

de Solla Price, Derek J.

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D. J. de Solla Price

THE HISTORY OF SCIENCE AS TRAINING AND RESEARCH FOR ADMINISTRATION AND POLITICAL DECISION-MAKING

To all of us whose professional life is concerned with research and teaching in the History of Science it is clear that the last few decades have brought, in many countries, a considerable enlargement of the scope and importance of our subject. Many full-time academic posts now exist, many bright young students are now entering the field and receiving special training within it.

As some indication of this, the Institute of the History of Science and Technology of the Polish Academy of Sciences now has 26 scientific workers on its staff, and our own Department at Yale University (just one of nine major departments in U.S. universities) with a professional staff of some six teachers together with several additional part-time members and distinguished visitors from other countries now deals with about 100 undergraduates, 20 graduate students and four or five post-doctoral students each year.

This tremendous post-war increase is, of course, a reflection of the growth of science and technology within our civilization. Though for many centuries they have held important place, philosophic interest and even material benefit, it is only comparatively recently that they have become a numerous occupation and an expensive one. In the most developed countries, trained scientists and technologists have become the largest group in the highly skilled labor force, and expenditure on research and development, now standing at several percent of the Gross National Product is growing so fast that if it were continued it would consume the whole before the end of this century.

With science and technology now generally recognized as the most potent activities of man, the producers of so much of our economic strength and political power, and the consumers of so much of our national resources of manpower and money, it is only natural that there should be an increased demand for the study of this science and tech-

nology as a human activity. Growing out of studies that were already old at the beginning of this century, there is no doubt that History of Science (including History of Technology and History of Medicine) and Philosophy of Science have become recognized and well-integrated academic disciplines with a corpus of literature and techniques of their own, respectable subjects that call forth in the student just as much perspiration and inspiration as any other subject including research in the sciences themselves.

Though the History and the Philosophy of Science have come first to fruition, they do not include all the many ways in which one may make a study of the place of science and technology within civilization and human activity. Furthermore, our goals as scholars and teachers concerned with the understanding and explication of these subjects are not by any means all that we could be doing within the frameworks of modern universities and research institutes. Interestingly enough, the first point, that History and Philosophy of Science by themselves are not enough, was first elaborated by two Polish scholars, Maria and Stanislaw Ossowski, in an article introducing an inelegant but now much-used term, *The Science of Science* ("Organon", Vol. 1, 1935), more than a quarter of a century ago. Though the basic studies are even now hardly developed, they were able then to point out the need for a general scholarly analysis and understanding of such things as the psychology of scientists and of scientific discovery, the sociology of the scientific professions, and the comparative study of scientific institutions, the economics of scientific research and the formation of social and state policy.

The last few decades have seen the publication of many pioneering investigations in fields such as these, e.g. those of Robert Merton and Bernard Barber in the Sociology of Science, of Anne Roe in the Psychology of Scientists, and of Stefan Dedijer in the analysis of scientific policy of states. My own work has been partly concerned with statistical econometric treatment of science, partly historical, partly modern. What seems especially interesting is that these studies, as they develop, seem to flow naturally out of the corpus of History of Science, deriving from it much useful material and lending to it an increased understanding of its own problems.

Though the work of Maria and Stanislaw Ossowski was a generation ahead of their time, later developments have justified their faith that a wider subject, the so-called Science of Science, was a viable whole and would come into being. To be realistic we must however admit that the subjects auxiliary to the history and philosophy of science have not developed nearly so much as those central disciplines. For those of us within Universities and research institutes, the major task is that of teaching and research in the history or philosophy of science, while the

sociology, psychology, economics and research policy studies must take secondary place for occasional excursions by us and by our colleagues is neighbouring academic departments. Part of the difficulty has, of course, been the fragmentation of the modern academic life that, e.g. removes the historian of science from contact with the sociologist or economist or political analyst, but another reason is that there has been perhaps too little demand upon the historian of science himself.

Recent developments are now beginning to make such demands upon our profession. Interestingly enough they make them in a way that now seems rather close to the *Science of Science* as imagined by the Ossowskis. In the U.S.A. and, I believe, in the U.S.S.R. too, the great complexities of organizing the science and technology of the nation have given occasion for work by a rising body of specialists whose business it is to study and attempt to understand such problems as the relation between science and technology, the relations between the various sciences, the process of discovery, the relative cost of various sizes of effort in the more expensive fields of accelerators and rockets, etc. Many such experts, of course, are drawn from the ranks of the older and more experienced scientists. Clearly this will always be so. But in addition to these, it seems also reasonable that men who have devoted their efforts to the understanding of historical development of science should in many cases be peculiarly and specially capable in having a greater feel for science and its processes than any "mere" scientific specialist. They should have something of the same sort of general aptitude vis-à-vis science as that which for age immemorial has made it a matter of normal educational policy for would-be aspirants to government to study history itself.

Thus, there seems to be growing some corpus of knowledge and expertise which stands in relation to science as economics does to business or art history to the artist, or the academic study of literature to the author and the poet. In this corpus it is now our subject, the history of science which seems cast in the leading role, as the most mature, most well-developed of all the related sub-disciplines that are needed.

One should not, I suggest, make any claim that history of science is already the theoretical basis of a new applied science of the organisation of science, but only that it is beginning to serve an interesting function in this direction. If even that is so, it does add rather considerably to the importance of our subject as a university discipline, and it also provides a rather deep natural repayment by our profession to the national purposes in whose interest "Big Science" has been created and has spurred our studies.

For some time, I suppose and hope, the greater number of our students and the readers of our monographs will be those whose interest

in the history of science is motivated by the same pure scholarship that has led us to this field. I think however that in addition to this we must allow that we have a considerable responsibility within the university in teaching our subject as part of a general education for citizens to live in this scientific age, more especially as part of the more special education needed by those whose task it will be to take government and executive and advisory positions in its organization. I feel it is highly desirable for historians of science to be sensitive to this function they can serve in the community, and to this end they might well give thought to directing some of their teaching and research efforts in these directions.

In our own department we now have many undergraduates and some graduate students whose chief interests are in administration and in its theoretical bases, and furthermore, it is not uncommon for our faculty and even our students to carry out research, sometimes as historians, sometimes in the almost non-existent fields such as economics of science, but always directed to particular needs and problems which have been referred to us by such bodies as the National Science Foundation or other state or business institutions for whom we act as advisers and consultants.

It may indeed be time for some serious effort to be made by the world's historians of science to adjust themselves to the actuality of this Science of Science and to see what we might do to help see that the most potent forces in this modern world are organized for the good of mankind in the light of the best historical perspective we can bring to them.