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## A Survey of the Use of On-Line Computer-Based Scientific Search Services by Academic Libraries<sup>†</sup>

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**To explore their use of on-line computer-based bibliographic search services, a one-page questionnaire was sent to 100 academic libraries in the United States having separate departmental chemistry or science libraries. An attempt was made to determine the background training of the persons performing the searches, who the end users were, the growth trend, the funding, the data bases used, and the value to the users. Of the 73 replies, 49.3% indicated use of such services, while 24.6% were planning to use them primarily by faculty and graduate students. Of those reporting, 83.3% used searchers with a background in library or information science; 47.2% had a background in scientific discipline. Two or more on-line services were used by 72.2%. A majority of respondents stated that the user paid all expenses or a portion of the expenses. The searches met the needs of the user most of the time in 83.3% of the cases, and all of the time in 5.4%.**

A workshop was conducted in November 1973, by the University of Denver Research Institute, organized by the Office of Science Information Service, National Science Foundation, to identify the highest priorities in future research covering all aspects of uses and users of scientific and technical information systems and services.<sup>1</sup> Graduate students of science and engineering were identified as eventual heavy users. One proposed research project concerned the education of graduate students in the use of the nationally available systems, and raised the question of the extent of courses available for such training.

This study explores the impact of machine retrieval of bibliographic information in academic libraries, with special reference to scientific literature.

In order to assess the use of computer-based on-line scientific search services by academic libraries, a survey was made. A one-page questionnaire was designed and sent November 1974 to 100 colleges and universities in the United States which maintain separate libraries with collections covering chemistry or science and technology. The librarian at Washington University prepared a covering letter for the questionnaire explaining its purpose.

The questionnaire was designed to determine the extent of use and consideration of use of on-line computer-based bibliographic services for obtaining scientific information in colleges and universities, and to determine who the end users of these services were, as well as determining if the end users were the persons performing the searches, or if the searches were being performed by intermediaries. The backgrounds of the persons actually performing the searches—reference librarians, subject specialists, or computer-trained personnel—were sought, as well as the extent of services offered, and the general growth trend. It was also designed to determine the magnitude and sources of funding, whether the searches met the needs of the requestors, the type of information requested, and to obtain general comments of library administrators regarding the success or failure of the use of these services. It was anticipated that possible application of the data derived from the questionnaire might be made by Washington University administrators in decisions to be made in offering computer-based search services. The following statistical information has been presented according to the organization of the questionnaire.

Of the 100 questionnaires sent to academic libraries, 73 replies were received. Of the 73 replies, 49.3% indicated they were using on-line computer-based information re-

<sup>†</sup> Presented at the 170th National Meeting of the American Chemical Society, Chicago, Ill., Aug 25, 1975.

Table I. Academic Users

	%
Faculty	58.9
Graduate students	56.1
Undergraduates	27.4
Others	37.0

Table II. Backgrounds of Searchers Present Users

	Yes, %	No, %	Both, %
Library or information science	83.3	2.7	2.7
Scientific discipline	47.2	25.0	13.8

Table III. Hands-On Users of Terminals

	Present users, %	Planners, %
Library staff only	69.4	22.2
Library staff and end user	13.8	
Computer personnel	8.3	11.1
Library staff and computer personnel	5.4	
End user only	2.7	

Table IV. Terminal Location

	%
Departmental libraries	44.4
Main library only	36.1
Main and departmental libraries	8.3
Not in a library	16.6
Off-campus	5.4
Industrial access	2.0

trieval services at that time, and 43.8% indicated that they were not. Of the 73 replies, 24.6% indicated they were planning to use these services. In several cases, plans were completely made, and start-up of service was being delayed only for arrival of equipment or the beginning of a new semester.

Both users, and those who planned future use, designated the intended use as indicated in Table I. "Others" on- or off-campus, were specified as users from commerce and industry, government workers, other academic researchers, health professionals, staff, and other library staff personnel, and one reply was simply, "any others".

The percentages of present users employing searchers with backgrounds in library or information science and backgrounds in scientific disciplines are shown in Table II. Of the 13.8% who replied both yes and no, one indicated that the searchers who did not have scientific backgrounds searched only the nonscientific data bases.

Of those planning to go on-line, 27.7% indicated the searchers would have library or information science training, and the same number intended to use scientifically trained personnel, while 11.1% indicated they would not have library or information science training, and the same number indicated they would not use scientifically trained personnel. A large number, 61.1%, said they had not yet planned to this extent.

The responses of the users about who actually had hands-on use of the terminals for searching, shown in Table III, showed a high percentage use by library staff only and a very low percentage use by the end user only.

Most terminals, 44.4%, were located in departmental libraries; 36.1% were located in the main library only. The locations of the terminals have been shown in Table IV. Terminals were used in as many as five departmental libraries in 2.2% of the user replies; searching was done in three departmental libraries in 5.4% of the cases; searching was done in two departmental libraries in 8.3% of the replies. Departmental libraries by type have been indicated in Table V. The planners indicated 16.6% would locate terminals only in the main library, 8.3% would use terminals outside of any library, 2.7% being campus-based, however, and 2.7% planned to locate terminals only in the science-

Table V. Departmental Libraries, by Type

	%		%
Medical	18.9	Agriculture	5.4
Science	16.2	Engineering	2.7
Health science	13.5	Biomedical	2.7
Education	8.3	Geology	2.7

Table VI. Services Used

	Users of single service (27.7%) % of above	Users of two or more services (72.2%) % of above
Own service	8.3	16.6
Lockheed	5.4	75.0
MEDLINE	5.4	47.2
System Development Corp.	2.7	66.6
Other: <sup>a</sup>		22.2
University of Georgia	2.7	

<sup>a</sup>Includes University of Georgia, SUNY, New York Times, UCLA, TOXLINE, OASIS, ERIC, NASA, and INFORMATICS.

Table VII. Who Pays for Use?

	%		%
User and library	30.5	Grants, library, and user	2.7
User only	27.7	Library and department	2.7
Grants	13.8	Department	2.7
Library	8.3	University	2.7
Grants and library	2.7	No reply	5.4

technology library.

Most libraries used a variety of services. As shown in Table VI, only 27.7% used a single service, while 72.2% used two or more services.

The number of searches made per month was impossible to tabulate. Some replies included all searches; others included only scientific searches. Some replies included batch searching as well as on-line searching. The numbers ranged from 1 to 5955, with an average of 95.

Library administrators had varying interpretations of total monthly charges; the replies were ambiguous and difficult to quantitate. Detailed financial reports were returned with a few of the questionnaires. Users reported by charge per month, charge per search, charge per data base, annual charges, and some indicated the costs had not been determined yet because the systems had not yet been in use very long. Replies ranged from \$1 per search to \$103,000 total annually.

The respondents indicated on-line search services have been paid for in numerous ways (Table VII). The highest percentage charged the user for actual on-line costs, transmission costs, and off-line printing charges, while the library paid the searcher's salary and the library overhead, including the lease or purchase of hardware. Of the group that reported costs were covered by grants, 8.3% said the grants could only be used for on-campus users. Of the planners, at one extreme, 16.6% planned to have the user pay all the costs, while at the other extreme, 5.5% planned to have the university absorb all costs.

The searches met the needs of the user most of the time for 83.3%, always for 5.4%, and 8.3% reported that they had not yet had time to assess the results.

The type of information requested most frequently was interpreted in different ways. Subject bibliographies, often in support of funded research, on the subjects of medicine, agriculture, forestry, chemistry, genetics, biochemistry, and nuclear magnetic resonance were identified by 63.8%. With varying interpretations, replies included, "hard to search manually", "specific, not general", "broad with high recall", "retrospective", and "none".

Commenting about the success of the use of on-line searching, 69.4% reported favorably. Of all who were sent the questionnaire, both users and nonusers, 79% were interested in learning the results of the survey.

In summary, there is a wide and increasing interest by colleges and universities in the use of on-line computer-based bibliographic services for obtaining scientific information. The end users are predominantly faculty and graduate students working on funded research projects. Library personnel are performing the searches, and the use of subject specialists for scientific subjects is indicated. Since it was found that users considered the information relevant to their needs all or most of the time, and since the comments were extremely favorable, the growth of the use of these services seems evident. The prevalent plan for paying for the services includes having the user pay for on-line and off-line charges, and having the library or university pay the searcher's salary and other overhead costs.

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# Comparative Evaluation of Facts. The Significance of the Gmelin Handbook in Modern Science Documentation

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**The "Gmelin Handbook of Inorganic Chemistry" presents critically evaluated facts based on original literature and systematically arranged for a given subject. About 90,000 text pages have been published in the current Eighth Edition and the New Supplement Series. The material in Gmelin is arranged by elements and their compounds. The encyclopedic character of the Handbook plays a crucial role in providing a broad understanding of a given field. Storage of the Handbook's detailed subject index on magnetic tape is planned. This will provide a combination of Handbook and computer, capable of supplying broad information profiles as well as specific facts.**

"Römpf's Chemical Dictionary" defines a handbook as the most comprehensive collection of scientific material.<sup>1</sup> The handbook offers a critical analysis of a specific field of knowledge, covering the subject matter exhaustively and in an organized manner. It is an indispensable and nearly all-encompassing store of information in which data are not listed as isolated facts, but are systematically grouped together with other relevant findings.

Over 150 years ago, back in 1817, Leopold Gmelin produced a handbook which bore the following caption on the title page: "Designed for use in his lectures." This indicates that Gmelin documented the science of chemistry in order to make possible a broader, deeper study of the science and also to transmit this knowledge by means of his lectures. The purpose was to encourage further research. Leopold Gmelin's plan succeeded, and the concept of his handbook was retained. Seven editions came out in rapid succession. From the fifth edition (started in 1852) on, inorganic and organic chemistry were separated and brought out as "Gmelin's Handbuch der Anorganischen Chemie" and "Beilstein's Handbuch der Organischen Chemie". In the eighth edition, initiated in 1922, the total body of knowledge of inorganic chemistry and related subjects going back to the middle of the 18th century was reevaluated on the basis of original publications and reviewed taking modern advances into account. This Eighth Edition is now being brought up to date through supplement volumes as well as by a New Supplement Series. The current status of the Handbook's publication is shown in Figure 1.

This chart illustrates the periodic system of elements

and indicates which elements and their compounds have been described in the Handbook or are still in preparation. In view of the vast mass of material and the limited staff and financial resources at its disposal, the Gmelin Institute, which prepares the Handbook, confines its active documentation work to selected areas of inorganic chemistry. For maximum timeliness, every effort is made to include papers that have appeared 6 to 12 months before the publication of the volume in question. The material contained in the volumes of the Handbook differs from the original papers as well as from reviews and abstracts in that it is not listed out-of-context, merely by date of original publication or by subject. Rather, it is a collection of all the data that have been reviewed critically and arranged within the larger context of a full description of the chemical elements along with all their characteristics.

Figure 2 is an excerpt from the Gmelin volume, Carbon, Part D, Section 1, which deals with carbon-nitrogen compounds. On page 259 of this volume, all the data pertaining to the stability of cyanamide are given. Included in the more general description is the finding by A. E. Baughen to the effect that, contrary to results obtained by other researchers, when cyanamide is heated to 150°C an instantaneous explosive polymerization to melamine occurs. The Gmelin text is compared with the corresponding reference on cyanamide in *Chemical Abstracts*, Volume 39, 1945.

A noteworthy aspect of the Gmelin Institute is that it functions not only as a scientific institution but also as a manufacturer of foundation stones for the sciences of tomorrow. As a manufacturer—like any economic enterprise—