concentrations will be a function of the "life spans" of the organisms in the system. Thus, the top carnivores, which play an important role in stabilizing the system, may take a long time to respond to the input of DDT. Since DDT is reducing predator numbers in present ecosystems, new population explosions may result.

The ecosystems making up the world biosphere might restabilize after the loss of a species, but with different population levels of the remaining species. Radical changes in population levels could have serious economic and public nuisance consequences. Further, the DDT once present in the obliterated populations will then be concentrated into fewer remaining species. Whether or not this process could be repeated in a series of systematic obliterations of the species in upper trophic levels with a consequent concentration of DDT into remaining species cannot be predicted at this time. However, with the models presented here, it can be predicted that the consequence of the present worldwide inputs of DDT in the environment will not become apparent for many years.


**References and Notes**

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# The Cultural Basis for Our Environmental Crisis

Judeo-Christian tradition is only one of many cultural factors contributing to the environmental crisis.


Lewis W. Moncrief


One hundred years ago at almost any location in the United States, potable water was no farther away than the closest brook or stream. Today there are hardly any streams in the United States, except in a few high mountainous reaches, that can safely satisfy human thirst without chemical treatment. An oft-mentioned satisfaction in the lives of urbanites in an earlier era was a leisurely stroll in late afternoon to get a breath of fresh air in a neighborhood park or along a quiet street. Today in many of our major metropolitan areas it is difficult to find a quiet, peaceful place to take a leisurely stroll and sometimes impossible to get a breath of fresh air. These contrasts point up the dramatic changes that have occurred in the quality of our environment.

It is not my intent in this article, however, to document the existence of an environmental crisis but rather to discuss the cultural basis for such a crisis. Particular attention will be given to the institutional structures as expressions of our culture.

## Social Organization

In her book entitled *Social Institutions* (*1*), J. O. Hertzler classified all social institutions into nine functional categories: (i) economic and industrial, (ii) matrimonial and domestic, (iii) political, (iv) religious, (v) ethical, (vi) educational, (vii) communications, (viii) esthetic, and (ix) health. Institutions exist to carry on each of these functions in all cultures, regardless of their location or relative complexity. Thus, it is not surprising that one of the analytical criteria used by anthropologists in the study of various cultures is the comparison and contrast of the various social institutions as to form and relative importance (*2*).


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This article is based on an address given at a Man and Environment Conference at Arizona State University on 16 April 1970.

A number of attempts have been made to explain attitudes and behavior that are commonly associated with one institutional function as the result of influence from a presumably independent institutional factor. The classic example of such an analysis is *The Protestant Ethic and the Spirit of Capitalism* by Max Weber (*3*). In this significant work Weber attributes much of the economic and industrial growth in Western Europe and North America to capitalism, which, he argued, was an economic form that developed as a result of the religious teachings of Calvin, particularly spiritual determinism.

Social scientists have been particularly active in attempting to assess the influence of religious teaching and practice and of economic motivation on other institutional forms and behavior and on each other. In this connection, L. White (*4*) suggested that the exploitative attitude that has prompted much of the environmental crisis in Western Europe and North America is a result of the teachings of the Judeo-Christian tradition, which conceives of man as superior to all other creation and of everything else as created for his use and enjoyment. He goes on to contend that the only way to reduce the ecologic crisis which we are now facing is to "reject the Christian axiom that nature has no reason for existence save to serve man." As with other ideas that appear to be new and novel, Professor White's observations have begun to be widely circulated and accepted in scholarly circles, as witness the article by religious writer E. B. Fiske in the *New York Times* earlier this year (*5*). In this article, note is taken of the fact that several prominent theologians and theological groups have accepted this basic premise that Judeo-Christian doctrine regarding man's relation to the rest of creation is at the root of the West's environmental crisis. I would suggest that the wide acceptance of such a simplistic explanation is at this point based more on fad than on fact.

Certainly, no fault can be found with White's statement that "Human ecology is deeply conditioned by beliefs about our nature and destiny—that is, by religion." However, to argue that it is the primary conditioner of human behavior toward the environment is much more than the data that he cites to support this proposition will bear. For example, White himself notes very early in his article that there is evidence for the idea that man has been dramatically altering his environment since antiquity. If this be true, and there is evidence that it is, then this mediates against the idea that the Judeo-Christian religion uniquely predisposes cultures within which it thrives to exploit their natural resources with indiscretion. White's own examples weaken his argument considerably. He points out that human intervention in the periodic flooding of the Nile River basin and the fire-drive method of hunting by prehistoric man have both probably wrought significant "unnatural" changes in man's environment. The absence of Judeo-Christian influence in these cases is obvious.

It seems tenable to affirm that the role played by religion in man-to-man and man-to-environment relationships is one of establishing a very broad system of allowable beliefs and behavior and of articulating and invoking a system of social and spiritual rewards for those who conform and of negative sanctions for individuals or groups who approach or cross the pale of the religiously unacceptable. In other words, it defines the ball park in which the game is played, and, by the very nature of the park, some types of games cannot be played. However, the kind of game that ultimately evolves is not itself defined by the ball park. For example, where animism is practiced, it is not likely that the believers will indiscriminately destroy objects of nature because such activity would incur the danger of spiritual and social sanctions. However, the fact that another culture does not associate spiritual beings with natural objects does not mean that such a culture will invariably ruthlessly exploit its resources. It simply means that there are fewer social and psychological constraints against such action.

In the remainder of this article, I present an alternative set of hypotheses based on cultural variables which, it seems to me, are more plausible and more defensible as an explanation of the environmental crisis that is now confronting us.

No culture has been able to completely screen out the egocentric tendencies of human beings. There also exists in all cultures a status hierarchy of positions and values, with certain groups partially or totally excluded from access to these normatively desirable goals. Historically, the differences in most cultures between the "rich" and the "poor" have been great. The many very poor have often produced the wealth for the few who controlled the means of production. There may have been no alternative where scarcity of supply and unsatiated demand were economic reality. Still, the desire for a "better life" is universal; that is, the desire for higher status positions and the achievement of culturally defined desirable goals is common to all societies.

### The Experience in the Western World

In the West two significant revolutions that occurred in the 18th and 19th centuries completely redirected its political, social, and economic destiny (*6*). These two types of revolutions were unique to the West until very recently. The French revolution marked the beginnings of widespread democratization. In specific terms, this revolution involved a redistribution of the means of production and a reallocation of the natural and human resources that are an integral part of the production process. In effect new channels of social mobility were created, which theoretically made more wealth accessible to more people. Even though the revolution was partially perpetrated in the guise of overthrowing the control of presumably Christian institutions and of destroying the influence of God over the minds of men, still it would be superficial to argue that Christianity did not influence this revolution. After all, biblical teaching is one of the strongest of all pronouncements concerning human dignity and individual worth.

At about the same time but over a more extended period, another kind of revolution was taking place, primarily in England. As White points out very well, this phenomenon, which began with a number of technological innovations, eventually consummated a marriage with natural science and began to take on the character that it has retained until today (*7*). With this revolution the productive capacity of each worker was amplified by several times his potential prior to the revolution. It also became feasible to produce goods that were not previously producible on a commercial scale.

Later, with the integration of the democratic and the technological ideals, the increased wealth began to be distributed more equitably among the population. In addition, as the capital to land ratio increased in the production process and the demand grew for labor to work in the factories, large populations from the agrarian hinterlands began to concentrate in the emerging

industrial cities. The stage was set for the development of the conditions that now exist in the Western world.

With growing affluence for an increasingly large segment of the population, there generally develops an increased demand for goods and services. The usual by-product of this affluence is waste from both the production and consumption processes. The disposal of that waste is further complicated by the high concentration of heavy waste producers in urban areas. Under these conditions the maxim that "Dilution is the solution to pollution" does not withstand the test of time, because the volume of such wastes is greater than the system can absorb and purify through natural means. With increasing population, increasing production, increasing urban concentrations, and increasing real median incomes for well over a hundred years, it is not surprising that our environment has taken a terrible beating in absorbing our filth and refuse.

## The American Situation

The North American colonies of England and France were quick to pick up the technical and social innovations that were taking place in their motherlands. Thus, it is not surprising that the inclination to develop an industrial and manufacturing base is observable rather early in the colonies. A strong trend toward democratization also evidenced itself very early in the struggle for nationhood. In fact, Thistlewaite notes the significance of the concept of democracy as embodied in French thought to the framers of constitutional government in the colonies (*8*, pp. 33–34, 60).

From the time of the dissolution of the Roman Empire, resource ownership in the Western world was vested primarily with the monarchy or the Roman Catholic Church, which in turn bestowed control of the land resources on vassals who pledged fealty to the sovereign. Very slowly the concept of private ownership developed during the Middle Ages in Europe, until it finally developed into the fee simple concept.

In America, however, national policy from the outset was designed to convey ownership of the land and other natural resources into the hands of the citizenry. Thomas Jefferson was perhaps more influential in crystallizing this philosophy in the new nation than anyone else. It was his conviction that an agrarian society made up of small landowners would furnish the most stable foundation for building the nation (*8*, pp. 59–68). This concept has received support up to the present and, against growing economic pressures in recent years, through government programs that have encouraged the conventional family farm. This point is clearly relevant to the subject of this article because it explains how the natural resources of the nation came to be controlled not by a few aristocrats but by many citizens. It explains how decisions that ultimately degrade the environment are made not only by corporation boards and city engineers but by millions of owners of our natural resources. This is democracy exemplified!

## Challenge of the Frontier

Perhaps the most significant interpretation of American history has been Fredrick Jackson Turner's much criticized thesis that the western frontier was the prime force in shaping our society (*9*). In his own words,

> If one would understand why we are today one nation, rather than a collection of isolated states, he must study this economic and social consolidation of the country. . . . The effect of the Indian frontier as a consolidating agent in our history is important.

He further postulated that the nation experienced a series of frontier challenges that moved across the continent in waves. These included the explorers' and traders' frontier, the Indian frontier, the cattle frontier, and three distinct agrarian frontiers. His thesis can be extended to interpret the expansionist period of our history in Panama, in Cuba, and in the Philippines as a need for a continued frontier challenge.

Turner's insights furnish a starting point for suggesting a second variable in analyzing the cultural basis of the United States' environmental crisis. As the nation began to expand westward, the settlers faced many obstacles, including a primitive transportation system, hostile Indians, and the absence of physical and social security. To many frontiersmen, particularly small farmers, many of the natural resources that are now highly valued were originally perceived more as obstacles than as assets. Forests needed to be cleared to permit farming. Marshes needed to be drained. Rivers needed to be controlled. Wildlife often represented a competitive threat in addition to being a source of food. Sod was considered a nuisance—to be burned, plowed, or otherwise destroyed to permit "desirable" use of the land.

Undoubtedly, part of this attitude was the product of perceiving these resources as inexhaustible. After all, if a section of timber was put to the torch to clear it for farming, it made little difference because there was still plenty to be had very easily. It is no coincidence that the "First Conservation Movement" began to develop about 1890. At that point settlement of the frontier was almost complete. With the passing of the frontier era of American history, it began to dawn on people that our resources were indeed exhaustible. This realization ushered in a new philosophy of our national government toward natural resources management under the guidance of Theodore Roosevelt and Gifford Pinchot. Samuel Hays (*10*) has characterized this movement as the appearance of a new "Gospel of Efficiency" in the management and utilization of our natural resources.

## The Present American Scene

America is the archetype of what happens when democracy, technology, urbanization, capitalistic mission, and antagonism (or apathy) toward natural environment are blended together. The present situation is characterized by three dominant features that mediate against quick solution to this impending crisis: (i) an absence of personal moral direction concerning our treatment of our natural resources, (ii) an inability on the part of our social institutions to make adjustments to this stress, and (iii) an abiding faith in technology.

The first characteristic is the absence of personal moral direction. There is moral disparity when a corporation executive can receive a prison sentence for embezzlement but be congratulated for increasing profits by ignoring pollution abatement laws. That the absolute cost to society of the second act may be infinitely greater than the first is often not even considered.

The moral principle that we are to treat others as we would want to be treated seems as appropriate a guide as it ever has been. The rarity of such teaching and the even more uncommon instance of its being practiced help to explain how one municipality can, without scruple, dump its effluent into a stream even though it may do irreparable damage to the resource and add

tremendously to the cost incurred by downstream municipalities that use the same water. Such attitudes are not restricted to any one culture. There appears to be an almost universal tendency to maximize self-interests and a widespread willingness to shift production costs to society to promote individual ends.

Undoubtedly, much of this behavior is the result of ignorance. If our accounting systems were more efficient in computing the cost of such irresponsibility both to the present generation and to those who will inherit the environment we are creating, steps would undoubtedly be taken to enforce compliance with measures designed to conserve resources and protect the environment. And perhaps if the total costs were known, we might optimistically speculate that more voluntary compliance would result.

A second characteristic of our current situation involves institutional inadequacies. It has been said that "what belongs to everyone belongs to no one." This maxim seems particularly appropriate to the problem we are discussing. So much of our environment is so apparently abundant that it is considered a free commodity. Air and water are particularly good examples. Great liberties have been permitted in the use and abuse of these resources for at least two reasons. First, these resources have typically been considered of less economic value than other natural resources except when conditions of extreme scarcity impose limiting factors. Second, the right of use is more difficult to establish for resources that are not associated with a fixed location.

Government, as the institution representing the corporate interests of all its citizens, has responded to date with dozens of legislative acts and numerous court decisions which give it authority to regulate the use of natural resources. However, the decisiveness to act has thus far been generally lacking. This indecisiveness cannot be understood without noting that the simplistic models that depict the conflict as that of a few powerful special interests versus "The People" are altogether inadequate. A very large proportion of the total citizenry is implicated in environmental degradation; the responsibility ranges from that of the board and executives of a utility company who might wish to thermally pollute a river with impunity to that of the average citizen who votes against a bond issue to improve the efficiency of a municipal sanitation system in order to keep his taxes from being raised. The magnitude of irresponsibility among individuals and institutions might be characterized as falling along a continuum from highly irresponsible to indirectly responsible. With such a broad base of interests being threatened with every change in resource policy direction, it is not surprising, although regrettable, that government has been so indecisive.

A third characteristic of the present American scene is an abiding faith in technology. It is very evident that the idea that technology can overcome almost any problem is widespread in Western society. This optimism exists in the face of strong evidence that much of man's technology, when misused, has produced harmful results, particularly in the long run. The reasoning goes something like this: "After all, we have gone to the moon. All we need to do is allocate enough money and brainpower and we can solve any problem."

It is both interesting and alarming that many people view technology almost as something beyond human control. Rickover put it this way (*11*):

> It troubles me that we are so easily pressured by purveyors of technology into permitting so-called "progress" to alter our lives without attempting to control it—as if technology were an irrepressible force of nature to which we must meekly submit.

He goes on to add:

> It is important to maintain a humanistic attitude toward technology; to recognize clearly that since it is the product of human effort, technology can have no legitimate purpose but to serve man—man in general, not merely some men; future generations, not merely those who currently wish to gain advantage for themselves; man in the totality of his humanity, encompassing all his manifold interests and needs, not merely some one particular concern of his. When viewed humanistically, technology is seen not as an end in itself but a means to an end, the end being determined by man himself in accordance with the laws prevailing in his society.

In short, it is one thing to appreciate the value of technology; it is something else entirely to view it as our environmental savior—which will save us in spite of ourselves.

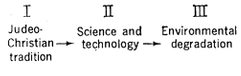
## Conclusion

The forces of democracy, technology, urbanization, increasing individual wealth, and an aggressive attitude toward nature seem to be directly related to the environmental crisis now being confronted in the Western world. The Judeo-Christian tradition has probably influenced the character of each of these forces. However, to isolate religious tradition as a cultural component and to contend that it is the "historical root of our ecological crisis" is a bold affirmation for which there is little historical or scientific support.

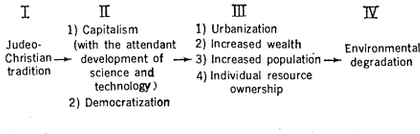
To assert that the primary cultural condition that has created our environmental crisis is Judeo-Christian teaching avoids several hard questions. For example: Is there less tendency for those who control the resources in non-Christian cultures to live in extravagant affluence with attendant high levels of waste and inefficient consumption? If non-Judeo-Christian cultures had the same levels of economic productivity, urbanization, and high average household incomes, is there evidence to indicate that these cultures would not exploit or disregard nature as our culture does?

If our environmental crisis is a "religious problem," why are other parts of the world experiencing in various degrees the same environmental problems that we are so well acquainted with in the Western world? It is readily observable that the science and technology that developed on a large scale first in the West have been adopted elsewhere. Judeo-Christian tradition has not been adopted as a predecessor to science and technology on a comparable scale. Thus, all White can defensibly argue is that the West developed modern science and technology *first*. This says nothing about the origin or existence of a particular ethic toward our environment.

In essence, White has proposed this simple model:




I have suggested here that, at best, Judeo-Christian teaching has had only an indirect effect on the treatment of our environment. The model could be characterized as follows:




Even here, the link between Judeo-Christian tradition and the proposed dependent variables certainly have the least empirical support. One need only look at the veritable mountain of criticism of Weber's conclusions in *The Protestant Ethic and the Spirit of Cap-*

*italism* to sense the tenuous nature of this link. The second and third phases of this model are common to many parts of the world. Phase I is not.

Jean Mayer (*12*), the eminent food scientist, gave an appropriate conclusion about the cultural basis for our environmental crisis:

It might be bad in China with 700 million poor people but 700 million rich Chinese would wreck China in no time. . . . It's the rich who wreck the environment . . . occupy much more space, consume more of each natural resource, disturb ecology more, litter the landscape . . . and create more pollution.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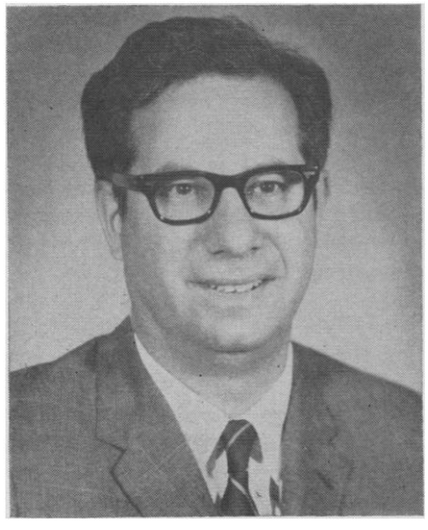
**NEWS AND COMMENT**

# R&D Funding: Top Treasury Aide Decries Blind Faith Approach

The government's top financial officers rarely, if ever, make pronouncements on financial support for science and technology, preferring to leave such arcane subjects to the small band of officials and academics who specialize in these areas. However, a conspicuous exception occurred 22 October, when Murray L. Weidenbaum, assistant secretary of the treasury for economic affairs, strongly assailed some of the criteria that have been employed to get funding—for both basic and developmental research—in the past. Too often, Weidenbaum said, science and technology are regarded "almost as something sacred and inviolable—any retardation of the rate of spending for research and development is viewed as no less a sin than the suppression of truth."

Weidenbaum's remarks were made in a speech prepared for delivery at the annual meeting in Houston of the American Institute of Aeronautics and Astronautics, of which he is an associate. The major thrust of his speech amounted to a complaint that large-scale scientific and technological projects are generally undertaken without hard, objective evidence to justify them. Though Weidenbaum was careful to name no specific projects, he is reliably known to have been referring primarily to the Apollo moon program and the supersonic transport—two projects which have been endorsed rather enthusiastically by his own Administration. To a lesser degree, his remarks also applied to expensive "pure science" projects, such as the building of linear accelerators. Weidenbaum suggested that, in the future, major projects should be justified by rigorous cost-benefit analyses, rather than simply by faith that they will ultimately prove beneficial to mankind. "I am amazed," he said, "when scientists say that we must embark upon a major technical project on faith—faith that through serendipity . . . it will turn out to be worthwhile after all."



Murray L. Weidenbaum

Weidenbaum has no direct responsibility himself for research and development funding, and he stressed that he was presenting his own views rather than those of the Administration, so his speech should not be interpreted as signaling a new "tough" attitude on the part of the federal government toward big science and technology. But to the extent that Weidenbaum's views percolate through to those officials who are directly responsible for research funding, they could end up having an impact on the future course of federal support for R & D. Already several such officials have requested copies of the speech. Moreover, Weidenbaum himself has a direct input into the new Productivity Commission which, among other tasks, is supposed to measure the productivity of government-financed R & D programs.

Though Weidenbaum's specialty is economics, he is no stranger to technological affairs. He served as chief economist for the Boeing Company in Seattle from 1958 to 1963 and he has also worked for the Convair Division of General Dynamics Corp. and for the Stanford Research Institute. Moreover, while serving as a professor and then chairman of the department of economics at Washington University in St. Louis from 1964 to 1969, he headed a study—financed by the National Aeronautics and Space Administration—of the economic impact of the space program and related aerospace activities. He has also served on a National Academy of Sciences committee that studied science, technology, and regional growth. What's more, Weidenbaum has