fall into this category are (a) effects of polluted drinking water on the cardiovascular system, (b) inhibitors or potentiators of lead poisoning, (c) embryotoxic or teratogenic effects of amphetamines, and (d) relationship of race and/or inner city dwelling to toxemia of pregnancy.

SUMMARY

Because of the unique location, with its access to extensive library facilities, computerized data banks, other information centers, and research facilities, TIRC is in an ideal position to collect and disseminate toxicology information (Figure 8). TIRC disseminates information by (a) compiling bibliographies in response to search requests, (b) providing selected bibliographies to the public through NTIS publication, and (c) contributing to the toxicology review literature through state-of-the-art reviews.

ACKNOWLEDGMENT

The authors acknowledge the kind assistance and suggestions made by James Edward Huff (Director, Biomedical Sciences Section, EISO) Helen S. Warren, Florence M. Holland, and Betty C. Drake in the preparation of the manuscript. Appreciation is extended to Gerald U. Ulrikson (Director, Environmental Information System Office, ORNL), and Bruno M. Vasta (TIP/NLM) for providing data related to sources of toxicological information. The Toxicology Information Response Center is funded by NIH (NLM/TIP) under contract No. **W7405-eng-26.**

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SPEEDI—A Better Information System*

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Received December 6, 1973

We propose an improved scientific information system involving dissemination of abstracts to individuals by core abstracts services followed by publication and distribution of individual articles. Our scheme would be fast, selective, give good coverage, permit easy access to pertinent information, permit efficient retrospective searching, and be economical. The need for each of these attributes is discussed. Problems of the chemical literature are emphasized but our proposals are applicable to other disciplines as well.

As a result of deficiencies in existing information systems, proliferation of scientific literature, and associated rising costs, better ways for publication and dissemination of technical information are being actively discussed by many organizations. A three-day symposium on the future of scientific and technical journals was sponsored by the IEEE in May 1973. The American Chemical Society has a broad interest in this subject and has established the Committee on Improved Publication Formats to study many aspects of the problem of devising alternatives to the traditional journal. Part of the program of the Special Library Association's 64th Annual Conference concerned the future of the scientific journal; one paper was devoted specifically to the need for speed in information dissemination.

Many proposals for change have been advanced,[1-6] but most appear to solve problems faced by publishers and libraries while assuming that individual users will adapt to the changes. We believe that reforms should be aimed at better service to users and, therefore, should result in a system which primarily is very fast but also is highly selective (relevant), gives good coverage, allows easy access to complete information, permits retrospective searching with high reliability, and is economical. To accomplish this, we propose a new system SPEEDI—acronym for System for the Publication and Efficient, Effective Dissemination of Information—that will be superior to previous proposals for change. The degree to which SPEEDI satisfies the above criteria will be discussed in more detail later. SPEEDI would operate stepwise as follows:

(1) Articles submitted to journals would carry abstracts suitable for sending to a core abstracting journal upon receipt by the journal of the final version of each article accepted for publication.

(2) The core abstract journal would assign an identification number to each abstract and this would appear on the original article.

(3) Abstracts would be disseminated selectively to subscribers to the abstract service, by matching the abstracts to keywords to be provided by users as descriptive of their specific interests.

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(4) Subscribers would indicate which papers they wish to receive by returning a suitably marked card to the core abstract service or clearinghouse.

(5) These requests would be collected by the abstract journal or the clearinghouse and orders sent to the appropriate journal.

(6) Each journal would print the required number of copies and send them directly to subscribers, or indirectly via a clearinghouse.

(7) Journals and abstract journals would continue to be supplied to libraries in their current form.

THE EXISTING SYSTEM AND PROPOSALS FOR CHANGE

The present information system requires that scientists employ a variety of sources such as personal or library copies of journals, reprint requests, interlibrary loans, etc., in order to acquire complete information. This problem of multiple sources results in unavoidable gaps and duplications in the retrieval effort and can result in significant delays.

The demand for speed is shown by the popularity of preprint systems,[7] and increasing use of short communications[8,9] in scientific literature. The preprint provides a reduction in time between the writer and the reader but suffers from the disadvantage that it is not, as a rule, the "final" version of a paper. Publication of results as communications requires only about three months as compared to nine months on the average, and sometimes as many as fifteen months, which elapse between submission of a paper and its publication in a conventional journal.

Moreover, the number of scientific journals now published is so large that it is economically impossible for most institutions to subscribe to every journal of interest to its employees. Many users, particularly in small institutions, are thus denied easy access to information relevant to their work. Another consequence of the large number of journals published is the large expenditure of time required to discover relevant articles.

Current SDI (Selective Dissemination of Information) systems are effective ways of increasing the relevance of information but delivery of their output lags well behind primary publications.

Schemes suggested previously do not provide the same degree of speed and selectivity as SPEEDI. In 1948, Bernal[1] proposed that readers of scientific literature receive copies of papers likely to interest them rather than entire issues of journals. Later, Brown, Pierce and Traub[2] recommended fast, selective distribution of preprints and abstracts and that papers be published later. These systems were intended to operate through individual journals, and therefore, could not have given good coverage.

Another system involving a high degree of selectivity is that of the American Institute of Physics (AIP) which, in 1972, began publication of *Current Physics Advance Abstracts* containing author abstracts of papers accepted for publication in AIP journals.[3] The AIP plans to publish a series of collections of papers in specific areas. This system embodies some of the features of SPEEDI but could not be used in other disciplines such as chemistry because the chemical literature is much less compact than that of physics.

SPEEDI IN OPERATION

The major steps involved in the flow of papers and abstracts from authors to users in the conventional information system and under SPEEDI are shown in Figure 1.

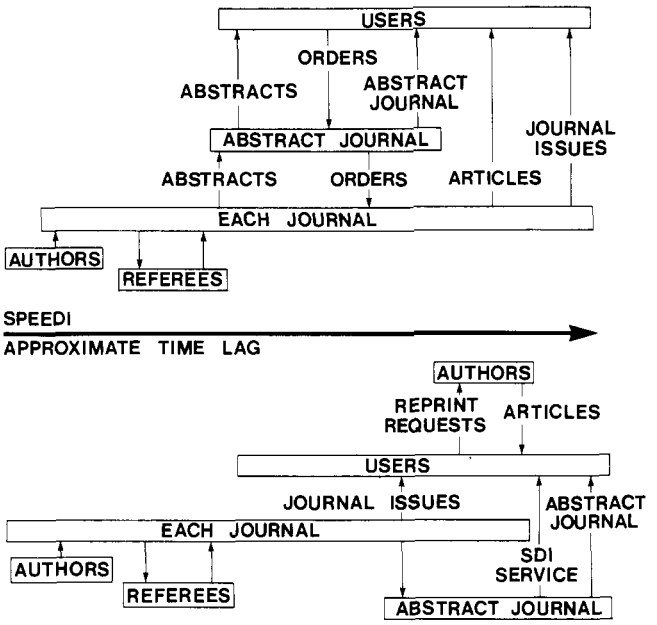

Figure 1. Steps involved in SPEEDI and in the conventional information system

The time scale is not exact. Thus under SPEEDI, the time lag between acceptance of a paper and journal publication would be no greater than in the present system

This figure also illustrates time savings which may result from SPEEDI. For example, we expect that in many cases abstracts would reach users six months earlier and reprints three months earlier than at present. There should be no delay in the publication of journals.

All steps in our procedure would emphasize short handling times with no delays to be tolerated. This would permit desirable changes in the direction of research at the earliest possible time and should help scientists to avoid duplication.

Good abstracts are an excellent way of answering the question, "Is it worthwhile to get a copy of the paper?" but despite this fact are not yet much used for current awareness. However, their use for this purpose, as SPEEDI provides, would reduce waste by giving enhanced selectivity to the gathering of primary information and reducing the chances of missing relevant information.

The responsibility for writing acceptable abstracts should rest with authors. In chemistry, this kind of decentralization of abstracting has already begun as shown by cooperative ventures whereby several chemical societies supply or intend to supply *Chemical Abstracts* (CA) with abstracts suitable for direct use.[9] Approximately 80 to 85% of original journal articles in chemistry carry author abstracts, and CA uses about 17% of these abstracts without much modification.[10] Clearly, authors and editors should make efforts to improve author abstracts so that CA would need to do only minor editing for the sake of consistency. This appears to be the desired goal of CA.

Our system requires an increase in the percentage of scientific literature accompanied by author abstracts and an improvement in their quality. The American Chemical Society has agreed to require abstracts even for short notes and communications although the ACS will not publish these in primary journals, but will supply them to CA.[10] We propose that abstracts accompany *all* forms of scientific literature. Eventually, abstract services would prepare abstracts for only foreign language papers for which acceptable English language abstracts are not available.

Control of the dissemination of abstracts would be by means of keyword combinations to be chosen by subscribers from a list supplied by the abstract journals. In chemistry, index terms from CA could be used. Careful choice of keywords by the subscriber would ensure receipt of only those abstracts relevant to his needs. This may require a frequency count of the use of keywords from the previous year so that a user may modify his profile to ensure high selectivity and to reflect his changing interests. Whenever possible, abstract services use the full text of each piece of scientific literature for indexing purposes to achieve the high degree of accuracy on which relevance depends. SPEEDI would, therefore, involve submission to abstract publishers of copies of the final draft of all papers accepted by the journals.

The cost of the SPEEDI abstract service ought not to be much more than that of existing alerting services ($100 to $200 per year on an individual basis) such as CAN/SDI[11] and *Current Physics Advance Abstracts*[3] because it would make use of existing abstracting and indexing services. The cost would be higher for service to organizations with broad interest profiles and which in turn selectively disseminate SPEEDI output to individuals within the organization, but the cost per person would be lower than that to individuals.

OTHER ASPECTS OF SPEEDI

SPEEDI abstracts would be made useful for retrospective searching as well as for current awareness by dissemination of selective annual and cumulative indexes.

The SPEEDI identification number could be mentioned in all citations of the original paper, and this number would facilitate filing and give rapid access to the abstract during retrospective literature searches. The alphanumeric used could also serve as order number for the papers which could be ordered by means of cards like the reader's cards used by many journals such as *Science, Analytical Chemistry,* and the *Journal of Chemical Education.*

SPEEDI does not imply a delay in publication of regular journals although these would follow—not precede—the issue of individual papers. To save time and perhaps eliminate the need to wait for orders from the abstract publisher or clearinghouse, journals could employ a demand estimate equation to predict the required number of copies of each article. As a result of the speed of the system, preprint systems and communications will assume lesser importance than at present.

It should not be necessary to wait for agreement by all journals before the new system is started. SPEEDI could be phased into operation. In chemistry, the publications of the American Chemical Society could serve as initial input and coverage could be broadened gradually. Coverage could also be extended to include books. Each chapter could be abstracted and publishers persuaded to sell individual chapters separately. Indeed, this idea could be used with any written material readily divided into parts.

APPLICATION TO DISCIPLINES OTHER THAN CHEMISTRY

SPEEDI could be enlarged to encompass *all* science. The resultant, integrated service would serve workers in interdisciplinary areas of science better than the present system and would eliminate the overlap which results from the separate collection, storage, and dissemination of information by core abstract systems of different disciplines. The system would be efficient and would be able to provide all users with most of the available, pertinent information.

CONCLUSION

SPEEDI eliminates none of the institutions that comprise our chemical information system nor does it add new ones, rather it better integrates their services and maximizes the advantages of each. In particular, it emphasizes and makes greater use of abstracts.

We foresee an enlarged role for abstract services. In chemistry, for example, CA could become the core service to which every chemist will subscribe. To serve all areas of the world equally well it may be necessary to decentralize each abstract service and the publication of abstract journals, and create regional centers linked, perhaps, to a central computer facility.

This article should not be regarded as the final answer to the question of how best to change scientific information systems to retain economic viability and yet satisfy user needs. Its purpose is to suggest a framework whereby the often conflicting needs of publishers and users can be reconciled. Many aspects of SPEEDI may require careful study by journal and abstract publishers, individual users, and libraries before the scheme can be implemented, and there may be a variety of ways to develop our suggestion particularly in disciplines other than chemistry.

ACKNOWLEDGMENT

We thank colleagues at this establishment for useful references, and Dale Baker of Chemical Abstract Services for alerting us to Reference 9 and providing much useful information about abstracting and indexing policies and practices at CAS.

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