

SCIENTISTS and SOCIETY

By Leland J. Haworth



Leland J. Haworth gave the following address at the Spring Meeting of the American Physical Society in Washington, D. C., on April 24, 1963. For the past two years Dr. Haworth has been a member of the Atomic Energy Commission. On July 1 he took office as director of the National Science Foundation.

It is customary when a Washington bureaucrat gives an after-dinner speech for him to discuss something about his own agency, its past achievements, its aims and ambitions, its predictions for the future. However, I speak to you tonight from an anomalous position. I am a "lame duck" in one agency and an unhatched egg in another. It would be presumptuous of me to discuss the problems or the future of either. I have chosen, therefore, to give you briefly a few of the general impressions I have gained during my two years and one week as a scientist in government. Specifically I would like to speak of the responsibilities of scientists in the society of today.

It is trite to say that science and scientists have changed the posture of the world. They have created untold opportunities for good and enormous potentialities for evil. Hence, it is clearly a responsibility of scientists to assist their fellow citizens in every possible way to chart the course of society between the shoals of danger—through the channels of peace and human well-being. Perhaps the strongest impression I have gained in Washington is how great and far-reaching that responsibility really is, and how numerous the means for its discharge.

The greatest danger that we face today is that of nuclear war. One, and possibly the only, lasting approach to the deterrence of such war is that we protect, maintain, and strengthen the deeper human values that make life worth while.

Therefore, I would like to discuss specifically the question: "How can scientists make maximum contributions to significant and lasting human values?" I do not pretend that I have specific answers to this question. Rather I hope that by posing additional questions I might stimulate further your thought on this far-reaching and important subject.

Today there is no question as to the skill, capability, efficiency, and natural endowment of American scientists and engineers. The public is proud of the remarkable achievements they have made. Abundant electricity in the home; safe and speedy surface and air transportation; nuclear reactors propelling surface and subsurface ocean-going vessels; on-the-spot television from Europe via communications satellites; space vehicles traveling millions of miles to inspect the planets and to relay their observations back to the earth; giant accelerators probing deep into the subnuclear world;

ultrahigh-speed computers calculating the complex problems of both science and business—all these things and more have instilled in the average citizen a feeling that scientists and engineers can do almost anything. This image of the scientist is, of course, exaggerated. Scientists cannot produce miracles. You and I know this—but does the average citizen? Yet the citizen actually yearns for the truth. He wants to learn how to utilize science properly so that nature may be made to serve him. Only people such as we have the ability to help him. It is our duty to do so.

Perhaps then a partial answer to my question, "How can scientists make maximum contributions to significant and lasting human values?" is to be found in the realization that the scientist has the dual mission of uncovering the facts of nature and of interpreting these facts to his fellow men.

Certainly a great deal more effort and attention should, indeed *must*, be given by all of us to present a true picture of science, in the most meaningful form, to the public, both at the level of the citizen and at the level of the government. The aspirations, the potentialities, and the limitations of science must be made known to the people so that they can meet the responsibilities for progressive citizenship called for in the world today. They must be made known to government so that decision-makers can act rationally within the framework of reality.

To fail to do this is courting danger. We must remember that all of mankind is not yet intellectually mature. We are still "growing up" and growing up can be dangerous. Throughout the centuries, history has shown us that the human race has never gone forward unanimously. As we have said, increasing knowledge means both opportunity and danger. Only by effective communication can opportunity be strengthened and danger lessened.

How can a government be responsible in matters involving science if those guiding its course do not really

understand how their acts will *affect* the individual citizens, or even how their acts will be *regarded* by the individual citizens? How can the general welfare be promoted, or the blessings of liberty be generally secured, through government action on scientific affairs, without a proper understanding in both quarters?

Additionally and importantly, how is it possible to instill in the individual citizen the spirit and outlook that shines so brightly at this meeting—that an understanding of the fundamental truths of nature yields intellectual and cultural rewards that are among the greatest of the lasting human values.

Science and Social Responsibility

I am convinced that the citizen wants to know more about our scientific achievements. Certainly he deserves to do so. In the final analysis, the labor and toil of the citizen have paid for the freedom of the scientist to conduct research with dignity and honor. Do we not owe that citizen, as his right, some part of our time to assist him to enjoy the thrills of better understanding of the fundamental principles of nature and of the impact that science has on his daily life and on world affairs. Scientists have only partially succeeded in this task. Often we simply have satisfied ourselves that we have told the citizen of our activities by repeating our own shoptalk and catch phrases in our public appearances and press releases. When asked for further details, we have gratuitously provided copies of our highly condensed and sophisticated technical papers and let the matter drop. To be sure, the citizen, in his turn, has many times refused to spend the necessary time and effort to acquire a knowledge of the basic principles, without which it is almost hopeless for him to understand the more subtle discoveries and their significance to him. It is part of our responsibility to persuade him that he *should* acquire that knowledge.

Over the long pull an informed citizenry can best be achieved by reaching the individual in his formative stages—while still in school and while the excitement of learning about the world has not undergone the dulling influence of our modern way of life.

To this end, considerable progress has been made in the past decade in improving the methods and content of the school systems. Much of this progress has been brought about by leading scientists who have taken the time and expended the effort required to bring our new knowledge into proper focus on the minds of the youth. The true measure of our improvements in the teaching of science is the level of competence and understanding retained by the students five to ten years after they have completed their basic studies. I urge that all of us continue our efforts to improve the teaching of science in our high schools and colleges, both from the technological point of view and from the standpoint of the cultural and human values of science.

But thus to educate the public as a whole will require many decades. Meanwhile we cannot wait. We must create an understanding by methods that reach

adults. Scientists have a great and often irksome responsibility to *interpret* science to the layman, through simple articles and talks, through sympathetic and careful help to the journalists and others who reach the public through newspapers, magazines, radio, and television. By helping in this way, scientists not only serve society as a whole, they also serve themselves, for an informed citizenry will be far more sympathetic and helpful to the aims and aspirations of science for its own sake.

It is also important that the public learn to understand the scientists themselves, that they are simply highly-educated men working in a special field. There is a popular conception that their inherent characteristics, together with their specific training, in some mysterious way have rendered them incapable of other tasks. It is commonly accepted that a lawyer, a businessman, a farmer, or a labor-leader—indeed, almost anyone—can, if given opportunity, become a successful executive, or congressman, or government official; but not a scientist. This last, of course, is arrant nonsense. But let me give you an example. For two months last year the Atomic Energy Commission was reduced to three members, all with scientific educations. The fear was expressed in many quarters, including articles by leading journalists, that these “callow”—the word is mine—these callow scientists might mismanage the whole atomic energy establishment, that managerial experience and sense were clearly lacking. But actually one commissioner had headed one of the largest oil companies in the country; another had been chancellor of the largest and one of the greatest universities; the third had directed a large and reasonably successful laboratory. I believe the composite successful managerial experience would compare more than favorably with the average of all the 20-odd commissioners that have served. These facts were overlooked.

It is only by projecting ourselves and our colleagues to the people that we can correct such misconceptions and make them understand what sort of folk we really are.

Scientists in Public Roles

To create an informed citizenry will ultimately insure an informed government, for government officials are merely special citizens. But in the governmental process, there is need for deeper understanding, especially in certain fields. Furthermore, the informed citizenry does not now exist. Here then lies the first responsibility of scientists to government—to assist responsible officials to gain as far as possible this deeper understanding of the scientific and technological facts and their implications. But this is not enough. No matter how well informed, the layman cannot in many instances appreciate and understand the implications of his actions when science and technology are involved. It is essential that he have the advice of competent and experienced scientists. There are many mechanisms to this end—advisory committees from

without the government such as the President's Science Advisory Committee, the General Advisory Committees of the Atomic Energy Commission and the Disarmament Agency, the many boards and committees advising the Department of Defense and other agencies. The scientists of the country have given unselfishly and effectively of their time and effort to serve on such committees.

But, useful as they are, part-time committees in turn are not enough. Advice is needed when decisions must be made. Intimate, continuing, and up-to-date knowledge of all the facts may be essential to the giving of advice in many instances. Hence there is need for many full-time scientists to serve as advisers to the most responsible officials of the government. A growing recognition of this need is found throughout the government. Increasing numbers of men of scientific stature are playing important roles—the Special Assistant to the President, who also heads the Office of Science and Technology, advisers at the senior level in the Departments of Defense, Interior, and State, the Disarmament Agency, and many others.

Within many agencies there is, of course, the need for scientists and engineers to administer scientific and technological programs. The Atomic Energy Commission, the Department of Defense, the National Science Foundation, the National Institutes of Health, and the National Aeronautics and Space Administration all have requirements for large numbers of such men. It is in the interest of both science and the general public that these men be highly qualified.

That scientists are appropriate to administer the details of scientific programs has long been recognized. But there is also growing recognition that scientists and engineers can play crucial roles in executive and policy-making positions. This recognition came first for technical agencies such as the National Science Foundation and the Atomic Energy Commission, which are headed by distinguished scientists. The trend is broadening. Scientists are found at the assistant-secretary level in agencies of a more general nature. These men and others are playing increasingly important roles in making and executing public policy, not only with respect to our scientific and technological programs, but clear across the spectrum of government affairs. Political, economic, and scientific implications are discussed on equal terms by composite groups who are experts in the various fields, with no sharp barriers as to participation by the individuals in the various subjects. In short, it is increasingly recognized within the government that scientists can have valid and useful thoughts beyond the realm of science, that they can contribute to painting a picture as a whole. This is as it should be. For science is increasingly enmeshed with all the other disciplines and activities that together make society and hence concern the government in a composite way.

And here I want to make a special plea. There is great and continuing need for mature and experienced scientists to devote a few years of their working lives

to full-time service in the government. You may well ask, "Why should any scientist want to make this sacrifice?" The pace is difficult, the criticism constant, and the pay is only adequate. However, I can assure you that such service can be an enriching experience for the individual. The satisfaction that one finds in feeling that he has made a contribution toward channeling the affairs of government in directions serving best the public interest can be great indeed.

The Special Responsibilities of the Scientist

The responsibilities I have outlined are common to all citizens. Scientists differ from others only in the nature of their skills and knowledge, and in the great importance that science holds today. But in another way, science—especially basic science—has a relationship to society that is more or less peculiar. Through government, the general public now supports financially a major fraction of all research—without direct and obvious financial return. It is well understood by scientists that in addition to the enormous cultural and intellectual values, this research is ultimately the base for all material progress, but this is not necessarily understood by the individual citizen. He sometimes feels that his money is being improperly diverted to serve the selfish interests of the scientists rather than the interests of society as a whole.

This brings me to another formulation of the basic question, "How can scientists make maximum contributions to human values of lasting significance?" Perhaps I could state it as follows: "How can scientists in our universities, with federal government financial support and control, assist in the preservation of the values and processes essential to scientific inquiry under conditions which will preserve the fundamental values and processes of responsible democratic government?"

My own belief is that the individual scientist can make his most effective contribution to this cause if he is able to carry into his public life those fundamental tenets of thoughtful analysis and intellectual honesty which guide him in his scientific endeavors.

Too often we have failed to separate our actions as reasoning scientists from our performance as simply nonrational human beings. We have all observed that some scientists, like some lawyers, doctors, businessmen, or others, have used their prestige and the name of science rather than their reason and the power of the method of science to try to impress their will upon the public. When this is done we are all the poorer. Would it not be better to strive toward that utopia when we could state clearly the question we wish answered, the related facts which are known about the subject, and then approach our solution in rational steps?

I think that the scientist can, by extension of his methods, contribute to progress along this way.

I have devoted all of my now lengthy adult life to service in universities, in scientific laboratories, and in the government. The more I become acquainted with

each of these institutions, the more I am convinced that each can learn something from the others. I believe, however, that thoughtful people from each of these institutions adhere to about the same sense of values and have their eyes on about the same goals, but without fully understanding one another.

Science and Public Policy

I think that scientists, after seeing political compromise in action, are often apt generally to conclude that government is composed of individuals whose actions are sometimes stupid or self-serving. The scientist, accustomed to the logic of the scientific process, is sometimes impatient with the seemingly slow, and, to him, often illogical and unintelligent, actions of government officials.

On the other hand, the harried government legislator or administrator, not always understanding fully the information he has available, is likely to interject into his official actions his own attitudes and experience. If he cannot solve his immediate problems on this basis, he is apt to rely heavily on the actions of powerful groups or the advice of influential individuals. Thus, when the official is faced with conflicting advice from competing groups, he often becomes cautious and less responsive to the real needs of the scientist. Worse still, he begins to attribute unintended motives to scientists; he is prone, mistakenly, to decide that all scientists are intellectually dishonest when removed from their laboratories. We must find ways to communicate with these individuals so that our motives become self-evident.

The government official and the academic leader must learn more about the proper role which scientists at home can play in a democracy. If you grant that this should be done, the entire realm of political philosophy immediately presents itself to us for reflection. The nature of man and his relationship with the state; the problems of political obligations, of rights and responsibilities, of authority and of freedom; the meanings of abstract principles such as liberty, justice, equality, public interest; means and ends, the form and substance of government processes—all these, and more, become germane.

The proper role of government in the affairs of science and the proper role of men (including scientists!) in the affairs of government, is surely the complete political process. Government decisions on large and small items—on accelerators, on space, on medicine—are composites of many decisions by many individuals and groups, both within and without the government. Conflict is built into the decision-making process in our society which permits contesting interests to exercise openly their power of influence at the decision-making centers of government. In this process, no activity is ignored, no tenet unchallenged, no doctrine sacred.

Few people will deny that the democratic principles of the United States are on trial today. The entire

nation—especially its leaders—is now faced with a critical challenge as to whether our increasingly complex society can continue to have a government which fosters the essential conditions of democracy.

Individual liberty and human dignity, the very cornerstones of democracy, bear brief examination here. It is easy for us as scientists, valuing as we do our academic freedom, to say that individual liberty is best served by a passive government; but as national problems increase in complexity, the needs of the nation and the rights of the individual are more and more being thrown into conflict. The question of war now involves the issue of human survival. Accordingly, the dictates of national defense pervade every area of our national life and therefore of our individual liberty.

I know this audience will agree that with the increasing rate of the accumulation of knowledge and with the improved speed and complex movements of men and materials, conditions will often change considerably during the decision-making process.

Those within the government who assist in formulation of the problems, or in reaching policy decisions, can do so effectively only if scientific advice is freely and promptly given by the scientific community and given in a form uncolored by real or imagined "political" implications.

The intricate web of relationships between government and society is too little known to express even in general terms. I certainly would not try to sketch for you any chart which shows the routes by which influence flows from our general culture, or, from special interests, like, say, physics research, to the programs and policies of governmental institutions.

I do know, however, that one factor which helps to account for this is the general lack of sound information on which proper decisions can be made. How many people in the Atomic Energy Commission, the National Science Foundation, the Bureau of the Budget, the Department of State, the Department of Defense, the Congress, or the general public have a sound basic understanding of the status of our knowledge in basic science, or, of the opportunities for, and the desirability of increasing our understanding of this aspect of nature? Yet, these are the people on whom the responsibility rests for making those major decisions so vital to the future of science and to mankind.

It seems to me that I have now come back, by this line, to almost the same points that I made earlier. We must develop a better system for communication between the scientist and the layman. We must educate the general public and the government to an understanding of the basic facts of science, and we must inculcate in ourselves the realization that individual scientists must play increasing general public roles including full-time service with the government. Only by striving in these ways as well as in our science proper—only by making the necessary sacrifices—can we insure that science and scientists will make their maximum contribution to significant and lasting human values.