SOME IMPLICATIONS OF SCIENCE FOR OUR SPACE AGE SOCIETY—FOUR YEARS LATER

C. LEPLIE KANATZAR
MacMurray College, Jacksonville, Illinois

Four years ago it was my privilege to address this assembly concerning some implications of science for mankind in the next decades. Several questions (none original) were posed with respect to the intellectual climate, the role of science in the humane tradition, and the future direction of science. The time allotted was utilized to develop background for these questions, thereby providing a convenient escape from the responsibility of suggesting possible answers. It would be presumptuous to imply that I have discovered the answers in the intervening years. It is more likely that my appearance this morning is mere testimony to a vanity deriving from our president's invitation to participate in this panel presentation. Those who read regularly *Science*, the journal of the AAAS, are aware of the more frequent discussions of the scientific climate and the role of science in the humane tradition that have appeared in its columns within the past few months. Perhaps my function this morning might be to comment upon these two topics and recent trends of thought concerning them.

The climate of science seems neither better nor worse than four years ago. The events that create the climate have failed to match the explosion of the first atom bomb or the launching of the first sputnik in the immediate effect upon the sensibilities of the lay public. Richard Hofstadter (1963, p. 5) has noted a significant change for the better in the intellectual atmosphere since October, 1957, although he does not suggest that the vigilante mind has disappeared or that anti-intellectualism has ceased to be a force in American life. Perhaps his optimism is based too much upon the late President Kennedy's hospitable disposition toward intellectuals in public life. As Hofstadter prepared his manuscript, he was encouraged by "the new President's obvious interest in ideas and respect for intellectuals, his ceremonial gestures to make that respect manifest in affairs of state, his pleasure in the company and advice of men of intellectual power, and above all by the long, careful search for distinguished talents with which his administration began." However, Professor Hofstadter was not under the illusion that "the recruitment of such talents would altogether transform the conduct of our affairs." Perhaps it is reasonable to say that the late President set the tone for recognition of the need for intellect in the affairs of mankind, e.g. the White House dinner for the Nobel Prize winners, his interest in space research and in the National Academy of Sciences, or his respect for intellect paralleling that rendered by Thomas Jefferson, to mention but a few incidents directly related to science. One may only guess at the potentialities of the intellectual cli-

mate had Mr. Kennedy survived to complete his administration with possibly a second term of office.

There are those who say that the scientific climate is suffering in Washington, especially in view of what seems to be an increasing skepticism in Congress regarding government support for research. Inevitably a congressman unhappily discovers and misinterprets the title of a research project, thereby furnishing colorful news copy that strikes a response among anti-intellectuals and those who fear or ignore science. Senator Anderson (1964) suggests "a growing uneasiness in Congress about its own ability to oversee programs effectively." He mentions the "cost consciousness" of Congress, i.e. its concern for the relationship of cost to performance in the area of research and development. D. S. Greenberg (1964) reminds us that "Congress did not reduce federal support for research. It did reduce the rate of growth that had prevailed in recent years." Even the National Science Foundation had its budget increased $31 million although it had hoped for an increase of $267 million. Greenberg speaks of the "icy reception" of the proposed budget in the House of Representatives and the resulting "lecture on the perils of rapid growth." The National Institute of Health sought and obtained an increase of $38 million, an increase somewhat smaller than in previous years. But Greenberg also notes the enormous increase in the share of the budget designated for research and development. He cites congressional support of research in high-energy physics and oceanography, and passage of the college-aid bill as indications that Congress is not hostile to science. He does not regard the investigations and studies by various congressional committees as indicative of ill treatment of science, but rather as desirable discussions of long-standing problems arising from the complexities inherent in the more significant aspects of research.

Threats to the intellectual climate are not entirely outside the realm of science. Readers of *Science* are aware of the current debate as to whether evidence from science may bear upon the race problem. Persons of academic distinction have published assertions that scientific evidence proves the members of Negro races inherently less competent than individuals of other races. Data are cited to justify inequities in civil rights and to challenge the Supreme Court's decision of 1954 on school segregation. The report of the AAAS Committee on Science in the Promotion of Human Welfare (1963) makes clear that "the issues concern not only the validity of allegedly scientific conclusions but also fundamental principles that affect the integrity of science." These allegations are scarcely new. Your speaker heard them voiced at various times by persons of academic attainment during his years of study.

There is not time this morning to summarize the arguments of those who contend that scientific evidence demonstrates significant inequalities between the Negro and other races, nor to summarize the report by the Committee on Science in the Promotion of Human Welfare. For

the most part the debate among scientists has been conducted on a fairly high level of discussion, at least in the columns of *Science*. It is essential, however, that we recall parallel situations in other times and places, notably between 1933 and 1944 in Nazi Germany and in the past three decades in the Soviet Union. Merely to mention the prostitution of science to serve the ends of the Nazi dogma of race purity or the attack upon genetics in Russia should be sufficient to remind us that, as Robert Merton (1957) puts it, when "such doctrines percolate to the laity, they invite a general distrust of science and a depreciation of the prestige of the scientist, whose discoveries appear arbitrary and fickle." The scientist may soon be caught with a variety of anti-intellectualism on the ideological front which entails a conflict with the traditional assumption of the objectivity of modern science. The recent research by Robert Rosenthal on the bias of the experimenter, a topic viewed with trepidation by some psychologists, may ultimately serve to question the available evidence on the measurable differences among racial groups and to underscore the possibility that we can prove whatsoever we set out to prove.

One of the most significant factors in the climate of science in the past five years derives from two lectures delivered in 1959 and 1960 by the former physicist and present man of letters, C. P. Snow. The first lecture, delivered at Cambridge University and entitled *The Two Cultures and the Scientific Revolution* (1959) (and recently, *The Two Cultures: and A Second Look* (1963)), has had enormous influence in focusing upon the demise of a common culture and the existence in virtual isolation of two groups more or less hostile toward one another, between whom there is little or no communication—the scientists on one hand and the practitioners of the humanities, constituting the non-scientific viewpoint, on the other. Snow argues that the scientific revolution has greatly improved social conditions by decreasing poverty, hunger and disease, i.e. closing the gap between the privileged rich and the unfortunate poor at opposite ends of the socio-economic scale. Snow indicts the humanists of the 19th and 20th centuries for antagonism to the scientific revolution which he holds primarily responsible for social change.

Snow's second lecture, delivered at Harvard University under the title of *Science and Government* (1960), contains the argument that scientists should participate more widely in government because of the attitude and habits of thought peculiar to the scientific mind, particularly the quality of foresight possessed by many, but not all scientists. This virtue the scientist can bring to the conduct of public affairs, especially in the realm of decision-making by administrators who tend to avoid the free debate of legislators and the free discussion of scientists and who deal with short-term solutions. Snow observes that the Western world must change to survive the challenge of the communist world, but that it is unable to change because there is no model for the future. As Moody Prior (1962) analyzes Snow's essay, the commu-

nist countries are "convinced that the future is theirs and are sure that they know its form because they are confident of their ability to shape it." Snow holds that Western society must likewise become "future-directed," and that those best prepared by habit and traits of character to develop such a society are the scientists. Snow cites that which to him is a horrible example illustrative of the precept that no one scientist should exercise unlimited influence.

The humanists were not slow to answer Snow's arguments. F. R. Leavis, the British literary critic, has attacked the materialistic implications of Snow's view that improved social conditions stem from the scientific revolution (Margolis, 1962). However Leavis does not tend to deny the desirability of better communication between nonscientists and scientists. Robert Hutchins (1963) repudiates Snow's views on scientists in the government and holds that there is but a single culture, the pseudo-scientific. Jacques Barzun (1964) adopts a confusing position summarized by George Gaylord Simpson (1964): The two cultures are isolated because science lacks an equivalent of the criticism characteristic of the humanistic culture; there is a single culture—scientific; and each of the two cultures "is too diverse to count as only one."

The late Aldous Huxley (1963) takes the middle road and attacks the problem of how to make the best of both cultures, with science examining external experiences and the humanities the inner experiences of the same world. Huxley makes the case that the humanists would do well to examine the functions, psychology and language of science, and even the metaphysical and ethical problems lifted by contemporary science, that these materials might be incorporated into contemporary literature to enrich the subject matter, the expression and the vision of the total human experience. Huxley may be on the right road, for underlying the whole of the scientific enterprise is the search for unifying principles, e.g. the concept of the universe, the nature of matter, the nature of life, organic evolution, et cetera. The humanist likewise searches for unifying principles that are the basis of the total human experience, external and internal, cultural and individual.

I am convinced of Snow's thesis respecting the cultures, but I am reluctant to accept Snow's estimate of the extraordinary vision of the practicing scientist. But whether one agrees with Snow's views, his effect has been enormous in causing thinking men in all sectors of the intellectual universe to contemplate that which each culture can contribute to the other when communication between the two is improved. That is Mr. Huxley's approach to the subject. Snow and others have laid emphasis upon the humane dimensions of science in a sense opposed to those who would require the practicing scientist to foresee the consequences of his discoveries and assume personal moral responsibility for them. The Harvard report on *General Education in a Free Society* (1945) held that the humane tradition is essential for both humanists and scientists, i.e.

that all men, notwithstanding their individual specializations, should be obliged "to think effectively, to communicate thought, to make relevant judgments, to discriminate among values." A colleague of mine puts it that the goal of the humane tradition is "not simply to inform a man or excite his brilliance with brilliant footnotes. It implies commitment to seek the truth, to espouse the truth where and when he finds it, and to correct his appraisal of the truth when he finds just cause to do so. It implies commitment to seek and espouse the good and the beautiful and to correct his estimates."

Ian Barbour, a physicist who is chairman of the Department of Religion at Carleton College, has listed (1961) the issues dividing the two cultures: the irrationality of man which occupies the humanist, versus man's reason, the chief instrument of progress for the scientist; the pessimism of the humanist versus the optimism of the scientist; and the subjectivity of the humanities versus the objectivity of science. Barbour suggests that there is no inherent conflict in that each of the two cultures asks different kinds of questions, serves different functions in man's life and reflects different aspects of human experience. "The conflict arises only when either field thinks that it can replace the other and that its methods alone are significant."

That the scientific world is concerned with negotiating an understanding of the world of the humanities is indicated by the increased quantity of literature bearing upon this necessity. A single indication of the current trend is the action of the National Science Teachers Association in 1963 and 1964 to allot a significant portion of the programs of its annual convention to consideration of the humane dimension of science.

Gerard Piel, publisher of *Scientific American*, puts it bluntly (1961): "We cannot produce great scientists by stuffing little heads with chemistry and physics and mathematics. Great work in science comes out of an exposure to the whole fabric of the culture. The questions scientists are concerned with are not mean little technical issues, but important questions that concern and interest every man. They get asked only by men who have the large view and generous interests that come from literature and the arts as well as science." Piel is saying that we cannot raise scholars and scientists as means to an end, nor as instruments of national power. We educate our young people because we prize them as people while we envision the marvelous life which can be theirs if they can but realize their full capacities as human beings.

Literature Cited

Hofstadter, Richard. 1963. Anti-intellectualism in American Life. New York, Alfred A. Knopf. ix + 434 pp.

Anderson, Clinton P. 1964. Scientific advice for Congress. Science, 144 (3614): 29-32.

Greenberg, D. S. 1964. Scientific gloom (in News and Comment). Science. 144 (3614): 32, 33.

AAAS Committee on Science in the Promotion of Human Welfare. 1963. Science and the race problem. Science. 142 (3592): 558-561.

Merton, Robert K. 1957. Social Theory and Social Structure. New York, The Free Press of Glencoe. 645 pp.

SNOW, C. P. 1961. Science and Government. Cambridge, Harvard University Press. vi + 88 pp.

———. 1963. The Two Cultures: and A Second Look. Cambridge, Cambridge University Press. 107 pp.

———. 1959. The Two Cultures and the Scientific Revolution. New York, Cambridge University Press. 58 pp.

HUXLEY, ALDOUS. 1963. Literature and Science. New York, Harper & Row. 118 pp.

PRIOR, MOODY E. 1962. Science and the Humanities. Evanston, Northwestern University Press. xii + 124 pp.

MARGOLIS, H. 1962. Intellectual life in England (in News and Comment). Science. 135 (3509): 1114, 1115.

HUTCHINS, ROBERT M. 1963. Science, Scientists, and Politics. New York, The Center for the Study of Democratic Institutions. 16 pp.

BARZUN, JACQUES. 1964. Science: The Glorious Entertainment. New York, Harper and Row. 322 pp.

SIMPSON, GEORGE GAYLORD. 1964. Barzun: The glorious entertainer. Science. 144 (3614): 38, 39.

GENERAL EDUCATION IN A FREE SOCIETY: REPORT OF THE HARVARD COMMITTEE. 1945. Cambridge, Harvard University Press. xiii + 267 pp.

BARBOUR, IAN G. 1961. Science, ethics, and education. Proceedings of the third Combined Plan Conference. The Columbia School of Engineering and Applied Science, October 22-25, 1961.

PIEL, GERARD. 1961. Science in the Cause of Man. New York, Alfred A. Knopf. x + 298 pp.