

AIP

DOCUMENTATION RESEARCH PROJECT

R. E. Maizell, who for the past two years has been in charge of the AIP's program of research in physics documentation and publishing, came to the Institute in 1958 from the Olin Mathieson Chemical Corporation. In August of this year he returned to Olin Mathieson as supervisor of technical information at the firm's Research Laboratories in New Haven, Conn.

By R. E. Maizell

ONE of the major problems facing the physicist today is that of finding enough time and energy to keep up with the technical literature in areas of research in which he is involved. Some measure of his dilemma may be understood simply in terms of the rising abundance of reading matter in physics. In 1950, the American Institute of Physics and the Member Societies published 13 672 journal pages; in 1959 there were published 23 022 pages, not including the Soviet translation journals and *Physical Review Letters*.

Since much of the vitality of modern physics depends upon the swift communication of new facts and ideas, it is important that the methods employed in disseminating and retrieving information be adequate to cope with the increasing quantities of research results submitted for publication in physics journals. In recognition of its own responsibilities in such matters, the AIP established a special committee in 1956 for the study of publishing problems¹ and subsequently inaugurated a staff program designed to carry out specific studies dealing with the communication needs of physicists. Work on the Institute's Documentation Research Project, which was started in November 1958

with support from the National Science Foundation, and supplementary funds from the Atomic Energy Commission, has been conducted in cooperation with the AIP Committee to Study Publishing Problems and the APS-AIP Committee on Science Abstracts. Close liaison has also been maintained with the Institute's Publication Board, which consists of the editors of the various AIP and Member Society journals.

The present article is intended as a progress report on the work of the Documentation Research Project to date. Much of the initial work necessarily consisted of identifying problem areas in physics publishing which may be attacked with some hope of obtaining quick results.

IN order to supplement individual annual indexes to journals published by the AIP and Member Societies, the Institute is studying the feasibility of issuing a single, monthly index covering material in all AIP and Member Society journals including the Soviet translation journals. This index might be cumulated annually, and could eventually include references to meeting papers, book reviews, and laboratory notes, in addition to articles and letters to the editor. Such an index would have the advantages of speed of issue, ease of cumulation, completeness, and convenience, thus eliminating the need for searching through indi-

¹ The AIP Committee to Study Publishing Problems in Physics was organized with the aid of a grant from the Atomic Energy Commission, with the following members: E. U. Condon (chairman), F. N. Frenkiel, F. V. Hunt, K. G. McKay, and J. E. Mayer. G. H. Shortley joined the Committee in 1959.



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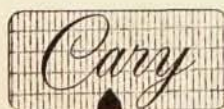
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vidual tables of contents for articles. However, it is not yet certain whether such an index could be offered at acceptable subscription prices.

In addition to a combined title index study, various new indexing methods are being considered which may reduce the amount of time needed for index preparation.

One such system is based on the use of a high-speed camera. The method involves the typing of subject and author entries on tabulating machine cards, followed by mechanical or manual alphabetic sorting, high-speed filming, preparation of offset plates, and printing. If punches in a card are not used for mechanical sorting, they can be used to facilitate information retrieval. As an experiment in the use of the system, author and subject indexes to *The Journal of Chemical Physics* (Volume 31, July-December, 1959) were produced in this manner. While a preliminary cost analysis shows no current advantage over monotype composition, future developments may change the situation.

Preliminary data to help answer questions as to what type and arrangement of index may be most satisfactory have been gathered by means of a pilot test program which analyzed the speed with which 36 graduate physics students were able to retrieve information from various types of indexes. The indexes included in this program were those of *Physics Abstracts*, *Chemical Abstracts*, *Nuclear Science Abstracts*, *The Physical Review*, and an index based on the permutation of significant words used in the article titles. The participating students were given abstracts of the same 15 articles from *The Physical Review*. For each article, they were required to locate a corresponding subject index entry used in the particular index assigned to them.

The results of this test program will be published fully after a larger number of cases have been studied. The present program is designed to test indexes as used for retrospective searching for specific subjects. Results so far indicate that the permuted title system appears to be workable and that indexes with specific headings appear to be easier to use than those with broader index headings. Future studies are planned with a larger number of cases and to study such other index uses as for generic searching and current awareness. Other plans involve a study of how a group of physicists would index the same group of articles in contrast to professional indexers and a study of the number of subject headings which physicists would assign to articles.

In cooperation with the APS-AIP Committee on Science Abstracts,² a continuing survey of *Physics Abstracts* is being maintained. Data are collected and other characteristics as extent of coverage. These are compared with similar characteristics of other abstracting journals such as the Russian *Referativnyi Zhurnal Fizika*, *Chemical Abstracts*, and *Nuclear Science Abstracts*. The number of abstracts of interest to physi-

cists produced by the various abstracting services are shown in Table I. It will be noted that *Referativnyi*

Table I. Number of Abstracts in Major Physics Abstract Journals

Abstract Journal	1954	1955	1956	1957	1958	1959
Physics Abstracts	11 700	10 150	9 150	10 000	9 201	14 016
Nuclear Science Abstracts	7 197	7 602	12 194	14 042	17 960	23 147
Physikalische Berichte	15 563	10 274	12 881	11 822	13 177	14 667
Referativnyi Zhurnal Fizika	14 200	26 550	36 500	31 850	28 970	28 750

has in the past included about twice as many abstracts as *Physics Abstracts*. However, in 1960, *Physics Abstracts* is planning to include about 21 000 abstracts. Differences in size between *Physics Abstracts* and *Referativnyi Zhurnal Fizika* have been due in part to the different ways which these two journals define the scope of physics. It should also be noted that many will argue that a more selective abstract journal such as *Physics Abstracts* is more desirable than a comprehensive journal because of speed and ease of reading. The APS-AIP Committee on Science Abstracts is in the process of working out recommendations as to the proper scope and coverage of a physics abstracting journal. In addition, the opinion surveys begun by Dwight Gray in 1948 are being continued. For example, a survey has been made of the opinions of members of the Division of Solid State Physics of the American Physical Society with respect to *Physics Abstracts*.

Several other aspects of abstract journals are under investigation. For example, one of the criteria which may be useful in measuring the value of an abstract journal is the density, i.e., number of subject index entries per article, of the subject index. The average number of index entries per article in *Physics Abstracts* is slightly more than two. Studies are being planned to show whether a greater number of index entries per article will facilitate ease with which information is retrieved. It should be realized that too many subject index entries per abstract increases the expense and time involved in the preparation of the index and may possibly impede its use.

Further investigations such as the following are needed to meet more fully the information retrieval problem in physics:

1. A study of the feasibility of a title index to the world's physics literature.
2. A study of the feasibility of more informative titles for technical papers.
3. A study of encoding problems for physics information centers.
4. A continuing study of the performance of *Physics Abstracts*.
5. A continuing study of the efficiency of various types of indexes.

Developments with respect to mechanized literature searching will also be watched closely by the AIP staff. It is not known to what extent centralized, mechanized information centers would be used by physicists, but certainly they offer some possibilities for the future.

² Members of this committee are F. G. Brickwedde (chairman), D. E. Gray, Conyers Herring, H. H. Nielsen, S. L. Quimby, and E. Hutchisson.

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ANOTHER major problem in physics documentation is to find improved means for the publishing and distribution of scientific information. The principal problems involve production costs and time lags in publication. In most sciences, including physics, there continues to be a substantial interval between the time a manuscript is received and the time it appears in print. The average may be approximately six months.

Printing and other aspects of journal production continue to be expensive, mainly because the typesetting of physics material is especially difficult and often involves working with complex mathematical expressions. A preliminary analysis of causes of typesetting errors (which increase costs and lead to delays) has shown that mathematical expressions and tables may be the principal causes of difficulty. Means to facilitate the more accurate and uniform drawing of mathematical expressions and preparation of tables are being studied.

The use of direct photo-offset reproduction and printing of typed copy as submitted by authors has been suggested for more rapid dissemination of abstracts of papers presented at meetings. Abstracts typed by authors on specially lined forms could be photo-offset and printed directly without the need for time-consuming and expensive composition.

Minor changes in style that could result in small cost savings are also being studied. For example, the grouping of all bibliographic references at the ends of articles instead of in the form of footnotes at the bottoms of pages would result in the savings of page make-up time equal to about 1.5 percent of total composition cost. However, the value of any such changes would have to be balanced against the inconvenience they might cause for readers.

Although technological printing developments now on the horizon do not appear to promise any major savings, they are being watched closely. Among such developments are optical typesetting machines such as Photon and Linofilm. The American Chemical Society is experimenting with one such device (Photon), but has not yet published the results of its experiments.

Still another development in printing technology which may reduce costs is the use of plastic plates for the preparation of engravings.

Plans for the future in the Documentation Research Project with respect to improved dissemination of physics information include such studies as the nature and function of the referee system; the possible shortening of time lags in the manuscript screening process; a possible shortening of time lags involved in actual preparation of copy for the printer (editorial mechanics); continuing analysis of the causes of typesetting errors; studies of the reduction of printing costs by various style changes; and closer investigation of photo-composition equipment.

Under the Documentation Research Project, a study of background data on the copyright problem is being made, preliminary to the development of new Institute policies with respect to copyright and photocopying.

Many physicists may not be aware of the rapidly growing practice of photocopying from copyrighted scientific journals such as those published by the AIP and Member Societies. In recent years photocopying devices have become relatively inexpensive and their use has multiplied greatly, particularly in large technical information centers in industry and elsewhere. Since the Institute and Member Societies have been founded primarily to further scientific communication, it would seem as though this new practice should be encouraged and applauded.

There are, however, difficulties which may not be apparent at first sight. Publication activities of the Institute and Member Societies are conducted on a nonprofit basis. Wide circulation of the journals is possible by virtue of relatively low subscription rates and a general acceptance of a voluntary page charge. A small income is also received from sale of back numbers and reprints. Low subscription prices can be maintained only if large circulation is assured.

If photocopying tends to cut into circulation or back number sales, the subscription price would need to be raised or the volume of published material reduced. It is for this reason that the rapidly growing use of photocopying is being watched carefully. Developments along these lines are already affecting the Institute's position with respect to request to photocopy from its copyrighted journals. Another point that many physicists may not realize is that photocopying is often a relatively uneconomical course of action except from the point of view of time saved. Other courses of action open include the ordering of back numbers, and, of course, subscription to the original journal.

THE AIP has established a *Documentation Newsletter* to report briefly to the scientific community on interesting results obtained in these studies and to assist in coordinating other documentation studies which have particular application to the field of physics. Initially, it has no regular schedule, but appears whenever there is sufficient newsworthy material to justify it. At this writing, four issues of the *Newsletter* have appeared.

In addition, brief reports on the cost-per-word to subscribers to AIP and Member Society journals and on the location of unclassified government-sponsored research reports have appeared in *Physics Today*. The results of other documentation studies will be similarly reported in the future.

A physics documentation symposium was held on January 26, 1960, in conjunction with the joint annual meeting of the American Physical Society and the American Association of Physics Teachers. The chairman of this symposium was E. U. Condon, and speakers were Allen Kent, W. A. Wildhack, and M. M. Kessler. Some eighty individuals attended the evening meeting, and the spirited discussion that followed the formal program offered encouraging evidence of widespread interest in the problems of physics documentation.