

The Scientist in Society

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WHEN GREGOR MENDEL published the results of his long and thoughtful observations just a century ago, no trumpets sounded. Neither his government, nor his fellow citizens, nor even his few scattered and lonely fellow-seekers after truth, took notice. The stone dropped into the still pond, and many years were to pass before its ripples would be noted and amplified. This meeting represents, in a sense, the amplification of those ripples into a wave of tidal proportions. Brother Gregor, if he were here today, would have many things to ponder.

He would be fascinated, of course, by the chain reaction of scientific discovery that has brought human genetics to its position of leadership among the sciences. Before he could begin to understand these discoveries, he would need to grasp new concepts, new methodologies, a whole new language of science.

But even more difficult for him to comprehend, I suspect, would be the circumstances of this conference. Scientists are gathered here from all parts of the world. Many of you have received the highest honors which society can confer upon its citizens. Your names—though not as widely known, perhaps, as those of politicians and football players—are often found in the daily press. Your work is intelligently described in the popular media of communication.

Moreover, still more significantly, this gathering is being sponsored, not by a few of the enlightened elite but by institutions representing society as a whole. It is being held under the auspices of a great university [the University of Chicago]. Its expenses are being shared by a national voluntary agency [the National Foundation—March of Dimes] to which private citizens contribute their dimes and their dollars, and by an agency of the Federal gov-

ernment [the Public Health Service] which is supported by national taxation.

This represents a social revolution relevant to the stature of science. It is this revolution, rather than the scientific revolution itself, that Gregor Mendel might well find beyond belief. And it is this intricate, rapidly changing relationship of the scientist to society that I would like to discuss briefly this morning.

As I begin, let me define the point of view from which I observe the scientist in society. First of all, I am not a scientist as such, but a physician and a governmental administrator. These facts undoubtedly condition my vision of science, perhaps even more deeply than I realize. As a physician, my training predisposes me to be especially interested in the consequences of scientific research as they may be applied to sickness and health. As a governmental administrator of scientific programs, I must be sensitive—and may indeed be hypersensitive—to the changing public evaluation of scientific activity. Finally, most of my first-hand observations of science in society are based on experience in the United States and my remarks need to be interpreted in that context.

Public Support of Science

We in the United States are relative late-comers to the world of scientific advance. European science, in the modern sense, started and developed well ahead of ours. The gap was wide in the late years of the 19th century and remained so well into the 20th. In fact, al-

Dr. Stewart, Surgeon General of the Public Health Service, presented this paper on September 5, 1966, at the Third International Congress of Human Genetics, which met at the University of Chicago, Chicago, Ill.

though America was blessed with a number of brilliant engineers and inventors, our contributions at the frontiers of scientific thought were relatively limited until a couple of decades ago.

Today, however, I think we can rightly claim our proportionate share of world leadership in science. This coming-of-age of American science has been swift and dramatic. It has been accompanied by, and also accelerated by, widespread public enthusiasm for science. This enthusiasm has expressed itself in practical and productive ways—specifically in massive governmental support of scientific investigation. Support on this scale would have been impossible, under our extremely responsive political system, if it had not been widely accepted—and indeed demanded—by the electorate.

What is the nature of this support? Why has the American public suddenly, in a few short years, transformed its image of the scientist from that of an eccentric and often menacing figure to a respected and honored citizen, almost a folk-hero?

Part of the answer, I'm afraid, must be attributed to an imperfect understanding of what science is. The public tends to confuse science with technology and research with development. Our society is fundamentally practical. It is less interested in process than in product, less concerned with truth than with consequences. Thus, when the public applauds science, it is applauding moon shots and polio shots—the visible, tangible results that are several steps removed from science as the scientist sees it and lives it.

Therefore, when the public wholeheartedly endorses greater governmental expenditures for research in the biomedical sciences, for example, its expectations are framed in terms of specific medical benefit—the cancer cure, the wonder drug. Further, it has an unspoken but prevalent expectation that, if X dollars will produce a cancer cure in 20 years, 2X will produce it in 10 years and 4X in 5.

The Scientist at Work

How different is the scientific view of science! The scientist in the act of “doing science” is absorbed in the pursuit of truth. His work marches to its own cadence; it cannot be

hurried or stayed by timetables imposed upon him. Moreover, he operates apart from consequences; even the most basic and urgent needs of society are irrelevant to him as a scientist at work. The truth is worth the quest, regardless of whither it may lead.

The scientist is, in fact, more closely related spiritually to the creative artist than to the engineer. Even the language he uses in discussing his work has strong overtones of esthetics: a scientist writes of a “beautiful experiment” and means precisely what poets and musicians mean—the beauty of simplicity, of inevitability. John Keats' famous line—“Beauty is truth, truth beauty”—speaks as eloquently for science as for art.

What price should society pay to support this kind of science? Is it—as it was long considered—a luxury? Or has this kind of science become, in our turbulent century, a necessity without which societies will stagnate and ultimately perish?

To me there is not the slightest doubt. Free scientific inquiry—basic science, if you will—is integral to our way of life. Science, flexible and free of inhibitions, is supremely worth doing for its own sake. It is also indispensable to a dynamic culture; it furnishes the raw materials upon which societies flourish. Having led us out of superstition into reality, science alone can provide the foundation for solving the problems of reality.

The American Association for the Advancement of Science stated, a few years ago: “What science contributes to the national purpose is measured by what it adds to the sum of human knowledge; science serves the nation by serving humanity.” This is a principle which I am sure that all of us here would accept without hesitation.

But is the public—the humanity that science serves—ready to accept this dictum as an act of faith?

I believe, with some qualifications, that it is. I believe that, despite its confusion of science with technology, despite its preoccupation with tangible benefits, the American public has accepted the principle that the technological advances it desires must be based on a continuing flow of new knowledge attainable only through free fundamental inquiry.

Otherwise, the hands of its leaders, its statesmen and administrators, would be tied. Otherwise neither the National Foundation nor the Public Health Service could go on, year after year, supporting conferences like this one and the work of the individuals represented here. We could not successfully sugar-coat every research grant with the promise of specific, practical gain, even if we wanted to.

But there are qualifications in the public's support of science, and science would be ill-advised indeed to ignore them. Most of these qualifications have to do with the consequences of science—its awesome potential for good or ill.

The Scientist as Citizen

Earlier, in describing the scientist at work, I exempted him from concern with consequences while he is engaged in the pursuit of truth. Needless to say, that exemption does not apply to the scientist in his role as a citizen.

It would be extremely difficult to justify the position that scientists are "above the battle" when it comes to helping to guide the social forces loosed by their work. No one would seriously propose that scientists be solely responsible for social consequences. But neither can they conscientiously avoid a special kind of participation in the processes that shape social change.

For the scientist, the nature of this participation involves a complicated and delicate ethical problem. He takes part in social and political decision-making as a citizen. He is a citizen endowed with knowledge in depth on questions related to his field of inquiry.

But knowledge in depth does not necessarily confer wisdom in breadth. And even the scientist who is both knowledgeable and wise can claim no monopoly on either commodity. When it comes to a social issue in which science is only one of many factors to be considered, the knowledge and wisdom of other men, representing other disciplines, are equally indispensable.

Your own field of genetics, of course, presents some of the most dramatic and awe-inspiring issues with which society must deal, and deal very soon. A scientific case is being built for the necessity of some kind of eugenic practices in order to save the human race from its

own success in overcoming defects. But this is only the scientific case. (I use the word "only," not to demean it but to indicate that there are many other cases involved.)

For even if this position were universally accepted by the scientific community, it would only be a beginning. Difficult of achievement as this scientific consensus might be, it would still be easy compared with the subsequent hurdles lying between concept and policy. There would be moral, theological, and ethical challenges. There would be political problems, in both the broad and the narrow senses of the word. And in all of these debates the scientist, though he might be a passionate and persuasive advocate, would still have only one voice among many.

Whose are the other voices? They belong to all the people who are affected by the consequences of science—philosophers and plumbers, sociologists and shoe clerks. In the long run, science must place its faith in the humanity it seeks to serve. In a society like ours, the individual human being is not only the ultimate measure of our institutions; he also determines their fate.

Role of Education

How can you, as scientists, and I, as an administrator, help to assure that the collective judgments of the individual human beings we serve are intelligently reached and affirmatively made? The only possible answer, it seems to me, is for us to involve ourselves deeply and continuously in the educational process. If science is to work for the ultimate benefit of man in a democratic society, the individuals who make up that society must have the objective, inquiring mind and the capacity for self-generation and regeneration that are the products of education at its best.

An immediate beneficiary of such an educational climate would be science itself. I don't know how many scientists a society like ours requires, but I am sure that we can use more than we have, drawn from the broadest possible social and economic base.

Moreover, in this kind of society, even those whose careers are far removed from science will have caught something of the flavor, scope, and excitement of scientific endeavor. They

will respect the scientist, and respecting him, they will listen to him with special attention. Possessing something of his spirit of inquiry, they will be free to evaluate his arguments—even if they lead beyond the boundaries of their preconceived assumptions.

Most important of all, men and women raised in such an educational environment will be well equipped for the kind of individual self-fulfillment that is the highest goal of society itself. For the attributes that are most characteristic of the scientist at work—the restless mind and the determined pursuit of truth—are precisely those that release the greatest individual potential and yield the deepest satisfaction.

Am I describing Utopia? I don't think so. I think that our society—thanks in substantial part to scientific advance—can create such an educational environment for its people. But its creation will not take place automatically. It will require profound commitment and active participation by everyone of us.

I have sought to make three major points this morning.

First, fundamental scientific activity is indispensable to the dynamic society and merits that society's vigorous support.

Second, scientists have a special responsibility as citizens in helping to guide the social change that emerges from scientific activities.

And third, scientist and administrator alike have a special responsibility for commitment to excellence in education.

One of your colleagues, Dr. John Kendrew of Cambridge, has said of the brilliant progress in genetics in recent years: "We have merely sighted the shore of a vast continent waiting to be explored."

This statement, profoundly true of your rich and varied field, applies equally well to the still broader field of science itself and to its consequences for society. The greatest unexplored continent of all is the potential of science for the betterment of man.

Health Sciences Advancement Awards

Two awards have been made under the new Health Sciences Advancement Awards Program of the National Institutes of Health, Public Health Service, intended to meet the nation's growing need for biomedical research by increasing the number of excellent research and training programs in graduate academic institutions. Cornell University, Ithaca, N.Y., was granted \$535,000 to strengthen the health-related research programs of its new division of biological sciences; the University of Virginia, Charlottesville, received \$465,000 for developing and expanding research and training in the basic science departments of its school of medicine.

The awards were based on pilot studies with several institutions engaged in health-related research and training activities. Two advisory groups, composed of university scientists, research administrators, and experienced community leaders, reviewed the pilot studies and made recommendations for the awards. Proposals were evaluated in terms of intrinsic scientific merit and overall program significance.

Assistance under the program will be offered to institutions showing promise for advancing the quality of their health science activities in ways that will serve institutional objectives. Eligible institutions include universities, colleges that grant higher degrees, and health professional schools that are not part of a university.