The Problem of Antiscientific Trends Today[1]

Kirtley F. Mather

Department of Geography, Harvard University, Cambridge, Massachusetts

ALTHOUGH SCIENCE AND SCIENTISTS have never enjoyed the wholehearted approval of all people everywhere, there is abundant evidence to indicate a very serious decline in their popularity during the past few years. The climate of public opinion has changed from one in which scientists could bask in the sunshine of widespread admiration, respect, and even awe, to one in which the storm clouds of suspicion, recrimination, and fear endanger the intellectual progress and continuing welfare of mankind. Recent trends in America are too well known to require documentation.

There are three responses that the scientist may make: He may emulate the fabled ostrich, bury his head in the sand, and refuse to admit that there are any clouds in the sky. He may retreat to his ivory tower (or his white-tiled laboratory) and wait until the storm blows over. Or he may analyze the contemporary situation, seek to discover the causes of adverse developments, and do his best to reverse the trend before it has done irreparable harm. Obviously, I prefer to take this third course.

In doing so, it is well to distinguish between science, a method of gaining knowledge and the means whereby human welfare may be improved, on the one hand, and scientists, the individuals who use that method and apply those means, on the other hand. The distinction is sadly blurred in the popular mind, as are so many other things, but it should be kept clear if we are to grapple successfully with our problem.

Critics of the philosophy and strategy of science have been with us for centuries. They were especially vocal during the latter half of the nineteenth century, when evolution was vigorously attacked because of its alleged antagonism to widely held religious beliefs. Their voices have reached a new crescendo in late years, and new charges are now being hurled along with variations of the earlier theme. Many still believe that the philosophy of science is mechanistic and materialistic, that it reduces man to something closely akin to a complicated machine, and denies, or at least minimizes, the spiritual aspects of human life. A considerable portion of the current antagonism to science in America stems from the suspicion that science may be largely responsible for the abandonment of moral principles and the destruction of ethical standards, which undoubtedly have occurred in recent years. The problems of human relationships have certainly become more acute as the fruits of scientific research have been increasingly applied to the practical affairs of everyday life.

One reaction to this situation on the part of many scientists has been to remind the critic that the social sciences are, in fact, much less advanced than the physical and biological sciences. Let the strategy of science be applied more intensively and extensively to the problems of the individual as a member of society and of the community as an organization of individuals, and soon all will be well with the world. What we need, to eradicate the existing evils, is not less, but more science, is the frequent response to this particular type of antiscientific criticism.

Although I am heartily in favor of "more science" and welcome every new insight gained in the social sciences, I do not believe that such a response will have any significant effect upon the current antiscientific trends. The thought that prompts it is fundamentally unsound. In the market place of public opinion, where ethical and moral values are appealing for recognition, appraisal, and loyalty, the sciences are neutral. The release of atomic energy from nuclear fission by chain reaction, for example, has no moral significance, in and of itself. It is what men do with this new and spectacularly dynamic form of energy that is either good or bad. The primary objective of science is to increase the efficiency of men, of their minds and bodies, their tools and implements, their techniques and institutions. But it is all too obvious that there is little if any correlation between scientific efficiency and righteous morality.

This has long been recognized by workers in the physical sciences and accepted for many aspects of the biological sciences. I believe it also applies to the social sciences. It is doubtless true that the development of the social sciences has thus far been prompted in the main by the desire to promote human welfare. Most social scientists are inspired by fine motives. Nevertheless, it is all too evident that the new knowledge of human behavior may be used to serve bad as well as good ends. Scientific methods of propaganda have been applied with great success by autocratic dictators to pervert great numbers of citizens in certain countries. Modern advertising campaigns are using this knowledge for ends that may be detrimental to social progress, as well as for highly commendable purposes. The use of the new social tech-

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niques by governments and pressure groups may prove to be more fundamental to the evolution of society in these times of rapid change than economic structures or social stratification. Even here, the knowledge and tools of science reveal themselves only as means to an end. And the end may be either beneficent or malevolent, depending upon the purpose toward which the technicians direct their efforts.

If this analysis of the limitations, as well as the powers, of science be anywhere near the mark, it suggests the strategy that should be used by those who seek to reverse the trend of antiscientific thinking in the popular mind, insofar as it derives from the consideration of morals and ethics. Let us not play the game according to the opposition's rules. Instead, let us have something to say about the rules ourselves. Do not apologize for the failure of science to do things that science alone cannot be expected to do. Displaying something of the humility that has always characterized every really great scientist through all the years, we should push the battle line forward into the very camp of the enemy. The great, imperative problems of our day cannot be solved unless something is added to the intelligence of science. The world's troubles are really caused by the fact that the dynamic of good will is not adequate to direct beneficially the vast resources of intelligence that are at hand.

If civilization is to be saved from catastrophe, the ethical consciousness of each of us must be greatly strengthened, renewed, and improved. The wellsprings of good will lie deep within the spirit of man, not in the outer, public world. Science discloses the imperative need; something that transcends science must assist men to respond to this challenge of our time. The scientist is just as responsible for failure or success along these lines as the nonscientist—neither more nor less responsible than every other intelligent citizen.

Let me be specific here. Nuclear physicists have frequently been castigated for their part in the production of the atomic bomb, the most efficient means of mass destruction we have thus far known. Other scientists are charged with what amounts to immorality for their indispensable assistance in the development of new ingredients of chemical and bacteriological warfare. Many scientists in various professional fields are criticized for not leaping precipitously to the barricades and demanding that all such new weapons be outlawed immediately by international agreement. Such antiscientific propaganda has had the beneficial effect of focusing the attention of scientists upon the social consequences of their work, but that by-product of this disparagement is merely a validation of the customary interpretation of the adage "It's an ill wind that blows nobody good."

Our strategy in meeting such charges of immoral purposes and unethical conduct follows directly from what was stated above. New knowledge gained through scientific research, no matter under what auspices the research is carried forward, provides the means with which to achieve objectives. It is no greater sin to kill people with the searing heat of an atomic explosion, or the paralyzing trauma of poison gas, than with the old-fashioned explosives of a saturation bombing mission, the bullets of machine guns or, for that matter, a crossbow or a stone ax. It is war itself that is immoral, not the weapons used by warriors. The critic of the scientific improvement of the means for waging war should therefore promptly be invited to join with us in the more important and most highly ethical project of discovering and eradicating the causes of war, in order that the world of humanity, with its present tensions and strife, may be transformed into a world of intelligent cooperation, in which adequate means for the restraint of aggressors will be established and there will be no valid excuse for the resort to war.

Few of the critics of modern science are aware of the extent to which research and development in each of the sciences, from psychology, sociology, and political science, through geology and geography with their emphasis upon conservation of resources, to biology, physics, chemistry, and even astronomy, are providing the data and the techniques necessary for progress in that direction. The only valid criticism that could be leveled against scientists on this score would be based upon their reticence and their reluctance to enter the public forum to exert an influence, commensurate with their insight, upon the currents of public opinion.

Here, however, one phase of the current antiscientific trend finds many scientists in a dilemma. Is it realistic to make unlimited promises about the benefits that mankind may derive from the applications of science? In the long run, will not all attempts to raise the standard of living in densely populated, underdeveloped countries prove futile? Demographers and conservationists do well to remind us that, if the increase in population resulting from improvements in economic conditions and the lowering of death rates is unrestrained, it may put an impossible burden upon available resources. But great care must be taken lest science be further discredited in the public mind. It is almost a case of "damned if we do and damned if we don't."

It is presumably the aim of scientists to enable men and societies to conduct their affairs in increasingly efficient and beneficent ways. Efficiency involves value judgments that are relatively easy to make; everybody agrees that penicillin is more efficient in the treatment of certain diseases than any drug at hand before antibiotics were available. Beneficence is in another category; the value judgments it involves are relatively difficult to make. Men of apparently equal intelligence differ widely in their appraisal of the multifarious procedures proposed for attaining contentment, happiness, and peace. No wonder there is much difference of opinion among the scientists of the United States concerning what is best for the people of India, China, Java, and Puerto Rico.

This is neither the time nor the place to marshal the data concerning fertility, mortality, and resources, both utilized and potential, in various parts of the

earth. Permit me merely to share with you some conclusions that seem to me to be justified.

At the present time, about 40 per cent of the earth's inhabitants appear to be living under conditions to which the Malthusian principle of external restraints does not apply. The rate of population increase is not for them determined by limitations upon the means of subsistence. The other 60 per cent of the world's population is apparently under the Malthusian restrictions. These are the closely crowded masses of large parts of Asia and certain regions of Africa and Europe, as well as a few localities in the Western Hemisphere. For one reason or another—be it ignorance or exploitation—these people are not taking full advantage of the opportunities that modern science and technology can provide for improving their means of subsistence. Give them the assistance and the freedom that they need to make the most of their own opportunities, and they will develop the same pattern of population change that has characterized every technologically advanced nation in recent years.

It is quite erroneous to use the statistics of recent population growth, as certain of the neo-Malthusians have been guilty of doing. The increase of the world population and the expansion of numbers in many nations during the first half of the twentieth century are unique phenomena in the history of mankind. Medical research, since the turn of the century, has greatly lengthened the average span of life. A large fraction of the people now living would long since have been dead, were it not for modern sanitation, public health measures, and medical or surgical treatment that was unavailable a century ago. It is, however, the lethal diseases of infancy, youth, and early maturity that have largely been conquered. Diseases of old age are still almost as obdurate as they have always been. Death rates have declined while the average age of the inhabitants of all technologically progressive communities has been advancing. But this trend must inevitably reach its limit. In spite of all that medical science can do, death rates will increase before long among such communities. We here in America, for example, will soon be "taking up the slack" resulting from the recent lengthening of our average life span.

Since 1900, the colored races have made considerable progress toward attaining the white man's death rate. In that advance the medical missionaries and the philanthropic foundations' doctors from the United States have lent an efficient helping hand. Progress toward attaining the white man's birth rate has been appreciable but much less rapid. Consequently, for the next few decades the colored peoples will increase in number more rapidly than the white. But the many complex and often subtle factors in human nature that bear upon reproductivity seem to be essentially the same, regardless of the pigmentation of the skin. In time—three or four decades for some communities, six or eight for others—the balance between fertility and mortality among colored peoples will be similar to that among white people.

It is quite unrealistic to take, for example, the recent percentage growth of the population of India and project it into the future, with the warning that within a century a billion Indians will be jostling one another for food. By the same token, it is altogether fallacious to suggest that continuance of medical missions and further indoctrination of the people of India and China with modern techniques of public health will permit them suddenly to acquire the low death rate of the United States, with a resulting "population explosion" that would have dire consequences. The trend of the recent past is far more likely to continue. Gradually, the death rate will continue to decline and at the same time the birth rate, lagging somewhat behind, will be reduced.

Without going into the technicalities of birth control, or "planned parenthood," as we in Massachusetts prefer to call it, or of the psychological and sociological factors that influence the birth rate in various communities, certain significant correlations may be noted. There is an almost perfect inverse correlation between the birth rate and the per capita consumption of pig iron among the nations. The higher the consumption of pig iron—i.e., the greater the industrialization—the lower is the birth rate. Similarly, there is an almost perfect correlation between literacy and birth rate. The higher the percentage of illiteracy in a nation, the higher the birth rate.

If, then, we are interested in reducing the birth rate among non-Caucasian peoples and thus hastening the stabilization of population in such countries as India, China, Java, and Puerto Rico, the method to be followed is clearly evident: Assist the inhabitants of those countries to accelerate their progress toward mechanization of industry, agriculture, and commerce, and help them in their efforts to reduce illiteracy. The future for such members of the human family is by no means hopeless. Their problems are exceedingly difficult—perhaps even more difficult than our own. But they can be solved. I see no excuse for selling science short.

It is of course true that we have been plundering the earth. But the mistakes of the past are being corrected. We now know how to use without destroying. And it is by no means too late to apply good will, as well as intelligence, to the conservation of nature's stored capital and the expenditure of man's annual income from renewable resources.

It is also true that the road to survival leads to wise adjustment between populations and available resources. Science and technology have charted that road. Mother Earth is rich enough to nourish every man in freedom. Ours is an age of potential abundance, as well as of inescapable interdependence.

Unfortunately, there are people in our country who do not welcome the thought that they should adjust their own lives and the policies of the nation to the requirements of that sort of world. They seem to prefer the strategy of grabbing while the grabbing is good, lest there not be enough to go around. To accept

the fact of interdependence of all the human beings who dwell upon our little planet goes definitely against the grain.

Scientists, by the very nature of their mental habits, are internationalistic rather than chauvinistic in their outlook. They are accustomed to the study of a neutral world of objective facts that are the same, regardless of what nation the observer is a citizen, or to which of the races of men he belongs. They know that there are fellow-scientists in foreign lands who are working on problems more or less akin to those of their own research projects. They recall the beneficial results of free exchange of information and ideas among the scientists of many nationalities in most of the significant scientific discoveries of the past. They are more aware than anyone else of the tremendous indebtedness of American technology to the scientific research prosecuted by citizens of other countries, even since science came of age in America. They know that the progress of science is most rapid when there is the greatest freedom for uninhibited communication among the scientists of the world, such as was provided by the many international scientific organizations, with their world-wide distribution of publications, that were established during the latter part of the nineteenth and the early part of the twentieth centuries. Therefore they want to reduce the keeping of scientific secrets to the absolute minimum necessary for national security in this time of international tension and strife. Therefore, also, they disapprove the red-tape curtain dropped around the United States by the McCarran Act.

Scientists, moreover, are naturally devoted to the principles of democratic freedom that shine so clearly in our constitutional Bill of Rights, based as they are upon the one most important freedom of all, the freedom to think one's own thoughts and to express them so that they may be appraised in the court of public opinion. Any semblance of thought control is resented by the true scientist, because he knows it will blight his intellectual activities or those of another who may be as good a scientist as he. As a matter of fact, in spite of human frailties that occasionally mar its escutcheon, the fraternity of scientists is the outstanding example of a "free society" in modern civilization. Each scientist is not only permitted but encouraged to form and express his own independent judgment. When he thinks others are wrong, he says so. By the same token, he is ready to submit his own opinion to the judgment of his fellows. All are confident that from the clash of opinion and the dust of controversy a collective judgment will be formed that will be generally accepted by all. Lasting friendships may persist, even though differences of opinion have not yet been resolved.

It is not surprising, therefore, that scientists occasionally speak up in defense of a fellow-scientist who is charged with being guilty of disloyalty because of his associations, or who is being persecuted because of allegedly un-American ideas he may have expressed. Even though one scientist may heartily disagree with another's opinions, he knows he must defend the right of the other to express them, else he will be false to his calling as a sincere and earnest seeker of the truth. He trusts the laws of libel and misconduct to take care of any pernicious extension of the principle of freedom and, with Thomas Jefferson, who was a scientist as well as a statesman, he says "We are not afraid to follow truth wherever it may lead, nor tolerate error as long as reason is left free to combat it."

These attitudes, an inevitable consequence of the intellectual discipline of science as a way of acquiring knowledge, are obviously in perfect accord with the genius of American democracy. They are, however, such as to make those who display them especially vulnerable to suspicion and recrimination in times of national fear and hysterical demands for security against dangers, without and within the nation. It is quite unnecessary to mention the many attacks upon scientists in recent years, which serve as straws to show the direction in which some of the antiscientific winds are blowing. If you do not like what a scientist says, "We are not afraid to follow truth wherever it control in America, the wisdom of supporting the United Nations, the sharing of our surplus grain with hungry Indians, or anything else that he may say, the easiest way to stop him is to insinuate that he is dangerously subversive and advocates doctrines that are approved by the Communists or their fellow-travelers.

The machinery for this expression of antiscientific trends is unfortunately extensive and well oiled. Lists of allegedly subversive organizations, membership in which is believed by many to be absolute proof of guilt, have been made public not only by the Attorney General of the United States and the Un-American Activities Committee of the House of Representatives, but also by legislative committees in several states and by numerous private organizations. Black lists of suspected individuals are freely circulated, or sold at profitable prices, by many "patriotic" societies and "protective" associations. There seems to be a well-organized campaign to paralyze all independent thought, discussion, dissent, and protest in America, and men of science are conspicuous among the targets of those who would force their fellow-citizens to think only those thoughts they themselves approve.

Against this trend the scientist should take a firm stand as a champion of intellectual freedom. He must not adopt the defeatist conclusion that the only sure way to avoid penalty for unpopular opinion is to express no opinion at all. Regardless of the odds against him, he must do his best to change the attitudes of mind of those who will yet listen to his words. Education for life in a free society must continue, and scientists have a great responsibility for its success.

Just one specific example of the kind of education I have in mind. Few people know the facts about such lists of subversive organizations as that compiled in the Attorney General's office. Very little publicity has

been given to the ruling of the U. S. Supreme Court a few months ago, which, as former Attorney General Francis Biddle stated in an article in the November 1951 *Bulletin of the Atomic Scientists,* "knocked out the whole system of listing." The court ruled that it was a denial of due process thus to brand organizations without a hearing. We cannot hope to compensate for all the harm already done by the unjustifiable use to which these lists have been put, but we can at least hope to reduce their harm in the future by spreading information about them as widely as possible.

The future is by no means hopeless for science and scientists in America, in spite of the contemporary trends of thought that are antagonistic to them. There is much reason for fearing the adverse elements in the mental climate that surrounds us, but as Robert Oppenheimer has well said, "The answer to fear cannot always lie in dissipating its causes or in yielding to it. Sometimes it lies, simply enough, in courage."

News and Notes

Scientists in the News

Because of his many contributions to the confectionery industry, **James P. Booker** has been chosen as the recipient of the Stroud Jordan Medal for 1952. The award will be made at the fourth annual meeting of the American Association of Candy Technologists on June 3, at the Conrad Hilton Hotel, Chicago.

Harold A. Braendle and **Carl W. Sweitzer,** of Columbian Carbon Company, New York, were invited by the Swedish Institution of Rubber Technology to address its spring meeting May 2–3 on "The Role of Heat in the Carbon Black Reinforcement of Rubber." While in Europe, Braendle and Sweitzer are visiting rubber plants in Denmark, England, France, Germany, Italy, Sweden, and Switzerland.

Melvin Calvin, professor of chemistry at the University of California, Berkeley, has been named 1952 Harrison Howe Lecturer by the Rochester Section of the American Chemical Society. Professor Calvin, who is also director of the Bio-Organic Group of the Radiation Laboratory in Berkeley, was honored for his contributions to theoretical organic chemistry and for his pioneering work on the mechanism of photosynthesis, using isotopic tracers. The Harrison Howe Lecture will be given in Rochester on Nov. 22. This is the eighth award of the honor, which commemorates the services to chemistry of Harrison E. Howe, for more than twenty years before his death in 1942, editor of *Industrial and Engineering Chemistry.*

The Council of The New York Academy of Medicine has announced the appointment of **Robert L. Craig** as secretary to the Committee on Medical Education of the academy. Dr. Craig fills the office heretofore held by **Mahlon Ashford,** who retired. He has practiced obstetrics and gynecology in New York since 1930 and has served continuously on the staff of the New York Lying-In Hospital (New York Hospital), where he is at present associate attending obstetrician and gynecologist. During the same period he has been on the faculty of the Cornell University Medical College, at present as assistant professor of clinical obstetrics and gynecology.

E. C. Drescher has been appointed chief of the Division of Commissioned Officers, Public Health Service, succeeding **Eugene A. Gillis,** who has been assigned as consultant to the Lebanese government to assist in the development of public health services in that country. Dr. Drescher has served as deputy state health officer of Oregon, director of venereal disease control and assistant state epidemiologist of the Kentucky State Health Department, and chief of medical services in Public Health Service District No. 1. Before coming to Washington in 1951 as operations officer of the Division of Commissioned Officers, he was Public Health Service consultant to the city of Pittsburgh.

J. H. DuBois, formerly sales manager of the Plax Corporation, a division of the Emhart Manufacturing Co., has been appointed vice president in charge of engineering of the Mycalex Corporation of America.

The following persons from abroad were recent visitors at the Eastern Regional Research Laboratory of the Agricultural Research Administration, Philadelphia: **B. Eriksson,** Institute for Applied Textile Research, Norrkoping, Sweden; **Gosta Silen,** Finnish Wool Industry Research Laboratory, Helsingfors, Finland; and **K. Sakaguchi,** University of Tokyo.

Luther H. Evans, Librarian of Congress and member of Unesco's Executive Board, was elected chairman of the U. S. National Commission for Unesco. He will serve the remainder of the unexpired term of **George D. Stoddard,** who resigned the chairmanship in order to devote more time to the University of Illinois.

Leonard Greenburg, of the New York State Department of Labor, has been designated the 1952 winner of the Cummings Award, highest honor of the American Industrial Hygiene Association, for his work in the field of industrial health and safety. The association cited Dr. Greenburg, who is director of the New York department's Division of Industrial Hygiene and Safety Standards, for his "contributions to the knowledge and practice of the profession of industrial hygiene." The award is presented annually in