Derived primarily from Romanticism, transcendentalism looked to nature for the source of spiritual enlightenment–a distinct departure from the traditional Judeo-Christian ethic.[79]

Today's environmental concerns thus can be attributed to the expansion, embellishment, and intermingling of the three basic sources discussed above. The *impulse* for the movement, however, cannot be compared with any other: it went far beyond the Progressive doctrine of efficient resource utilization and did not stop with the prospect of ugliness in the world. The new driving impulse transcended concern for quality of life to fear for life itself. Americans came to realize that man was vulnerable. More precisely, they began to see man as part of a larger community of life, dependent for his survival on the integrity of ecosystems and on the health of the total environment. Man, in short, was rediscovered as being part of nature.[80]

The awareness of environmental degradation grew rapidly in the preachings of such people as Rachel Carson,[81] Barry Commoner,[82] Paul Ehrlich[83] and Garrett Hardin.[84] But the awakening of the early 1960s represented only a politico-scientific awakening. It told us that mankind's survival depended upon halting certain forms of environmental degradation. It questioned only the presence of these problems and sought their elimination. It did not concern itself with the underlying reasons for these problems and to this extent, dealt only with the external symptoms of a much more fundamental social and cultural problem. Gradually, it came to be realized that environmental crises, like other social problems, emerge when the traditional social myths and rhetoric are questioned and new ones compete for their replacement.[85]

79. *Id.*
80. NASH, *supra* note 76.
81. R. CARSON, SILENT SPRING (1962).
82. B. COMMONER, SCIENCE AND SURVIVAL (1966).
83. P. EHRLICH, THE POPULATION BOMB (1968).
84. Hardin, *The Tragedy of the Commons* 162 SCI. 1243 (1968).
85. BURCH, *supra* note 75.

It was not until the early 1970s, however, that the environmental issue came full circle and was transformed into essentially an ethical and ideological controversy. This metamorphosis came at least partially as a result of the widespread infusion of the middle 1960s counterculture movement into the environmental arena.[86] Woodstock proved to be more than simply a large scale rock concert and a forum for anti-war sentiments. It simultaneously marked the dissolution of the counterculture movement and the sublimation of its energies, goals, and beliefs into a more tangible and hence, socially condoned movement of "participatory ecology." Less than a year later in April of 1970, the new environmental movement was officially celebrated by Earth Day. The fundamental feature of this movement, which distinguished it from any previous conservation effort, was the belief that saving the environment is impossible without changes in the economic, social, and ideological fabric of the modern world. The new movement extended the "new conservation" from the physical environment to the social and cultural one—from man's effects on nature to his strategies for managing it.[87]

As writers from the various schools of the environmental movement recognized one connection or another between the environment and some other field or discipline, the realm of ecological study quickly spread to every facet of society. Such an ecological approach can be seen developing in the writings of Aldo Leopold (whose book, *A Sand County Almanac*[88] is still considered to be the classic statement of the land ethic) and later, the admonitions of Rachel Carson and Barry Commoner discussed above. Finally in the 1970s we see the ecological approach coalescing with such diverse individuals as Buckminster Fuller, Ian McHarg, Rene Dubos, and Max Nicholson.

Fuller, whose professed field is that of "comprehensive anticipatory design science," has revolutionized the approach to architecture and design through the application of ecological and biological principles. His concepts of "ephemeralization" and "doing more with less" have become accepted ideals within the ever-widening body of environmental literature.[89] Similarly, Ian McHarg, head of the Department of Landscape Architecture and Regional Planning at the

86. The counterculture movement of the 1960's is certainly only one, albeit a very important, element of the emerging environmental constituency. Indeed, the environmental movement is unique to the extent to which it has drawn its coalition from across class and interest lines. For an interesting discussion of this idea see Andrews, *Class Politics or Democratic Reform: Environmentalism and American Political Institutions,* 20 NAT. RES. J. 221 (1980).

87. Anderson, *Radical Ecology: Notes on a Conservation Movement,* 4 BIOLOGICAL CONSERVATION 285 (1972).

88. A. LEOPOLD, A SAND COUNTY ALMANAC (1949).

89. *See* B. FULLER, *AN OPERATING MANUAL FOR SPACESHIP EARTH* (1970).

University of Pennsylvania, initiated a new approach to land-use planning known as "physiographic determinism" or "design with nature."[90] He simply proposed to change the usual order of planning procedure and start with a presumption for nature by first identifying those areas most important to natural processes. Rene Dubos, an eminent microbiologist, has gone so far as to seek the adoption of ecological principles in relation to viruses and other microorganisms.[91] Finally, Max Nicholson has called for the application of ecological principles to human affairs in hopes it may overcome the dilemmas associated with traditional forms of social order and offer a more natural, constructive, and diverse life style.[92]

Thus, the ecological crisis can be seen not merely as an imbalance in the biological system produced by man, nor simply a problem of exhausted, misused, or dirtied resources. It is a crisis resulting directly from man's own social ecology—his science, his technology, and his culture.[93] Jacques Monod, in his book, *Chance and Necessity*, elucidates this problem all too clearly:

> Modern societies accepted the treasures and the power that science laid in their laps. But they have not accepted—they have scarcely even heard—its profounder message: the defining of a new and unique source of truth, and the demand for a thorough revision of ethical premises. . . . Armed with all the powers, enjoying all the riches they owe to science, our societies are still trying to live by and to teach systems of values already blasted at the root by science itself. . . . What ails the modern spirit is this lie gripping man's moral and social nature at the very core. It is this ailment, more or less confusedly diagnosed, that provokes the fear if not hatred—in any case the estrangement—felt toward scientific culture by so many people today. Their aversion, when openly expressed, usually directs itself at the technological by-products of science: the bomb, the destruction of nature, the soaring population.[94]

Thus, the fearful recognition of overt technological destruction serves only as an indicator of a much more deep-seated disorder. The core of this disorder lies in the dualism between "objective truth" or science on the one hand, and subjective values or ethics on he other. The former cannot function properly unless it is grounded in the latter. Hence,

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90. I. McHARG, DESIGN WITH NATURE (1971).
91. R. DUBOS, A GOD WITHIN (1972).
92. M. NICHOLSON, THE BIG CHANGE (1973).
93. Steck, *Power and the Liberation of Nature: The Politics of Ecology*, 1 ALTERNATIVES/PERSPECTIVES ON SOC'Y & ENVIRONMENT 4 (1971).
94. J. MONOD, CHANGE AND NECESSITY 172 (1972).

> [T]he way to solve the conflict between human values and technological needs is not to run away from technology. That's impossible. The way to resolve the conflict is to break down the barriers of dualistic thought that prevent a real understanding of what technology is—not an exploitation of nature, but a fusion of nature and the human spirit into a new kind of creation that transcends both.[95]

Such is the potential function of ecology. Ecology is the great connector. The processes of ecology are not power seeking, or absolutist. Instead, the ways of ecology are searching, realistic, and constructive, but they are also widely tolerant of variety and individuality.[96]

The environmental revolution thus can be likened to the European Renaissance. As in the Renaissance, a fresh dynamic is arising partly from the revolt of individuals against archaic laws, rules, and conventions, and partly from the disillusionment and contempt at the great gulf between the stated intentions of established institutions and their actual conduct and results. Most importantly, however, the environmental movement, like the Renaissance, seeks to return to "stubborn fact"—to narrow the gap between scientific nature and intuited nature. Over the course of 200 years, science has become increasingly abstract and, as such, has become virtually separated from the everyday perception of the world. Modern science seeks to define the structure and processes of nature in ideal or mathematical terms; the result is that the life-world is relegated to the realm of purely subjective experience from the viewpoint of science, despite the fact that this is the world in which all human activity occurs.[97] Thus the environmental revolution, by returning to "stubborn facts," seeks somehow to reconcile the workings of a highly abstract scientific and technological machine with the limitations and preferences of the world of everyday experience.

As such, the new environmental movement represents an attempt to reinstate a mode of control over scientific and technological development—the fulfillment of the Baconian creed so long without means of ethical control. As previously discussed, the Baconian formulation of the idea of human dominance over nature is internally consistent only in a religious context. But as the foundations of this idea have become increasingly secularized, neither reason nor religion have been capable of guiding the search for power over nature and of preventing such activities from becoming self-destructive. Contrary

95. PIRSIG, *supra* note 2, at 284.
96. NICHOLSON, *supra* note 92.
97. LEISS, *supra* note 28.

to Bacon's great expectations, modern scientific and technological rationality have failed to escape the hold of more powerful mechanisms kept in motion by irrational social conditions.[98]

Bacon's concept presumes a link between the increasing control of external nature and a complementary element of human self-control which would serve as a guide to the social application of this power. Such a doctrine has proven inoperative in the absence of effective religious and/or ethical controls; instead it has resulted in the exploitation of nature as well as man. As William Burch points out, it seems that "when men not gods make miracles, the good works always contain the seeds of human terror, and it is a terror all the more frightening because we feel that we should understand it. Thus rationality tends to become the most terrifying of irrationalities."[99] To transcend this dilemma means not to reject the entire situation, but rather to preserve its positive elements within the outlines of a new formulation that will serve us better.

This, then, is the real significance of the new environmental movement—it provides the parascientific ethics through which science again can be applied humanistically to technology. It provides the link between "progress" and quality. In essence, it is a new religion of self-restraint through ecological awareness, a theology of the earth, a perception of every person's undeniable link with the ever shrinking capacity of "spaceship earth."

The overt sanctions of this new mode of self-restraint are fundamentally different from those envisioned by Bacon—the precepts of ecology rather than the decrees of God. But perhaps they are not so very different after all. The general effect is the same; a reverence for life in all its guises as a manifestation of a single, unified, creative process. The one truly fundamental difference, however, is that in the ecological ethic, man himself disposes of the powers of life or death over the other species, whereas in the earlier scheme, only God could have withdrawn the license to live from any of His creations.[100]

The responsibility for maintaining all forms of life is now totally human. May God help us.

98. *Id.*
99. BURCH, *supra* note 75, at 159.
100. Fleming, *supra* note 78.