# Research Publication: A Federal Responsibility?

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THE NATION'S POSTWAR BUDGET for research and development during 1947 reached the highest point in our history—more than $1.1 billion." Thus John R. Steelman reports to President Truman in "Science and Public Policy" on the unprecedented volume of our national research effort (*2*).

This is a staggering figure when viewed against a total national research expenditure in 1930 of $166 million and of $345 million in 1940. Over a period of 17 years the national budget for research and development has increased more than 560 percent. Steelman recommends further that "our national expenditures for research and development should increase as rapidly as possible. By 1957, we should have at least doubled our present budget for this purpose" (*3*).

If Steelman were making his report today, he would have the federal expenditures on atomic energy research and development to add to the total. Officials of the Atomic Energy Commission estimate that approximately 300 million dollars of their federal appropriation are now spent annually on scientific research, exclusive of construction, weapon development, and administrative costs. This raises the total annual national expenditure for research and development to well over the billion dollar mark.

## Research vs. Publication

For the cause of science, this calls for rejoicing. But something has been overlooked. The scientific journals—in which results of this tremendous research effort would normally be published—have not kept up either in volume or in scope with the increase in research. On the contrary, these journals have been beset by rising printing costs and overtaxed by the amount of good scientific material crying to be published.

To make matters very much worse, most research expenditures are made by the federal government and publication in the government, by tradition, has been viewed rather dimly because Congress frowns on publicity by government agencies. Although scientific publication is a necessary part of research and a far cry from publicity, the bad connotation of publishing by the government persists. This is unfortunate, for science rests upon its published record, and this record is of the utmost importance.

## ONR-AEC Policy

It is interesting to note the stand taken in this respect by two government agencies which today figure most importantly in scientific research—the Office of Naval Research and the Atomic Energy Commission. ONR's publication policy has been stated as follows: "The most appropriate means of disseminating results of sponsored research is by publication in the recognized scientific channels." The AEC, in its Fifth Semiannual Report, says: "The Commission's policy is to encourage the use of normal channels for the release of scientific and technical information" (*8*). Both agencies have adopted this policy because they believe the normal channels for scientific publication have been tested by time and found acceptable. But the policy has now proved inadequate.

Let us review effects of this policy. The Royal Society Scientific Information Conference, held in London last sumer to examine the scientific publication problem on an international scale, listed these major effects of the existing publication system of scientific papers:

1. *Absolute loss of knowledge.* Many papers are never seen by the workers who could make use of their findings and who are therefore obliged to discover the results for themselves.

2. *Relative loss of knowledge.* Owing to delays in publication, abstracting and distribution, scientific papers often reach interested workers long after their publication, occasionally as long as three years. This delay slows down the whole circulation of science and also leads to unnecessary duplication.

3. *Inconvenience,* due to loss of research time in searching for literature and for this purpose reading through masses of irrelevant information.

4. *Increasing cost of publication,* which in turn has three consequences:

   a. Reducing the possibility of full publication of scientific material

   b. Crippling scientific societies by so adding to their subscriptions that they lose membership, and consequently

   c. Depriving the students of poorer finances of the possibility of membership of these societies.

5. *Loss of scientific, clerical, and technical manpower* in directing and administering an extremely complicated

and overlapping series of small undertakings producing scientific literature.

The report concludes that "these obstructions to scientific progress are plain and obvious" (*5*).

These, then, are some of the recognized universal effects of the existing system of scientific publication. ONR and AEC, in recommending use of this system, as it now exists, are recommending use of an inadequate system, but are severely limited in authority and resources to make it more adequate. At the same time they are burdening the scientific press by adding to the volume of papers it must handle.

To illustrate specifically what is happening to the normal channels for scientific publication, let us examine journals in two very important fields: physics and the biological sciences.

*Physics.* The American Institute of Physics publishes the following journals: *Physical Review, Reviews of Modern Physics, Journal of the Optical Society of America, Journal of the Acoustical Society of America, American Journal of Physics, Review of Scientific Instruments, Journal of Chemical Physics,* and *Journal of Applied Physics.* The first five are published by the Institute for member societies and the last three are the property of the Institute. About a year ago the Institute started a semitechnical publication, *Physics Today.*

The Institute is trying to cope with its increased publication costs by using a standardized format for all of its eight technical journals, by lowering typographical standards somewhat, and by expecting authors (or their laboratories) to make an appreciable contribution towards the cost of publication. Such aid is asked on the grounds that this cost is small compared with that of the research described, and that it encourages brevity of presentation. This policy is implemented by giving no free reprints and by charging a high price for any number up to 150. Price of reprints ranges from $11.90 for 150 reprints of articles of 1–4 pages to $59.50 for an article of 17–20 pages. An additional $7.50 is charged for covers. Alternatively, authors may elect to pay a publication charge of $4 per page. In this case they are entitled to 100 "free" reprints (without covers), and the price of further copies is then obtained by deducting that of the first 100 from the prices quoted above. In practice, the latter option is decidedly more expensive for the author. It is nevertheless the one that he is expected normally to adopt as a means of meeting part of the costs of publication.

The authors are also expected to prepare any diagrams included with the paper in a form suitable for immediate publication. The American Institute of Physics offers no facilities for redrawing. Poor diagrams are returned to the authors, and the result is delay of publication.

The author is expected not to make changes after his article has reached the galley proof stage, and is charged $3 per hour for editorial corrections.

In spite of these restrictions, physicists are publishing at an increasing rate. Henry A. Barton, director of the American Institute of Physics, reporting on the financial difficulties of the *Journal of Chemical Physics,* says: "The budget was balanced in 1948 only by 'holding over' some 200 pages ready for publication . . . to catch up and keep up with the accelerated flow of material meeting the editorial standards of the Journal, 2000 pages are needed for 1949." In 1944, 596 pages had been adequate.

Dr. Barton continues: "The estimated total income of the Journal for 1949 is $30,000, which falls $20,000 short of providing for the demand. . . . To meet the need of the *Journal of Chemical Physics* and others of a like nature, the Institute would have to budget such large deficits as to exhaust its total financial reserves in eighteen months. Obviously a more durable solution must be found. Meanwhile the Executive Committee of the Institute must very reluctantly restrict the page budget for 1949 to a figure much lower than 2000. . . . It is hard to overstate the seriousness of the present situation" (*1*).

How much of all this should be of concern to the government? A count of all articles and letters-to-the-editor appearing in the *Physical Review* over a six-month period last year revealed that fully a third were reports on government-sponsored research. There is no way of estimating what percentage of government research papers go unpublished, but the journal's many-month backlog indicates that very many such papers are lying in the editor's basket.

Furthermore, the rise of nuclear physics has created special needs and no journal has come into being to provide for them. For instance, as far as ONR and AEC are concerned, there is no "normal" publication channel for the hundreds of nuclear physicists working on their programs. If results in this field are published they add to the burden of the present physics journals.

Nuclear physicists have an alternative: they can and do publish in McGraw-Hill's semitechnical magazine *Nucleonics.* It provides only limited publishing facilities but it fills, in a marginal way, a need that commercial backing can fill where a less favorable financial position prevents the nonprofit Institute of Physics from attending adequately to many of the scientists it was founded to serve.

*Biological sciences.* The situation as regards publication in the biological sciences is at least as serious

as in physics. For one thing, the research men in the biological sciences have not been organized until very recently. The American Institute of Biological Sciences was started just a year ago to serve this important group of scientists, whereas the American Institute of Physics was founded in 1931.

This looseness of organization has led to confusion. A count made recently by the American Institute of Biological Sciences reveals that there are in existence some forty journals in this field, some with a circulation of only two hundred. To mention just a few, there are the *American Journal of Physiology, Journal of General Physiology, Plant Physiology, Ecology, Ecological Monographs, Phytopathology, Journal of Parasitology, American Biology Teacher, Journal of Bacteriology, Bacteriological Reviews,* the *Bryologist, American Journal of Botany, Copeia, Journal of Heredity, Growth, Transactions of American Entomological Society, Journal of Economic Entomology, Entomological News.*

It would be difficult indeed to establish which are the normal channels for publication here. Many of the journals seem to overlap in function and field covered. Many reach such a limited audience that it would seem they hardly justify their publication costs. It is little wonder that publishers of most journals in the biological sciences are worried.

And yet the biologists constitute a large group that must be served. Seventeen member and affiliated societies, comprising over 10,000 scientists, have joined the AIBS in its first year of existence. Ten thousand scientists have much to say and there should be organized channels through which they could speak. AIBS has already appointed a Committee on Publication Problems to study the question. Under the capable direction of A. J. Riker, University of Wisconsin, this committee is trying to come up with some publication answers for its colleagues.

### Time for Government Action?

It is not necessary to recount here the publication troubles besetting scientists in other fields. It is safe to say that for the most part the learned journals are refusing good articles, forcing authors to pay for the privilege of publication, or reducing articles to little more than abstracts. To the extent that the scientific press has been forced to exclude useful material the progress of science is being slowed. To that extent, the normal channels, as the situation now stands, are proving inadequate to the dissemination of the nation's scientific information.

The scientific journals are not to blame for the situation and they can do little to correct it. But the government agencies that provide the principal support of research might logically be expected to help shoulder the burden of publication that this research creates.

The scientific information divisions of the government agencies are concerned with the problem. They have listened to various schemes and suggested various schemes. Many sent representatives to the Royal Society Scientific Information Conference mentioned before, which brought together heads of departments in universities and technical colleges, directors of government laboratories, research associations and industrial laboratories, and editors of scientific publications in Britain and the United States. The conference was called "to discover in what directions improved services can be provided for the promotion of science by assisting working scientists in the dissemination and assimilation of scientific information" (*6*).

The first proposals the conference considered were for a panacea—one solution for all the world's scientific publication woes. The most publicized scheme was that presented by J. D. Bernal of Birkbeck College, London, for replacing the present system of independent journals with a system for distributing individually printed papers through a central agency. "National Distributing Authorities" would be created, to receive papers and refer them to panels of appropriate scientific societies. On acceptance, papers would be printed by the National Distributing Authorities concerned and distributed according to a detailed scheme.

Dr. Bernal's plan aroused such a storm of protest that he finally withdrew his paper from the conference agenda in the interest of harmony. The official protest of the Society for Freedom of Science (Great Britain) contains the following statement (*4*):

> Scientific publication is a natural and indispensable sequel to scientific investigation, the two together forming an indivisible process which rests essentially on the individual freedom of men of science to work, write and publish as they choose within the powers they recognize as their own. The scheme for centralized printing and issue of scientific papers seems to threaten these rights to scientific freedom very directly and to involve a great over-all loss of efficiency.

In view of this violent reaction it would seem wise to recognize the fact that we cannot hope to solve our problem with any one scheme. If the experience of the conference is any criterion, many solutions must be sought and many experiments undertaken before we can approach effectiveness. The conference made progress only when it settled down to tackling the problem by many methods in many places. Delegates returned to their countries determined to clean out their own closets first.

### Proposed Steps for Government Research Agencies

These are the steps proposed, then, for action by government research agencies (but no one of the steps is adequate alone):

1. *Support of the normal channels.* It must be recognized that the normal channels through which scientific information is published, if they are to cope with a billion dollars of research annually, must be supported.

Existing legislation of course prohibits a government agency from supporting a private publication. That regulation need not be challenged. Support could be given to the learned societies or to groups of learned societies through their institutes to set up a central clearing office to cope with the publication problems of their own official journals. The American Institute of Biological Sciences has such a central unit under consideration to help solve the publication problems of its members, and funds are being sought for support from private research foundations. It seems only fair and right that the government agencies sponsoring research should lend their support, too.

How would this central publications unit function? It could consolidate weak journals into one effective stronger journal. It could negotiate with a printer a joint contract for a number of the journals of its constituent societies and thus obtain better printing rates by standardizing the physical characteristics of the journals. Type, paper stock, format, and other physical factors could be standardized and yet each journal could retain its individuality by means of such details as cover page and text divisions. The American Institute of Physics has already established itself as such a clearinghouse, with some success, but perhaps it could be more successful with outside support.

2. *Intra-agency publication.* Each government agency should provide some medium within its organization for publication of its own research. The National Bureau of Standards seems to have set a pattern that works effectively. Its unclassified *Journal of Research* is recognized by its scientists as worthy of carrying their papers. The *Journal* occupies a dignified, honored place, along with other well-recognized scientific journals. Furthermore, full reports on work reviewed in the *Journal* are readily available from the Government Printing Office and are widely used by scientists requiring detailed data on a specific research problem.

Other government agencies could establish such declassified journals, which would achieve reputation quickly by virtue of the unchallenged reputation of the scientists who would publish in them.

The last war demonstrated how scientists rally to the national defense. The success of the government's postwar research program attests that they are still interested in contributing to the national security. Offering them opportunity to publish in government journals would be a way to make them feel more effective. One ONR contractor, James A. Reyniers, of the University of Notre Dame, expresses a scientist's feelings in this respect: "One of the mistakes that governmental supported research can make is to become a vast silent repository into which a scientist's best efforts can be dumped with no echo in return."

3. *Exploration of other mediums.* We must constantly be alert to other supplementary mediums for disseminating scientific information. For instance, the government must support on an increasing scale symposia in which experts in a given field are brought together from government, industrial, and academic laboratories to tell each other what they are doing. The Royal Society Scientific Information Conference records as a recommendation of one of its working parties that "reports on 'symposia' are recognized as a valuable contribution to the recording of progress in science."

The Committee on Technical Information of the Research and Development Board plans to explore other existing mediums that can be used more and to better purpose.

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The problem of adequate scientific publication is urgent. If, as Steelman recommends, the nation doubles its present research budget by 1957 then it must also double its effort in publication. It is a problem everyone concerned with science must face. Surely the original and active minds of science can solve this problem, as they have solved so many greater problems in the past.

### References


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