



# Foreign Users of U.S. Bibliographic Data Bases in Biology and Medicine

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THE DECADE which ended in 1973 witnessed the establishment and rapid evolution of computer-based information retrieval systems in science and technology throughout the world. The pioneering efforts of American systems—MEDLARS, Chemical Abstracts Service, BioScience Information Service, and the Institute for Scientific Information, all of which have been responsive to the information needs of biomedical scientists, established models for international cooperation in scientific information services which have had a profound effect upon the growth of the field. This paper will treat one aspect of this development: the introduction of these services to users in other countries.

Some preliminary considerations may be helpful. Each of the systems noted above, and indeed any other computer-based system offering services at the national and the international level, is a socio-technical system of great complexity. Such systems are new to the world. Their novelty has three aspects: technical, managerial, and performance—the confrontation of users with novel and unconventional search procedures.

The rapidity of developments in computer technology which have made systems obsolete in three to five years are well known. For example, random access disc storage devices had just come on the market while the technical aspects of MEDLARS I were being specified. Their high price at that time made it impossible for MEDLARS, with its projected volume, to be other than a batch-process tape-drive system, subject to rapid obsolescence.

Any interpretation of the performance and utilization of computer-based retrieval systems must be made in the light of the technology available to them at different points in their historical development.

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What is perhaps less obvious is that each of these computer-based systems had to pioneer in areas of management and service policy as well as in technology. The provision of large-scale retrospective retrieval services and the organization of nationally available selective dissemination of information services have presented novel managerial challenges. Financial resources have had to be found, new types of contractual arrangements established, and manpower trained. Each service has had to reconsider its traditional policies, and formulate new ones reflecting its newly acquired capabilities and costs.

It may be noted that one of the first concerns of the Federal Council's Committee on Scientific and Technical Information was the harmonization of federal agency policies for mission-based information services, and that one of the earliest concerns of the Organization for Economic Cooperation and Development in the scientific and technical information field was the review of the information service policies of its member states.

The third novel component of these socio-technical systems is, of course, the interface between the user and the protocols for accessing the information which the systems process. Here it is important to make a distinction (not commonly observed in the literature) between "user" in the sense of "manager" of tapes supplied by a system, and "user" in the sense of the scientist-customer of the service. In this paper, the former will be referred to as "manager," the latter as "user."

Since the technology of machine search is new, both managers and users have had to learn new procedures and conventions. The four American services mentioned above have responded, each in its way, to this need.

The literature of systems management, both theoretical and reportorial, has been prolific as we have experimented with the organization of these new information services. However, except insofar as the managers of information services discuss the training of users in the use of their systems, or as systems evaluators survey the effectiveness of individual systems among user populations, the reports reflecting the impact of mechanized literature search on the performance of users are scarce indeed. One is constrained to view the user as the systems developer and manager sees him, a faceless, generalized entity, on whose hypercritical judgment the success or failure of the system (and its fiscal support) rests.

This paper, while attempting to concentrate on the interface of

### *Foreign Users*

foreign users with U.S.-generated bibliographic data bases, will of necessity reflect more of the concern which the *managers* of overseas information services have had with the utilization of these data bases than it will with the effects such use has had on the daily practice and productivity of the scientists themselves.

Four of the principal groupings of American bibliographic data bases concerned with biology and medicine (broadly construed) have been selected for the purposes of this review. These are: (1) the data bases made available by the Chemical Abstracts Service (*CA Condensates*, *CBAC*, *Chemical Titles*, *Polymer Science*, etc.); (2) the data bases related to the National Library of Medicine's MEDLARS (now MEDLINE); (3) *BA Previews*, the machine-readable version of *Biological Abstracts* and *BioResearch Index*; and (4) the data bases made available by the Institute for Scientific Information (*Science Citation Index*, *Permuterm Subject Index*, and *Index Chemicus*).

There are other American-generated bibliographic data bases of significance to biology and medicine, (e.g., the National Technical Information Service data base, which covers the technical report literature related to such subjects as bioengineering and other biological topics), but the four listed above have led over the past dozen years in developing the utilization of their data bases by agencies outside the United States.

Three of the four services fall into a noncommercial category: *Chemical Abstracts* and *Biological Abstracts* representing not-for-profit scientific societies, and MEDLARS representing a government service. The fourth, the service provided by the Institute for Scientific Information, represents a growing category of American commercial services concerned with developing overseas markets for their products.

Both categories, not-for-profit and commercial, have faced two sets of problems in common. The first set has been economic: how to reduce costs and increase benefits through broader utilization of services and products. Sommerfield has pointed out how the not-for-profit information services were motivated to develop international uses of their data bases through agreements whereby some of the input cost might be met nationally. In his opinion, this motivation has three aspects: "firstly to minimize the total cost and hence the subscription to users; secondly to increase the available manpower for the work of evaluating the primary literature, and thirdly to maximize the use of the service."<sup>1</sup>

While international cooperative agreements, with or without

governmental sanctions, for the purpose of reducing the input costs to an internationally used retrieval system have not been available to the commercially oriented services, the latter have shared in the economic objective of reducing costs through maximizing uses. In so doing, they share with their not-for-profit colleagues the second set of problems which Sommerfield considers the most significant factor restricting the development of information services. The conservatism of the average user of scientific information and a general lack of understanding of exactly how scientific information is used are, in Sommerfield's opinion, major factors inhibiting growth of mechanized information services. "Considerable education of the potential customers is required before they will appreciate the virtues of the different services offered to them. Such education is expensive: perhaps more expensive than the development of computer-based information services."<sup>1</sup>

In its own way, each of the four American services described above has, in its own interest, engaged itself with the problem of educating users.

Chemical Abstracts Service, with funding assistance from the NSF, and MEDLARS, funded by the NLM, were concurrently occupied with the development of their respective retrieval systems during the early 1960s. The first data base to be developed was the former's *Chemical Titles* (1962). That of *Chemical-Biological Activities* came later (1965).

Internationalization of these data bases was initially undertaken through long-established cooperative relationships with national chemical societies. The Chemical Society of London, for example, led the way in Britain, with funding from the Office of Scientific and Technical Information for a feasibility study at the University of Nottingham (1966), and for the creation of a consortium, the United Kingdom Chemical Information Service, intended to implement an exclusive rights agreement entered into between the Chemical Society and CAS in 1969.<sup>2</sup>

British national policy, as expressed by OSTI, has been to encourage the use of existing English-language systems rather than to make major capital investment in new ones. This has led to a highly organized and sophisticated testing of the actual and potential utilization of U.S.-generated data bases by British user groups.

For example, between 1967 and 1972, OSTI sponsored four major research projects at UKCIS and its predecessor agency, the Chemical Society's Research Unit in Information Dissemination and

### *Foreign Users*

Retrieval. The first project involved an assessment of the degree of satisfaction obtained by 200 users from 13 collaborating groups over an 18-month period. The acceptability of SDI services derived from the *CT* and *CBAC* tapes was studied by questionnaire and interview, resulting in a significant learning experience for both systems managers and users.<sup>3</sup>

User response to charges intended to recover costs for these SDI services were next studied (1969-70),<sup>4</sup> followed by an evaluation in depth of retrieval service from the *CA Condensates* data base.<sup>5</sup>

The studies cited above are representative of the many supported by OSTI as it has moved cautiously to encourage the use of U.S.-generated data bases in Britain. OSTI has been the primary public agency in the United Kingdom with a concern for the satisfaction of user needs. As a result, it has accepted responsibility for the education of users, directly in the case of MEDLARS (as will be discussed later), and indirectly as a byproduct of studies conducted by UKCIS and others.

In the other countries, governmental support for user education in the utilization of CAS data bases has not been so concentrated. By policy, the American Chemical Society has elected to market the machine-readable products of CAS through lease agreements,<sup>6</sup> which place the responsibilities of interacting with the ultimate user of the services almost exclusively on the subscriber. Except for a management internship program, which CAS has offered by special arrangement, CAS itself has not undertaken a direct user education program. On the other hand, it has moved to encourage the development of groups of processors of its machine-readable products, and to interact cooperatively with them. In the United States, this role has been played by the Association of Scientific Information Dissemination Centers. Both groups are composed of institutional members who have as their professional concern the provision of SDI services based on the data bases of multiple services.

Chemical Abstracts Service has entered into license agreements with a dozen information management centers outside the United States, most of whom belong to the ASIDIC group. In alphabetical order, these are:

Canada. National Science Library.

Czechoslovakia. Central Information Service of the Chemical Industry, Prague.

Denmark. Danish Technical Library, Copenhagen.

England. United Kingdom Chemical Information Service, Nottingham.

France. Centre National d'Information Chimique, Paris.

Germany. Chemie Information und Dokumentation, Berlin.

Hungary. Central Library of the Veszprem University of Chemical Engineering, Veszprem.

Japan. The Japan Information Center of Science and Technology, Tokyo.

Japan. Kinokuniya Book Store Company, Ltd., Tokyo.

Netherlands. Netherlands Organization for Chemical Information, The Hague.

Sweden. The Royal Institute of Technology Library, Stockholm.

Sweden. Biomedical Documentation Center, Karolinska Institutet, Stockholm.<sup>7</sup>

While these information centers provide different information services based on different combinations of data bases, they share a common responsibility of educating users. They are the mechanism of choice through which CAS acquaints its overseas users with the characteristics of its data bases, and the types of services which they can provide.

On the other hand, international programs for user education have yet to emerge among the processing centers. While some have sponsored tutorials within their regions, and all issue publications descriptive of their services, the degrees and characters of their educational efforts are various. The internationalization of the MEDLARS system has been well described by Corning.<sup>8</sup>

Because MEDLARS retrieval was based on familiarity with a controlled vocabulary, MeSH, whose use for indexing purposes required formal training efforts, user training in search formulation based on this vocabulary became a feature of MEDLARS decentralization, both domestic and international. Another consideration, equally important, was the responsibility initially assumed by the NLM in its role as central manager of the system for the successful operational performance of the system as a whole. This management philosophy set MEDLARS somewhat apart from other emerging systems, and has led to a continuing educational program.

One of the initial criteria established by NLM for the acceptance of a proposal by another country to establish a MEDLARS-based national search service was the willingness of a foreign institution to

### *Foreign Users*

undertake a program of training users of the system. Thus, the National Lending Library for Science and Technology, as a feature of introducing MEDLARS into the United Kingdom, organized a series of seminars and training courses, some held centrally in Boston Spa, Yorkshire, others regionally throughout the United Kingdom.

In Sweden, the Karolinska Institutet organized comparable training courses for users and their librarian intermediaries throughout the Scandinavian countries.

To cite a more recent example, the National Science Library in Canada became the Canadian MEDLARS Center in June 1970. In 1970-71 it organized MEDLARS seminars in different parts of Canada, using training slides developed by NLM. Visits were made to the principal medical schools: Memorial University (Newfoundland), Dalhousie, McGill, Ottawa, Queen's, Toronto, Western Ontario, Manitoba, Saskatchewan, Calgary, Alberta, and British Columbia. The Tape Services Branch of the National Science Library conducted monthly seminars for librarians and other users, thereby creating not only an informed market for MEDLARS services, but a network of "search editors" as well.<sup>9</sup>

The internationalization of MEDLARS, like that of the products of CAS, has been undertaken through formal agreements with institutions and agencies. In 1972, these were:

Australia. The National Library of Australia.

Canada. The National Science Library.

France. Institut Nationale de la Santé et de la Recherche Médicale (INSERM).

Japan. Japan Information Center for Science and Technology (JICST).

United Kingdom. National Lending Library for Science and Technology.

Germany (West). Deutsches Institut für Medizinische Dokumentation und Information (DIMDI).

United Nations. World Health Organization.

Each of these centers, as a condition of receiving the MEDLARS data base, has made a commitment to contribute a *quid pro quo*, usually in terms of indexing input. This community of interest in the system's successful operation has been matched by a now-institutionalized NLM program to provide for update and re-education as the system evolves. Following an initial meeting in

Amsterdam in 1968, international workshops were held in Boston Spa (1969), Stockholm (1970), Paris (1971), and Geneva (1972). In October 1973, a technical meeting of the directors of the International MEDLARS Centers was held in Washington, D.C., International policy meetings of the centers' directors were held in Washington, D.C. (1972) and London (1973). Among their other functions, these meetings have served to retrain systems managers and operators as changes have been made, and to equip them, thereby, with information they may pass on to systems users.

With the coming of on-line versions of MEDLARS (MEDLINE and its British contemporary experimental on-line system),<sup>10</sup> the need to educate users changes but does not diminish. In the experimental British version, a principal objective was to compare results of user-formulated iterative searches with the results achieved through formally prepared search strategies.

MEDLINE itself was introduced to Swedish users in January 1972 at a demonstration before library and information science personnel from all Nordic countries.<sup>11</sup>

User orientation to the new system concentrated on personal contact with the functioning system at demonstrations, supplemented by folders, flyers, journal articles, etc. The demonstrations have consisted of a general introduction, combined with a viewgraph presentation of a sample search dialog, and actual hands-on experience at the terminal.

Representative of a more extensive training effort, a two-week Introductory Training Course for MEDLARS/MEDLINE, held in Stockholm, October 15-November 2, 1973, aimed at providing a basic knowledge of the systems and their use to those involved in biomedical documentation work.

As other countries acquire and use the MEDLINE data base (Canada, for example, is in the initial phases), it may be anticipated that their centers will mount comparable training efforts.

*Biological Abstracts* (in its machine-readable form) was introduced to the British scientific public through the Experimental Information Unit of the University of Oxford. Working under a grant from OSTI, the unit conducted an experiment in 1970-71 with the fourfold purpose of (1) introducing the biological community to a mechanized information service, and testing its reaction; (2) investigating methods of formulating user profiles for the SDI services based on *BA Previews* tapes; (3) measuring the system's performance in terms of precision, recall, novelty, etc.; and (4) estimating the potential demand among

### *Foreign Users*

biologists for a mechanized SDI service, and the suitability of *BA Previews* for such a service.<sup>12</sup>

The unit employed three liaison scientists to interpret the test services first to a pilot group of 55 biologists at universities, governmental and industrial research establishments, and ultimately to a group of 337 biologists in 60 different establishments. Working through the librarian or information officer of the establishment, the liaison scientists visited the establishments, describing the parameters of the BIOSIS data base to individual biologists, and assisting them in the construction of search profiles for the SDI service.

The role of the scientifically trained "liaison scientist," acting as an intermediary between the working scientist and the mechanized retrieval system, had been separately studied by the unit in connection with the chemical information retrieval experiments.<sup>13</sup>

In the *BA Previews* project, the personal interviews which they accorded the participants were considered to be a major factor in maintaining the continuing interest of the users.

The general conclusions of the *BA Previews* project were that the SDI services provided were satisfactory from the point of view of relevance and retrieval (in relation to conventional methods) and significantly successful in terms of novelty of the references retrieved. It was concluded that biologically oriented users had a substantial interest in continuing to receive SDI services, and that *BA Previews* provided a satisfactory basis for a continuing service. It was determined, as in the case of the UKCIS experiments with the chemical data bases, to conduct further experiments simulating the assessment of costs to the user, and a project was subsequently established at the University of Nottingham.

While the United Kingdom experience with data bases from *Biological Abstracts* has been dealt with *in extenso* (primarily because of the superior documentation), BIOSIS data bases are utilized by the National Science Library of Canada in the provision of its national SDI services, by the Karolinska Institutet of Stockholm, and by INSERM in Paris as well. In all three instances, the processing institutions, through their public relations efforts, have taken on the responsibility for introducing the scientist-user to the capabilities of the SDI services based on BIOSIS tape products.

The extensive data bases made available for export by the ISI (Philadelphia) fall into two categories: those prepared as byproducts of the *Science Citation Index* and the *Permuterm Subject Index*, and those which are derived from the published components of the Index

Chemicus Registry System, the *Current Abstracts of Chemistry*, the *Index Chemicus*, and the *Chemical Substructure Index*.<sup>14</sup>

In the former category are the *Citation Data Tapes* (4,000,000 cited references annually) and the *Source Data Tapes* (400,000 source articles processed annually). In the latter are the *Index Chemicus* tapes, and the Wiswesser Line Notation tapes. ISI has successfully marketed both categories of tapes to overseas users.

In the United Kingdom, both Unilever and Imperial Chemical Industries have been operating SDI services from the *Source* tapes for several years. In Canada, the *Source* and the *Citation* tapes are utilized in providing national SDI services from the National Science Library. In Spain, the *Source* and *Citation* tapes form the basis of an SDI service under development by the General Administration of Archives and Libraries, Madrid.

The Royal Institute of Technology (Stockholm) has been using *Source* tapes since 1968 in providing SDI services to users in Scandinavian countries. There are other principal processing groups in Switzerland, Netherlands, and Japan.

ISI has paid a great deal of attention over the years to the training of systems operators to insure the successful utilization of its tape products. It is concerned not only with problems of local processing, but with the interface between local systems and ultimate users as well. To this end it has demonstrated and supplied systems software in turnkey operations, prepared training materials in local languages, engaged in parallel processing to provide a "failsafe" guarantee of local-user acceptance, and finally has provided linguistically competent staff to train not only the processors but the users as well. As part of an educational campaign, it has also agreed to the experimental testing of its data bases.

For example, in the OSTI series of experiments, the Oxford Experimental Unit, from 1969 to 1972, did a comparative study of SDI services based on *Chemical Titles* and on ISI's ASCA.<sup>15</sup> Some sixty-five participating users were involved in this particular experiment.

While the body of scientific knowledge is conceded to be international, each nation in the past has developed its own culturally and linguistically modified approaches to it. The advent of mammoth bibliographical data bases for the mechanized retrieval of published contributions has created several novel conditions: (1) the data bases are predominantly the creation of one country—the United States; (2) access to a machine-readable data base is by standardized procedures without national bias; (3) these procedures must both be taught and

## Foreign Users

learned by scientists regardless of their nationality, linguistic inheritance, or field.

Because the biomedical sciences in the United States were among the first to develop such bibliographical data bases, their efforts to train scientists in other countries in the art of using these new systems will have an impact on the acceptance by international communities of scientists of mechanized new modes of bibliographical search.

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