

Science, Poetry, and Politics

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ONE OF THE PARADOXES of the present period is that science, while relaxing metaphysical claims, has extended social ones. It is not unusual for the modern American scientist to find himself making demands on society that would formerly have been thought unnecessary to make—for financial support, for freedom from interference, for understanding of scientific aspirations and techniques on the part of the public. In protecting his own self-interest as a scientist he is compelled to enter arenas of value judgment from which science, as a philosophy, has progressively withdrawn itself. The principles on which claims might be based are no longer, if they ever were, generally accepted; and on every hand are signs of antiscientific sentiment. Deprived of the protective devices that operate within the scientific fold, the scientist is confronted with the problem of how to conduct himself in the fields of nonscientific behavior, of which poetry and politics, one for individuals and the other for society as a whole, are two extremes.

If the need were merely for a better press, for "selling science to the people," then the AAAS could hire a competent public-relations counsel and leave the matter in qualified hands. Unfortunately it is nothing of the kind. The problem of Anti-science, though it may be a subdivision of the larger one of Anti-intellect, is not amenable to the manipulation of opinions. Palliative measures—like encouragements for more and better teaching and popularization of science—do not alter the conditions that have brought it into existence. They are, in fact, likely to be self-defeating and to alienate as often as they attract. The trouble is not too little publicity but too much, not its failure but its success. Scientists as a class, like nearly every other in contemporary America, are prone to exaggerate the degree to which they are persecuted, ignoring the existence of their own prestige in order to visualize themselves as underdogs. The vast admiration that science actually enjoys is not only more widely shared than the antipathies against it, it is partly responsible for them. At least one source of Anti-science lies in the deepening absorption of science by society, a further interpenetration of one by the other than had earlier existed. Anti-science is in many respects the friction that this process inevitably generates.

I do not mean to minimize the difficulties that scientists face, particularly since I write as an avowed generalist whose own problem is of a different, if not opposite, nature. But I write also in the conviction that they cannot be reduced without lay participation,

that they involve propositions on which nonscientists have a responsibility to speak, and that science is much too important (to paraphrase Clemenceau) to be left to scientists alone. The limitations on a layman's prerogative are obvious and need neither be elaborated nor excused. This paper has no other justification than to offer scientists an outsider's view of their predicament. It is a sympathetic one, although it may not invariably appear so. The writer is fully aware how precarious his position is, but would rather take his chances than apologize for it, in the belief that science will be better served by friendly criticism than it is at present by its uncritical friends. Only from the outside, in any event, can the claims that science is now making beyond its proper sphere be validated.

II

The situation would be simpler to describe if those claims reached farther and were more vigorously engaged. "From nucleonics to sociology," writes the physiologist Ralph W. Gerard, "there exists in principle a continuum." Why stop at sociology? If there exists a definable boundary at which the orders of knowledge become qualitatively different, it must lie on the scale well beyond the region where the human personality begins overtly to intrude itself. If sociology is part of the scientific continuum, if only in principle, then so also must be the humanistic studies of behavior, which draw on poetry and politics, among other resources, for their factual evidence. Admittedly this is a wavering line of controversy, but it is the one from which science in the past quarter century has conducted a metaphysical retreat. The brave assertions of the behaviorists—like John B. Watson's "We need nothing to explain behavior but the ordinary laws of physics and chemistry"—are no longer to be heard except in faint echoes among the Social Physicists. During the same period in which science has made its longest forward strides in both performance and public esteem, it has reduced its aims and shortened its philosophical reach.

To be sure, it would be unreasonable to expect science to be permanently associated with optimism, even about itself. An increase in knowledge, as we frequently are reminded, is also an increase in ignorance. Only the innovators of scientific method like Descartes and Bacon could assume that, if it were widely and truly applied, all conceivable questions about the cosmos would be answered in from six to sixty years. Yet it is curious that scientific self-confidence should fluctuate as it does, from one generation to the next, especially in its relationship to competing and con-

ficting doctrines. Nowhere is this more apparent than in the rhythm of changing tensions between science and religion, which at the moment have fallen slack and seem not to be of pressing importance. No one thinks it strange that the Pope should enunciate a doctrine of creation timed to an expanding universe or that a scientist of the stature of E. U. Condon should speak of the "truths of science" and the "truths of religion" as though they were complementary. Such circumspection must be both a puzzle and a relief to mature scientists now at work who can remember the Scopes trial, or who may indeed have grown up on Andrew D. White's *History of the Warfare of Science with Theology in Christendom*. Confronted with the current revival of religiosity among intellectuals, they must be tantalized by the ironical thought that science has won all the battles but lost the war.

Obviously such is not the case. A great deal of confidence in science—as, for that matter, of science in itself—is dormant, beneath the surface, taken for granted, and no less operative because it is unobtrusive. Despairing scientists in search of a more realistic impression of what has happened should perhaps observe more closely the morale of their opponents, who are compelled to admit, like the British theologian C. S. Lewis, that the war is over and that a materialist faith is everywhere triumphant. To the Anti-scientist, also thinking himself an underdog, this era seems saturated with a pragmatism of disregard of supernatural sanctions. The easy-going empiricism of everyday life, in that sense, is both an index of science's success and a potential source of its strength, however little bearing it has on scientific philosophy at a sophisticated level. The point at issue here, however, is not the score of an intangible contest between ideologies. It is apparent that in science's house are many mansions, that there are many ways of "believing" in it or not, and that its forward progress about its main business does not depend directly on the regard in which it is held. Science has at best a negative or indirect effect on numerous currents in the climate of opinion, including some that have an effect on the intellectual reputability and what might be called the "political" status of science. Yet one could fairly deduce, I think, if only from the contemporary preoccupation of scientists with proselytizing and with self-protection, that in the near future no *status quo* for science, in its nonscientific situations, can be maintained.

III

For the purposes of the paragraphs which follow, it will be assumed that advance and retreat are the only alternative tactics and that of the two the former is preferred. Perhaps it is debatable whether science can ever serve as a universal organizing principle for those who are unable to apprehend its subtleties. Years of disciplined study, as Ernest Nagel has argued, are required for understanding the conceptions now employed at the outer edges of scientific

advance. Perhaps the injunction of James B. Conant, that the uninformed public refrain from speculation of any kind about a subject (nuclear weapons, in this instance) on which essential facts must be concealed, reflects a typical pattern of divided knowledge to which we must become permanently reconciled. I should prefer not to think so, and not to accept the specialist's point of view, though it is valid in itself, without a generalist's modification. "Great scientific advances are not now," as Charles Singer writes, "nor have they ever been, of their own nature specially difficult of comprehension. . . . If those men of science be right who assume as inevitable their own unintelligibility to a public all too ready to accept this assumption, then is the outlook of our age gloomy indeed." Rather, let us assume that science has no theoretical limits, either of applicability or acceptance.

What, then, are the obstacles to advance? Many of them come quickly to mind—mistrust and resentment of a morally neutral position, of a specialist outside his specialty, of allegiance to principles above national jurisdictions, of disturbing opinions for which no individual can be held accountable, and so on. Leaving aside those persons who oppose science for simple doctrinaire or unconsidered reasons, there is clearly a complex of many attitudes involved for the thousands of educated and rational people who, to the seeming detriment of science, continue to hold nonscientific beliefs. Since their convictions have survived as much as half a century of concerted attack, it is unlikely that they will be converted overnight, or by a television program on recent developments in marine biology. Many of them are apparently satisfied with a working allegiance to technology, rather than to science, as the fount of material welfare. If forced to choose between cumulative and noncumulative types of knowledge, many will reject the former in favor of the arts and letters that make life worth living and remain alive while science goes out of date. If science is to make any significant inroads on Anti-science in our lifetime, these are the people who must be convinced that science has music and color and poetry of its own.

I have not contrasted poetry with science in the naïve belief that all scientists are by definition insensitive to poetry. Yet disparagement of intuition in any form is a part of the scientific tradition, even if it is not universal or compulsory, or limited to scientists, for that matter. There is a certain thread of consistency in the response of scientists and poets to one another, from Bacon onward (how anyone, incidentally, who knew Bacon's low opinion of poetry could think he wrote the plays of Shakespeare is one of the real mysteries of nonscientific behavior). Newton was not alone among scientists in thinking poetry "a kind of ingenious nonsense," nor Blake among poets in calling science "the tree of death." Over a period of centuries, it is also a one-sided relationship, for the most part, with poets making the greater attempt to accommodate science than the other way

around. They were more interested in Newton than he was in them, as in our own day T. S. Eliot has encompassed more science than science has encompassed him. While poets have struggled to preserve a place for value in a world of fact, few scientists have had to concern themselves with finding a place for fact in a world of value.

We might be better off today if more of them had. Many readers of this journal are presumably familiar with the deplorable state of isolation from its audience into which the poetic art is generally thought to have fallen. Many of them may be surprised to know, however, that several critics hold modern science responsible for this. The two most recent scholarly books on the subject—Douglas Bush's *Science and English Poetry* and Hyatt Howe Waggoner's *The Heel of Ekohim: Science and Values in Modern American Poetry*—share the view that all modern poetry has been conditioned by science, even when seeming to react adversely, into avoiding clear and logical statement in favor of intentional complexity, ellipsis, and ambiguity. Mr. Waggoner puts it thus:

Now if the observational and experimental techniques of science really constitute the only valid approaches to truth . . . then it follows that poetry, if it is to seem significant, should . . . appeal to the sensibility (defined as primarily if not wholly emotional) but not to reason. . . . It should, indeed it must, be this kind of poetry to be taken seriously: for we cannot take it seriously if it is only poor science (it is clearly very bad science). . . . It must be thus, then, because in a world in which a divorce has been arranged between fact and value, poetry, which cannot compete with science in handling the kind of facts that science handles—and these are thought to be the only facts there are—poetry must keep strictly to the realm of value and leave the other realm to science.

"So much the better!" might be the reply of scientists who hold that science has no other responsibility than the untrammelled pursuit of its own ends. Yet if they choose to live and wish to be effective in a world in which poetry is also a fact, in which emotions undeniably exist and operate, then their position is untenable. Since it is little better than verbal and essentially false, the distinction between fact and value crumbles at the touch. In a strictly observational fashion, it is impossible to find values that are free of fact or facts that are free of value: the notion that one may do so is merely a convenience, and it becomes increasingly less convenient the more we suffer its arbitrary and obnoxious consequences. If science builds its future on these shifting sands it will not only build poorly, it will invite the ultimate undermining of the structure by the forces thus removed from scientific sustenance and restraint.

Science, at its own peril, may continue to treat the intuitions of which poetry is the purest product as an unrelated avenue of experience. The materials on which the poetic intuition works are no less factual because they are not statistically handled, nor is the intuitive process less accurate because it is rapid and deals with probabilities, using a mental shorthand in

which intermediary steps may not be consciously performed. Intuition is commonly called upon to manage an unlimited number of variables—the connotations, say, that a given word in a given poem will have for all possible readers—and to produce an approximate answer instantaneously. Intuitive conclusions may often be wrong, but not *because* they are intuitive or because any other method could have produced better ones. I trust these words will not be misinterpreted as a request that science scuttle mathematics and experiment forthwith, to rely henceforward on hunches and inspired guesswork—though much fruitful scientific work has had an assist from intuition in the past, and will presumably continue to enjoy its unpredictable and irreplaceable aid. Nothing need be abandoned that is now possible, nothing need be sacrificed that has proved its worth in any category, in lowering the artificial barrier that separates science from the proper studies of mankind. I do not presume that the sciences of the nonscientific which eventually result will be exact facsimiles of mid-twentieth-century models—or that they will need nothing more than "the ordinary laws of physics and chemistry"—but I do presume that they will be scientific in the best sense, in the traditional sense, which is science's only permanent legacy.

IV

Already there is a mounting body of evidence to suggest what the outcome will be if science hesitates to extend itself and withdraws into the security of only those "facts" that can be weighed and measured, or entered in the coding devices of electronic computers. In a mass-educated society people crave enlightenment, and, when they do not receive it from accredited sources, they will search elsewhere. Much of the faddist and crank behavior that perplexes and annoys the scientific community, often giving it the sense of being surrounded by a sea of irrationality, belongs in a grouping that might be titled "vacuum phenomena." Where an admiring but overdramatized picture of psychiatry is more widely accessible than reputable treatment, the result is dianetics. Where there is a pervasive sense of inadequate diet but only sporadic efforts to improve it, the result is Gayelord Hauser. Whenever large numbers of individuals are willing to make themselves ridiculous in the face of orthodox opinion, at a cost of which they are quickly made aware, there is likely to be an element among their motives that is not ridiculous at all. Much harm was caused by the liars and mental invalids who claimed to have seen flying saucers, but much harm was also caused by scientists who persisted in offering explanations that did not explain, insisting that no others were needed, and labeling all disagreement hysterical during the six years that elapsed before Donald Menzel's sympathetic, reflective, and apparently definitive book on flying saucers was published. If he is right, then the previous "explanations" were wrong; and they harmed science in their facile as-

sumption that all nonscientists are equally susceptible to hallucinations, and that all science was called upon to do was rap a few knuckles.

Hence a pronouncement like that of Michael Polanyi—"a society which wants to foster science must accept the authority of scientific opinion"—seems to me to be subject to considerable qualification. There can be no question of the right, nay, the obligation of scientists to decide for themselves what textbooks and journals will be published under their own auspices, what appointments will be made to their faculties and institutions of research, or to what projects their own time and effort will be devoted. Yet there seems to me to be a very large question whether this is the same thing as the acceptance of "the authority of scientific opinion" by nonscientists, or whether there is any substitute for free and open discussion on any questions that affect the entire society. The amount of money to be allocated to a National Science Foundation is just such a question, and the unhappy incident that occurred the first time it came up is highly illustrative. Among certain disrespectful nonscientists of my acquaintance, there was unseemly but understandable mirth when scientists, as a pressure group, lined up at the public trough with other pressure groups and suddenly discovered that they exerted no pressure. It was a salutary lesson.

One cannot be effective in politics while remaining above it. One cannot wield political power without accepting political responsibility, which is primarily the responsibility to respect the politics of others. I am very much afraid that ever since the threat of atomic warfare brought American scientists into politics on a large scale—and into government employ on an even larger scale—there has been a marked tendency among them to patronize the political scene, to sneer at it, and at the same time to seek to dominate it as a privileged caste. Like the poet, the politician must develop a healthy respect for facts, which are no less real because they are imponderable. He must manage a number of variables at least as large as the number of his constituents, and if his intuitive statistical processes for so doing do not average out successful answers, he ceases to be a politician. Here, on the other hand, is a representative sample of a "scientific" verdict on politics, taken from a symposium on cytology published by a college press:

We have to see to it that somehow future statesmen, members of the judiciary, the clergy, and other leaders of the people, the molders of public opinion, have a more "scientific" outlook than most now have. But in the meantime we scientists have also somehow got to take a larger part in the formulation of public policy than we have so far been doing. Here we run into a real problem: how determine policies without being a politician? And how can a good scientist be a good politician? For the essence of the politician's art is to make people think as he wants them to. . . .

Anyone who wonders why science has come upon hard times politically need only read that paragraph.

It is loaded with emotional assumptions that put a nonscientist's teeth on edge, and that lead nonscientists who seek to defend science into black despair. I am reminded of a physicist with whom I once discussed the "problem" of Anti-science; he said that it seemed to him perfectly natural that people should resent the scientist's superiority. There is a word for this, gentlemen, and the word is arrogance. It has nothing to do with science proper, it is not required by the needs of dedicated and impartial investigation; and it is certainly not sustainable on an evidential basis. It is an archaic prop to the ego, a social and psychological bad habit left over from the bad manners of nineteenth-century academic life, and fortunately it is already on the way out. But it is still one of the first and most unnerving aspects of science that many laymen encounter, and it has done incalculable harm.

V

A scientist might conclude, presented with these arguments for modifying the rigid definitions that separate science from other forms of human activity, that an effort was being made by laymen to penetrate science and to take over its time-honored functions. The prospect that existing distinctions might be blurred suggests this fear to Dr. Polanyi: "It would not only become practically meaningless to describe anyone as a scientist, but even to refer to any statement as a scientific proposition. Science would become, in effect, extinct." In all respect, I cannot share the logic of this defensive orientation. The opposite danger, that science might lose the fertilizing and revivifying contributions which amateurs have always made to it, seems to me equally great if not greater. And for science to lose contact with society at large would be, of course, disastrous. Error we shall always have with us, within the sacred precincts as well as without, and a dreary record of historical failures underlines the fallacy of supposing that any one group may purify itself and live apart. Is it an abrogation of the scientist's independent judgment to rejoin the race of common folk on more workable terms of equality than now pertain?

The "mad scientist" who is so consistent a figure of modern folklore is not entirely the product of envy and ignorance. There is justice—poetic justice, if you like—in the popular view of the archetypical scientist as a warped and incomplete being, a man who has isolated one component of the universal experience and cultivated it to the exclusion of all others. Science itself, in a historical perspective, has achieved its triumphs as well as its tragedies by imposing an arbitrary but significant order on the undifferentiated flux of nature. There is a sense in which science consists legitimately of distortion, in which one can say that all great scientific discoveries appear initially to be contrary to common sense, and in which the Western civilization that science has profoundly shaped now dominates the world precisely because it is neurotic. But it seems highly unlikely

that this pattern of dissociation can survive the coming fifty years without serious damage to both science and society, and of the powerful corrective forces now coming into play none is more hopeful than the urge of scientists themselves toward synthesis, both of one special field of study with another and of one with all.

That is why, as a nonscientist who wishes to see science prosper, I am relatively undisturbed at the image of a world in which scientists would be indistinguishable from people, in which scientists would be men and women first and scientists second, and in which—perhaps, in ways that scientists today may find difficult to visualize—everyone else will be scientists, too.

The human condition is crowded with ambiguities, and all our acts have unintended consequences. The act itself of posing the scientific dilemma in these terms will suggest to the reader countless other terms in which it might also be posed, perhaps irritating him where it ought to soothe and offering consolation where it ought to kindle wrath. These are emotional objects of dispute, charged with old quarrels and haloed with the motivations we impute to one another. They are not, in that respect, “scientific,” but I commend them to the attention of scientists, lest they be left indefinitely in other, and ultimately less sympathetic, hands.



Some Comments on Popular-Science Books

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CONTRARY to optimistic rumors that have been circulating ever since the end of World War II, scientists still have not deserted their ivory tower. But the place is a good deal better ventilated than it once was. Moreover, further renovations are in sight, a fact that may prove heartening to those who have spent years trying to bring American scientists and the rest of the American public closer together. I might add that they are still far apart, and progress along such lines comes none too soon.

One promising sign is the bumper crop of books prepared by scientists for nonscientists. Popularizing is a vice that cannot be indulged in privately. Sooner or later, your efforts will probably be published—and not long ago that would have meant some loss of social status in the scientific community. Of course, your colleagues wouldn't have said anything to your face. But among themselves they would have wondered why you were writing instead of doing research, and concluded that you were slipping.

This attitude has not disappeared entirely. Traces of it can still be detected, particularly in the upper, less efficiently aired, chambers of the ivory tower. Pure mathematicians, snug in their hyperspaces, are most reluctant to take time out for book-writing, or for any other concrete form of popular science. The reluctance coefficient becomes smaller as one passes through the spectrum of the specialties from theoretical physics and chemistry to biology and finally to the social sciences. But generally speaking, writing for the layman is becoming respectable, and it may actually bring the scientist as much prestige as his achievements in research.

This article will confine itself to a series of comments on popular-science books, most of which have been published during the past two years. The ma-

majority concentrate on research currently under way or offer up-to-date summaries of scientific thinking on specific subjects. Some books are devoted to various themes in the history of science, and others, the smallest proportion of all, deal with science itself—its methods and aims and values. These three categories may not be all-inclusive; certainly they overlap in many cases. But they may help to indicate those areas of science that are relatively well covered and those that have been neglected.

A MATTER OF STYLE

As far as books in the current-research category are concerned, one of the most encouraging developments is an unspectacular but steady increase in the use of the word “I.” This statement will have to stand as a general impression until some Ph.D. candidate investigates it statistically. But it is based on considerable reading, and several publishers have commented to me about the significance of the trend. In using the first person the scientist has taken an all-important first step in freeing himself from what is undoubtedly the deadliest, most awkward style ever invented by anyone for any purpose—the nameless style found in technical publications.

If the scientist insists on subjecting his colleagues to this sort of writing, that is his business (although judging by recent criticisms, they don't particularly enjoy it either). But the weight of experience shows that good English is more helpful in communicating with other people. Although uninhibited use of the first person is no guarantee that a book will be well written, it is a valuable index to general readability. The odds are that it will be easier to read than one which, in the name of being “impersonal,” falls back on the phrasing typical of the average scientific report.