THE STATUS OF SOCIAL SCIENCE*

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Let me begin by postulating that the high status now enjoyed by science is precarious. It is founded on fallacies in the minds of many people about the nature of science. These fallacies are widespread not only in the public mind but in the minds of scientists themselves because they have failed to recognise the significance of the human element in science. The general public entertains a different fallacy based on the belief that science's main role is a technological one, destined to help us improve material welfare and wage war.

My address discusses the nature and effects of these fallacies, and particularly the way in which they have reduced the status of the social sciences, not only in the minds of other scientists, but in the mind of the general public as well.

Science and the Arts

For too long scientists have used unscientific gamesmanship to restrict prevailing concepts of science to those aspects of human life where the human observer can, it is thought, step aside from nature and observe it impartially.

However, science is itself a creation of the human mind, and as such it has much in common with other forms of creative activity. It is comprised of a trinity of human inspiration, the collected knowledge of past generations, and techniques of observation and interpretation that together provide for an unending search for new knowledge and new concepts.

The human element in science, far from making science unscientific, is an essential component of it. Just as beauty is in the eye of the beholder, so is science in the minds of the scientists.

The artist, for instance, operates in much the same way as the scientist, especially with regard to inspiration and technique. Moved by inspiration, he uses available techniques to express as art forms his own response to the events or notions he perceives. Scientist and artist—each finds his way to a frontier ; to new forms of knowledge in the case of the scientist, and to new forms of expression by the artist. But while the scientist must test his inspirations by empirical observations, and use them as a basis for prediction, the artist can appeal only to the subjective responses and emotional experiences which he evokes in other men's minds.

This kinship between art and science, based on creativeness, represents a return to attitudes of bygone days when art and science were more closely wedded. Bertrand Russell,[1] when accepting his UNESCO

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[1] Bertrand Russell, " The Divorce of Science and Culture ", *Unesco Courier*, No. 2 (Feb. 1958), p. 4.

Kalinga Prize in 1958, said that the divorce of science and culture is a modern phenomenon. Many modern writers[2] are drawing attention to the common elements between science and the arts and humanities, and are striving to bridge the gap which is developing between them. Oliphant,[3] in his Rutherford memorial lecture (1955), strikes this note when he comments that—

> " The development of the nuclear model of the atom by Rutherford and Bohr, or the formulation of the theory of relativity by Einstein, display all the attributes of art or of literature in their highest forms."

From the other side, writers in the arts see the elements of unity between the arts and science. In a fascinating review of " Science, Poetry and Politics ", Larrabee[4] argues in similar terms from the viewpoint of the arts. He states that—

> " If science is to make any significant moves on Anti-science in our lifetime, those who favour arts and letters must be convinced that science has music and colour and poetry of its own."

Snow's Two Cultures

Despite this common ground between science and the arts, C. P. Snow[5] argues that modern life includes two virtually separate cultures, one comprised of scientists and the other of " literary intellectuals ". These two components of our culture, says Snow, are separated by " a gulf of mutual incomprehension ". They have virtually ceased to communicate with one another, and have a curious distorted image of each other.

Discoursing on the two separate cultures in modern society, the " scientists " and the " writer-intellectuals ", Snow berates each group for not

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[2] For example, see—

(a) Sir Lawrence Bragg, " Science and the Adventure of Living ", (Fourth Radford Mather Lecture), *Advancement of Science*, Vol. 7, No. 27 (Dec. 1950), pp. 279-284.

(b) J. Robert Oppenheimer, *Science and the Common Understanding*, B.B.C. Reith Lectures 1953, (London, Oxford University Press, 1954).

(c) Conway Zirkle, " Our Splintered Learning and the Status of Scientists ", *Science*, Vol. 121, (April 15, 1955), pp. 513-519.

(d) " Conference on the History, Philosophy and Sociology of Science, 1955 " sponsored by the American Philosophical Society and the National Science Foundation, *Proceedings of the American Philosophical Society*, Vol. 99, No. 5 (Oct. 15, 1955).

(e) N. R. Campbell, " Science, Imagination and Art ", *Science*, Vol. 125, No. 3252 (April 26, 1957), pp. 803-806.

(f) Merle A. Tuve, " Is Science Too Big for the Scientists ", Saturday Review, (June 6, 1959), p. 51.

(g) Paul Weiss, " The Message of Science ", *Bulletin of the Atomic Scientists*, Vol. 15, No. 7 (Sept. 1959), pp. 274-277.

(h) Carnegie Institution of Washington, Report of the President 1958/59, Washington, 1959, especially pp. 7, 10.

[3] Sir Mark Oliphant, " Science and Mankind ", (Rutherford Lecture 1955), *Science and Culture*, Vol. 20, No. 10 (April 1955), p. 468.

[4] Eric Larrabee, " Science, Poetry and Politics ", *Science*, Vol. 117 (April 17, 1953), p. 396.

[5] C. P. Snow, " The Two Cultures and the Scientific Revolution ", (Rede Lecture 1959), *Encounter*, Vol. 12, No. 6 (June 1959), pp. 17-24.

recognising the relevance of the other to its own problems. Of the writer-intellectuals he says—

> " They still like to pretend that the traditional culture is the whole of ' culture ', as though the natural order didn't exist. As though the exploration of the natural order was of no interest either in its own value or its consequences. As though the scientific edifice of the physical world was not, in its intellectual depth, complexity and articulation, the most beautiful and wonderful collective work of the mind of man. Yet most non-scientists have no conception of that edifice at all."

The two cultures, says Snow, have ceased to communicate because they live separate lives, each with its own social attitude, each with its own language, and each with its own underlying concepts about the nature of man's role in the universe. Snow goes on to express the view that, while there are all kinds of tones of feeling between the two extremes or poles, it is through the literary intellectuals that " the pole of total incomprehension of science radiates its influence on all the rest. That total incomprehension gives, much more pervasively than we realise, an unscientific flavour to the whole of traditional culture and that unscientific flavour is often, much more than we admit, on the point of turning anti-scientific ". This is an implied criticism of scientists, who should be radiating their own influence from the opposite pole. They need to convey to others the idea that science is something more than a cold and efficient way of doing things.

I am inclined to accept Snow's diagnosis as a partial explanation of the position we find in Australia. But I would also add that here we find the institutional influence strongly superimposed on the cultural. The " gulf of mutual incomprehension " exists not only as between the scientists and the writer-intellectuals, but also with regard to matters of science as between government and industry, between governments and universities, between fundamental scientists and applied scientists, as well as between physical and biological scientists and social scientists. These gulfs of mutual incomprehension are one of the major problems being faced in scientific liaison work. They tend to become institutionalised gulfs, preserved by institutions which have interest in or responsibility for only one phase of scientific work.

Communication Breakdown

Between both sides—scientists and artists—there seems to have been a breakdown in communication. Scarcely less serious is the breakdown that has also occurred between different branches of science—physical, biological and social—so that they, too, are virtually living in separate worlds, and failing to understand one another. What have an economist and a biological scientist in common ? Nothing, was the answer given to me recently by one of Australia's most renowned biological scientists. Perhaps his counterpart among the economists would say the same. But I would argue that they have much in common if only they would learn to communicate with one another, recognise the common components of science in each discipline, and look to the ultimate goal of intellectual scholarship.

Conant, in his book " *Science and Common Sense* ",[6] adopts the following definition of science—

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[6] James B. Conant, *Science and Common Sense* (London, Oxford University Press, 1951).

" Science is an interconnected series of concepts and conceptual schemes that have developed as a result of experimentation and observation and are fruitful of further experimentation and observations."

Conant goes on to stress that the " degree of empiricism ", relative to the " conceptual schemes ", varies not only between different sciences, but also at different stages in the development of science. This is the basis for the gradation between the purely physical, on the one hand, and, on the other, the biological sciences in which life processes complicate observations and make the derivation of conceptual schemes much more difficult. In this book, written in 1951, Conant says that his definition of science does not exclude the study of man, but that the extent to which there is parallelism between procedures involved in the social sciences and the natural sciences is still an " open question ".

Evolving Concepts of Science

Not all writers about science are prepared to go as far as Conant by leaving the door open to the social sciences. The literature of science is laden with discussion founded on the belief that, as Ashby[7] says, " It is the essence of the scientific method that the human element must be eliminated ". But nowadays one finds more and more eminent scientists exploring the implications of this attitude, which has prevailed for so long. Heisenberg,[8] in his *Physics and Philosophy*, says that " modern physics has perhaps opened the door to a wider outlook on the relation between the human mind and reality ". In her introduction to the book, Ruth Anshen[9] says :

" We stand at the brink of a world in which human life presses forward to actualise new forms. The false separation of man and nature, of time and space, of freedom and security, is acknowledged . . ."

Just as a physicist has been led to this viewpoint, so has Polanyi[10] concluded that it is time to discard the absurd ideal of impersonal objectivity :

" No, a humanistic revisionism can be secured only by revising the claims of science itself. The first task must be to emancipate the biological sciences, including psychology, from the scourge of physicalism ; the absurdities now imposed on the sciences of life must be eliminated. The task is difficult, for it calls in question an ideal of impersonal objectivity on which alone we feel safe to rely. Yet this absurd ideal must be discarded."

Strong words indeed, which involve quite significant adjustments in our concepts of science and scientific method. We should certainly not accept this view only because it is stated by such eminent scientists. But such views do lead us to look again at the scientific tradition which has insisted on extracting the human factor from science. Perhaps it is

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[7] Sir Eric Ashby, *Technology and the Academics, an Essay on Universities and the Scientific Revolution* (London, MacMillan, 1958), p. 82.

[8] Werner Heisenberg, *Physics and Philosophy, the Revolution in Modern Science* (New York, Harper and Brothers, 1958), p. 202. And also Werner Heisenberg, " From Plato to Max Planck, the Philosophical Problems of Atomic Physics ", *Atlantic Monthly*, Vol. 204, No. 5 (Nov. 1959), pp. 109-113.

[9] Werner Heisenberg, *Physics and Philosophy* op. cit., p. XIV.

[10] Michael Polanyi, " The Two Cultures ", *Encounter*, Vol. 13, No. 3 (Sept. 1959), p. 64.

another of those traditions which are handed on from one text book to another, from one Professor to his students who in turn become Professors, without thinking too much about its implications. In any case, these new ideas may soon shift the burden of proof for this attitude back to the scientists themselves.

Science a House Divided

Because of these different attitudes toward the human element in science, science nowadays is a house divided against itself. It is not remarkable, therefore, that science has failed to be meaningful to the layman, and that there has been a breakdown in understanding between scientists and other people in the community. Science can speak with no single voice while these schisms exist. So long as they do exist, scientists are forced to present a false front to the rest of the world—giving the impression that science depends for its value on its practical applications, and that this is the only common ground between different scientific disciplines.

One reason why science is a house divided is that scientists have not recognised the common basis of scientific method which characterises all science, whether this be physical, biological or social. Furthermore, social scientists have been encouraged by the climate of opinion created by other scientists to accept a concept of science which plays down the role of the human element in science.

Natural scientists may argue that the schism between the sciences is founded on the immaturity of the social sciences. But it seems also to depend on some purely institutional factors which tend to preserve, and not infrequently to exploit, the differences between these sciences.

For example, there is a well-defined " peck order " among different kinds of scientists. It varies somewhat from time to time, and the personal prestige of individuals can break it down occasionally. But this peck order is one of the realities of everyday life here in Australia in 1960—with physicists and medicos somewhere around the top and agricultural scientists and economists near the bottom.

A notable feature of this peck order is that the applied sciences are of lower status in the professional world than the fundamental or pure sciences. As long as this idea prevails, so long will C.S.I.R.O. and State Departments of Agriculture have problems in dividing lines of responsibility, with C.S.I.R.O. concentrating on the fundamental and State Departments on applied research. The States quite understandably want to participate in work which has the higher status in the scientific world. On the other hand, extension work (conveying the results of research to farmers) is not even recognised as having a scientific component by many of our agricultural leaders. This is an attitude which is rather shattering for those of us who appreciate how desirable it is for extension work to achieve professional status on a par with research work.

Well-established cultural traditions such as these are hampering the exploitation of our intellectual resources. They tend to discourage the better intellects from engaging in applied research or extension work.

Some of the clap-trap of professional organizations, and methods of publishing scientific papers, also tend to preserve this position.

At the top of the peck-order of Australian scientists, members of the Australian Academy of Science have defined the eligibility for membership on the convenient basis of subject matter instead of scientific method. They have thus excluded from the Academy the whole sector of scientific thought which is included in the social sciences. At the same time, the Academy seems to be trying to develop into Sir Douglas Copland's Fourth Estate,[11] by taking part in discussions about public issues, at least insofar as matters of science are concerned. In short, the Academy strives to define the role and status of science in Australia ; yet it has excluded the social scientists who should be best able to help the Academy achieve this particular aspiration.

Status of the Social Sciences

The status of social scientists has suffered in some eyes because they have not yet accumulated enough knowledge to enable them to make predictions on a scale which enables their discipline to qualify as a science. But to accept this definition of science, to the effect that scientific status is dependent upon the practical results and the predictions which it can provide, focusses attention on only one facet of science. Scientists who persist in doing so are being forced into indefensible attitudes with respect to the nature of knowledge, efficient technologists though they may be. Those scientists who do so are winning the battles (to find new practical applications for science) so to speak, but the nature of the beast is such that they must inevitably lose the war (to find the role which science can, and indeed must inevitably, play in the search for wisdom and for human values).

Inability to comprehend the common thread running through all science—be it physical, biological or social—is hindering the maturation of science in many ways. This lack of understanding provides fertile ground for prejudices about the supposed uselessness of some sciences, not excluding agricultural economics.

In another significant way, too, emphasis on the results of science rather than its methods has contributed to the breakdown in communication between the different sciences, and also between the sciences and the humanities.

Scientists must accept some responsibility for having planted in the public mind a wrong concept of what science is. Far too many people think of science merely as a means of improving material well-being. It is then a small step to think of science as being of the same order as a gimmick or a gadget. There is an element of magic about it which gives it the wrong status in the eyes of the general public. I am not saying that scientists have consciously created this idea in the public mind. But often they have stood by whilst this false image has developed. It follows that the high status which science enjoys in the minds of many people is precarious because it is founded on misconceptions and fallacies,

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[11] Sir Douglas Copland, " The Australian Economy : the economic potential and how to achieve it . . .", Address to the *Summer School of the Australian Institute of Political Science, Canberra, Jan. 30th*, 1960.

not the least of which I have called the Fallacy of the Invisible Hand.[12] Adam Smith notwithstanding, there is no invisible hand which will ensure that, by allowing individuals to pursue their own self interest, modern communities will achieve any particular goal, far less recognise the importance and significance of science. Nor is there an invisible hand which ensures that money and resources will be made available to any research agency which has no regard for the need to keep others informed of the nature and significance of its work.

Social scientists have a responsibility to show how all scientists are shot through with prejudices and philosophic attitudes which implicitly influence their whole approach. So often these attitudes, impressed into their personalities during childhood and adolescence, have predetermined their outlook towards concepts developed in other fields. The tradition established by Pearson's *Grammar of Science*[13] with its emphasis on the " unbiased " collection of empirical facts, is dying a long and lingering death, but it still leads many scientists to believe that a human element in science is a contradiction in terms.

These problems of methodology and especially new concepts of the status of the human factor may well be the big contribution which social science is yet to make in the historical development of science—even if this means a change in our present conception of science itself. In this respect we might well take our lead from the physicists, the purest empiricists of all—one of whom (Heisenberg[14]) has written " But the change in the concept of reality manifesting itself in quantum theory is not simply a continuation of the past ; it seems to be a real break in the structure of modern science."

Agricultural Economics

Although science generally enjoys a high, though rather precarious status in the public mind at present, agricultural economics is relatively unappreciated and neglected in the allocation of research funds. This is partly our own fault because we have not told others what we strive to do. Farm management research, for example, is too often thought of as little more than what farm management specialists would call cost accountancy.

We agricultural economists must become more vocal on behalf of our profession. In the course of our everyday discussions we need to be sure that people understand the terms which we use and the concepts and purposes of our science. We do agricultural economics a disservice and expose it to the risk of gross misrepresentation when we use an incomprehensible jargon in addressing others.

In recent years there have been submissions to different authorities in Australia seeking funds for research in agricultural economics. Unfortunately, these have been couched in language that must have been virtually incomprehensible to the people to whom they were addressed.

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[12] D. B. Williams, " Facts, Fancies and Fallacies, for Unscientific Scientists ", *Journal of the Australian Institute of Agricultural Science*, Vol. 24, No. 2 (June 1958), pp. 124-131.

[13] Karl Pearson, *The Grammar of Science*, 2nd ed. (London, Adam & Charles Black, 1900).

[14] Werner Heisenberg, *Physics and Philosophy* op. cit., p. 29.

As a result, agricultural economics is relatively poorly endowed by allocations of money from levies on wool, wheat and dairy products. We must now start from behind scratch and try to convince committees which control funds available for research of the purposes and usefulness of agricultural economics research.

To some extent, of course, this is a relic of the past when there was lack of co-ordinated effort to provide a background against which individual submissions for grants could be made. We have not yet, for example, clarified the roles of Universities, the Bureau of Agricultural Economics, and the State Departments of Agriculture in this respect, and submissions from each often cover common ground and inevitably become competitive.

We also need a much higher standard of economic journalism here in Australia. For example, has the general public really understood and appreciated the problem of, say, creeping inflation ? I am yet to be convinced that the issues involved have been communicated to and understood by the general public. Yet it is an essential part of our democratic system that many more people should possess a good working knowledge of the use and scope of economics and of science in general.

All this leads one to stress the great need for the establishment of scientific journalism as a profession in Australia. It is virtually non-existent here, while various societies of science writers (for example, the National Association of Science Writers) have been in existence in the United States for many years. In the United Kingdom, the Institute of Information Scientists was formed a few years ago to foster the development of scientific writing.

Conclusion

May I now reiterate my main contentions ?

Scientists have not created in the minds of other people—the public,[15] and especially artists and students of the humanities—a clear concept of what science is.

The diverging paths of science, on the one hand, and arts and humanities on the other, are emerging as one of the great unsolved problems of our generation. Some writers are making heroic efforts to bridge the gap. Reading the literature in this field, one gets the feeling that a breakthrough to new concepts is imminent.

As science comes to take its place as part of the bundle of traditions and values which together make up our culture, its influence may well be far deeper and more pervading than its physical effects on our national well-being—nuclear science, space research and polio vaccines notwithstanding.

From the viewpoint of the evolution of scientific method, the interchange of influence between the arts and the sciences should be mutual, and not one-way. Fear of the human element in science has made scientists turn their backs on artistic inspiration and on concepts which have a role in the further development of scientific methods.

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[15] Stephen B. Withey, " Public Opinion about Science and Scientists ", *Public Opinion Quarterly*, Vol. 23, No. 3 (Fall, 1959), pp. 382-388.

The essence of science is its rationalism integrated with a degree of inspiration, and with an open attitude of mind and sense of enquiry which drives the scientist to keep up his painstaking search for empirical evidence which may confirm or challenge the value of his conceptual schemes, and to accept changes in these schemes as new knowledge accumulates. For, as Polanyi[16] has said, " It is of the essence of a scientific theory that it commits us to an indeterminate range of yet undreamed consequences that may flow from it."

There is room for an infusion of understanding of these attitudes as part of the underpinning of our cultural values. The social sciences can emerge from adolescence to maturity by bridging this gap between the sciences and the arts, at the same time contributing to the evolution of new concepts of science itself.

It is one phase of our cultural heritage that non-scientists influence and control in an unscientific way a large part of the activities of governments. The role of science is still assessed in an unscientific way, as part of the art of politics. Here compromise is almost the invariable order of the day, and precise rational judgments are not always made. With the emphasis on art and culture, there is an inbuilt component of anti-science, if not anti-intellectualism. The non-scientific component predominates because of the nature of our educational processes and of human beings themselves. Governments necessarily move on a component of faith in people. Scientific rationalism, within government circles or even in the culture which the government mirrors, can never, and should never, entirely replace faith of this kind. But if there is a lack of understanding of the nature of science, such faith is too often precariously founded on the practical results made available by new scientific knowledge.

Some of the scientific greats of the past, such as Ian Clunies Ross, have used their personal gifts to try to make scientific institutions and scientific methods of enquiry a part, but again only a part, of our culture. It is the social sciences that can do so much more to analyse the nature, significance and role of science, so as to provide a wider basis of understanding on which these judgments of faith can be made.

Science itself may well have to merge its influence with other forms of human creative activity before it can provide answers to the kind of questions which have been raised here. Indeed, in full accord with its nature and its tradition, science may evolve new forms as the frontier of knowledge and human understanding is pushed further into spaces now unknown to us all.

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[16] Michael Polanyi, " Scientific Outlook : Its Sickness and Cure ", *Science*, Vol. 125, No. 3246 (April 15, 1957), p. 484.