The information Services Librarian*

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ABSTRACT

Libraries appear to be in a period of great change and the major reason for this has been the increasing availability of machine-readable data bases and the information retrieval systems based on these. A number of data bases producers have established networks on national and international level in order to make services from these data bases widely available. The fact that few individual institutions have the level of demand to justify an in house operation of this type led to the development of scientific information dissemination centers and the emergence of on-line, interactive searching capabilities. In relation to machine readable files, the librarian is assuming the role of a broker between *library* users and *a wide range of bibliographic data resources in MR form.*

Libraries for many years changed comparatively little in terms of their basic capabilities and the type and level of services they provided. Now libraries appear to be in a period of great change and are likely to continue in this period of change for some time. This paper is concerned with one type of change and its implications for library service and for the education and training of librarians. My special concern here is with the role of the library as a supplier of information. The developments I discuss have mostly occurred in the United States but similar developments are occurring now in libraries in many other countries.

It would be true to say that industrial and certain other types of special library have offered relatively dynamic information services for some time. By comparison, most academic and public libraries have adopted a relatively passive role in the provision of information service. By this I mean that they have generally waited to be approached by users and have done comparatively little to provide an information service more dynamically on a continuous, unsolicited basis. The *extent* of information service provided by these libraries has also been limited, usually to the handling of inquiries of a factual or "quick reference" nature and to assisting users themselves in the conduct of more extensive literature searches. Public, academic and even many special libraries have rarely had the time or resources to conduct really comprehensive literature searches for those users who need this level of service. This situation appears to be changing, especially in the academic and special library worlds.

The major reason for this has been the increasing availability of machine-readable data bases and of information retrieval systems based on these. Although it was not the first machine-readable bibliographic data base, MEDLARS'* was probably the first such data base to be made widely available in machine-readable (MR) form. MEDLARS tapes were made available by the National Library of Medicine for use by other libraries (MEDLARS centers) as early as 1965. Since then we have seen a phenomenal growth in the availability of MR files. In fact, an unpublished survey conducted in 1972 identified 268 such files, containing bibliographic citations or other data, of possible use to libraries. These data bases span an extremely wide range from very general (e.g., covering all of medicine or all of chemistry), to highly specific (e.g., files on interatomic potentials and on tall buildings). Files of numerical, statistical, physical and chemical *data* exist in MR form, as well as files that are strictly bibliographic in nature.

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AVAILABILITY OF MACHINE-READABLE FILES

But the mere existence of MR files did not in itself create a revolution in the provision of information service. Just as important has been the eagerness of the producers of these data bases to make them widely available for exploitation by other institutions. These data bases have been made available in several different ways and new developments have occurred at a furious pace over the last ten years. There appear to be six major developments worth noting in the provision of information service through machine-readable data bases. These developments are listed in Table 1.

TABLE 1
Modes of Library Access to Machine-Readable Data Bases

1. Through a library network or similar cooperative activity established by the producer of the data base (e.g., MEDLARS centers).
2. Through leasing a data base and operating it in-house.
3. Through purchase of service from a retailer, a scientific information dissemination center, providing such service in an off-line, batch mode.
4. Through purchasing direct on-line access from the producer of the data base (e.g., the New York Times Information Bank).
5. Through purchasing on-line access through an on-line service center.
6. Through joining a regional scheme for data base access (e.g., NASIC).

First, a number of data base producers have established networks or other cooperative activities, on a national or international level, in order to make service from these data bases widely available. A notable exemple is the international network of MEDLARS centers set up by the National Library of Medicine. This arrangement permitted medical libraries throughout the United States, and later beyond, to provide a level of literature searching service that they were completely unable to provide earlier. This MEDLARS network allowed the physician or other biomedical professional to request a comprehensive search of an extremely large national bibliographic resource through his own local medical library, possibly a small hospital library with only a single professional staff member. It also allowed certain medical libraries designated as MEDLARS centers to offer an SDI service, based on MEDLARS tapes, to keep users informed of new biomedical literature of direct concern to them. A number of centers did establish such a service, sometimes restricted to their own organization (e.g., the faculty of a medical school) but sometimes offered to other organizations.

The second development is that many data bases have become available through leasing arrangements. A library (e.g., an industrial library) may lease one or more data bases that are of particular interest to the organization and may offer service from these files (both retrospective search and SDI), using in-house computer facilities, to the organization's own staff of engineers, scientists or professionals. Unfortunately, the cost of leasing a data base can be quite high — perhaps $10,000 or more a year for very large files. It is clear that this kind of investment could only be justified if there was an extremely high level of demand for service from a particular data base within the organization, this large volume of use leading to a relatively low unit cost per retrospective search or user interest profile. The fact that few individual institutions have the level of demand to justify an in-house operation of this type led to a third major development, the emergence of the *scientific information dissemination center* (SI DC).

The scientific information dissemination center was a completely new phenomenon in the information world. The SIDC is a retailer or middleman between the producer (wholesaler) of information products and the end user. The SIDC enters into licensing agreements with one or more producers of data bases (usually the producers of printed indexes or abstracting publications, such as *Chemical Abstracts, Biological Abstracts* and *Engineering Index).* This agreement permits the center to offer service to a wide audience of users on a fee basis. Any individual, research group or institution, including a library, can purchase service from a center of this kind. Although great emphasis is placed on SDI, some retrospective search capability is also provided. The SIDC is a convenient single source through which service from a number of files can be purchased. By spreading the total costs of service (licensing fees as well as operational costs) over many users, the SIDC is able to keep the fee per search, or per interest profile, reasonably low. In the United States, the scientific information dissemination center has usually been set up within an academic organization. In Europe, the SIDC may be operated by an academic organization, a government agency or a research institution of some type. In Canada this role has been adopted by a national library, a pattern which appears to be emerging in Australiaalso.

The fourth development, and perhaps the most important of all, has been the emergence of on-line, interactive searching capabilities. On-line bibliographic systems have existed, at least in experimental or prototype form, for about a decade, but it was not until late 1960's that any significant level of on-line service was provided from a large bibliographic file. A pioneer

in this area was the RECON system of the National Aeronautics and Space Administration (NASA), which was made widely available to NASA facilities in the United States and subsequently, through the European Space Research Organization, in Europe. But RECON had limited impact on the library world, and on-line information retrieval really came into its own only in the 1970's.

The major development is again due to the National Library of Medicine which began to move towards an on-line implementation of MEDLARS in 1970. The result was MEDLINE (MEDLARS On-Line), a development that put a very extensive medical data base in the hands of virtually all major,medical libraries in the United States and considerably beyond. We have now reached the situation in which the medical librarian is using this computer-based retrieval system routinely as just another bibliographic tool, but a tool more powerful than any previously available. As a result of the development of on-line searching, academic and other medical libraries have been able to greatly extend their capabilities for literature searching. Through MEDLINE, they can undertake comprehensive literature searches of at least the most recent medical literature at a depth and level of complexity that is quite beyond the capability of printed indexes and other manual tools.

In addition, on-line systems have greatly increased the capability of libraries to respond to the user who does not need a comprehensive search but needs a few relevant references and needs them right away. As one example of this, the use of MEDLARS, as an off-line, batch processing system, was largely restricted to biomedical professionals working on relatively long-term research projects. Because of its often poor response time, the system was not particularly suitable for satisfying the clinician who needed information to use in immediate problems of patient care. The on-line version of the system, MEDLINE, *can* satisfy such needs and, in fact, the system has been found to attract to the medical library people who were not previously library users. Moreover, by decentralizing the actual searching process, on-line systems have extended by orders of magnitude the volume of machine literature searches that can be conducted on a particular data base. A use of MEDLINE at a level of 20,000 searches a month has been reported in the United States alone.

Although medical libraries, through the National Library of Medicine, have been at the forefront in the use of on-line systems for information retrieval, important data bases in many other areas are now being exploited by libraries through remote access via on-line terminals. Moreover, not all of these data bases are scientific.

A very important data base on current affairs exists in the shape of the New York Times Information Bank and other files cover the literature of education, business, law and several other fields.

The fifth development of importance is the emergence of the on-line service center. Like the scientific information dissemination center, this organization offers service on a retail basis. But it differs from the SI DC in that the service is offered on-line and the emphasis is on retrospective searching rather than current awareness (SDI). The on-line service center also enters into licensing agreements with data base producers. These agreements allow the center to load these data bases on its own computer facilities and to offer on-line access to various subscribers, including libraries. Any library can now subscribe to on-line service from a growing array of files made available in this way by the System Development Corporation and by Lockheed Information Systems. Among data bases thus available for on-line access are Chemical Condensates (CHEMCON), the ERIC files (Educational Resources Information Center), PANDEX, the INSPEC files of the Institution of Electrical Engineers, INFORM (in the field of business), the National Technical Information Service (NTIS) files, and data bases from the Institute for Scientific Information and the American Petroleum Institute. The use of these data bases, via on-line access, is growing, especially among industrial libraries and specialized information centers. The System Development Corporation alone was claiming 500 customers in April 1974.[1] But use of such systems is not restricted to industrial and other special libraries. Academic libraries are also making use of these important resources. So are some public libraries.

For example, Lockheed announced in June 1974 that it would provide on-line access to the patrons of three public libraries in the San Francisco area, this experiment being funded by the National Science Foundation, and that out-of-state public libraries would probably be added in 1975.[2]

The sixth development is even more recent. It arises from the gradual recognition that any scientist or other professional should have the capability of accessing any MR data base he needs, for retrospective search or current awareness purposes, at the time that he needs it. Data files as well as bibliographic files should be available to him. To achieve this goal the scientist needs to know: (a) what data bases are available, (b) which one is most likely to be relevant to his information needs, and (c) how to obtain service from these files. The obvious place for him to go for this information, and for this service, is to some accessible library, academic, industrial, governmental, possibly even a public library. In other words, the library (especially, perhaps, academic and special libraries of various types)

should be able to provide access, in some way, to any available MR file that exists, just as these libraries provide access to printed indexes and claim the capability of getting virtually any book to any reader, if not from their own collections then from some outside source.

It is clear that no library, however large, could acquire all available data bases for in-house exploitation or could purchase on-line access to these data bases when such access is available. Besides being financially impossible, this idea is impractical for other reasons. Most important, perhaps, is the fact that the level of demand for most data bases among the users of any one library is likely to be quite low and certainly not enough to justify leasing the files for in-house use or entering into other forms of agreement whereby service is obtained on a continuous and fairly permanent basis.

But the level of demand within a single library for machine-readable files in general (i.e., a wide array of data bases) may be quite high. Moreover, the level of demand for any one data base within a fairly large geographic region may also be high. An obvious possibility, then, is the arrangement of access to MR files on a regional basis, with each library in the region having guaranteed access, at various levels, to a large number of data bases. In other words, we are talking of a type of regional information center that deals primarily or exclusively with machine-readable files.

The first such regional center is now being established in the United States as a kind of prototype which may later serve as a model for other regional services. This center, the Northeast Academic Science Information Center (NASIC), is being established by the New England Board of Higher Education with funds provided by the National Science Foundation. NASIC is intended to be an information center serving the entire academic community of the Northeastern United States. This is a ten-state region that includes several hundred academic libraries.

Working through "information services librarians" in the member institutions, NASIC will "provide the Northeast area with a central access point to the nation's growing and diverse information resources in computer-readable form". NASIC service began in 1973 with four data bases (CHEMCON, ERIC, INFORM and MEDLINE) and others have been added since that time.

It seems obvious that, with some regional organization of the NASIC type, various modes and levels of service can be provided, as follows:

1. Some major data bases, for which there is likely to be a high level of demand, can be acquired by licensing agreements, brought into the region and operated on computer facilities in the region itself. On-line service, off-line service, retrospective search and SDI could all be provided.
2. For certain other data bases, arrangements for a batch processing service can be made either with the producer of that data base or with an existing information center (i.e., a scientific information center). Both SDI and retrospective search on demand can be provided in this way. Because of the volume of demand in the area as a whole, a regional center may be able to negotiate particularly favorable rates for service of this kind, thus keeping the unit costs per search or user interest profile relatively low.
3. On-line access to various data bases, for the region as a whole, may be provided through terminals at the regional headquarters or at one or more large libraries within the region. For example, the headquarters may use on-line terminals to access the New York Times Information Bank, MEDLINE and a range of data bases available through one or more of of the existing on-line service centers. The regional center will then accept requests for on-line searches from libraries in the region, by telephone or possibly telex. Where the projected demand seems to warrant it, some of the larger libraries in a region are likely to have their own on-line terminals to provide more direct, interactive access to those files of greatest interest.
4. The use of any other data base within a particular region is likely to be infrequent and irregular. Nevertheless, service from these data bases should be rapidly available when the need for this service arises. It will be important, therefore, for the regional center to enter into agreements (with the producer or some other information center) to obtain such service for any member library at the time it is needed — with the minimum of delay and inconvenience to the user. This situation is likely to pertain to the many quite specialized data bases that are now available in machine-readable form. Demand for use of the "tall buildings" file at Lehigh University or the data base on interatomic potentials at the University of Belfast may not be very great, even within a region, but these files should nevertheless, be readily available when they are needed.

Various characteristics of a regional center of this kind are worth special emphasis:

a) The regional center may largely operate through existing centers and will be likely to buy service from such centers (data base producers or information retailers) when it is more economical to do so.
b) The long-range goal of such a regional center should be to guarantee access, at some level, to any machine-readable file that exists.
c) An important role will be played by the information services librarians in member institutions. This role is that of an interface, an interface between a particular

user population and a large and growing array of files — bibliographic, chemical, physical, numerical, statistical — in machine-readable form.

It may be worthwhile now to recapitulate briefly on some of the major points made in this paper. Fifteen years ago there were no generally available machine-readable files and the application of the computer to literature searching was literally in its infancy. Approximately ten years ago the first steps were taken to make machine-readable data bases more widely available. But, at that time, the availability was quite limited, and very few librarians had any experience in searching machine-readable files. These librarians were concentrated in a few institutions: the Defense Documentation Center, NASA, the National Library of Medicine, and a few others. Now, a very wide range of such data bases is available and they are rapidly being integrated into library service. In fact, their use in some libraries is already considered routine. They may be used by: (a) bringing in-house and operating in an off-line, batch processing mode, (b) accessing them remotely through on-line terminals, or (c) purchasing off-line service from the producer or some other information center.

In relation to machine-readable files, the librarian is assuming the role of a broker, a broker between library users and a wide range of bibliographic and data resources in MR form. It is clear that this role calls for a new type of librarian or, at least, a librarian with somewhat new skills. Richard de Gennaro, Director of Libraries at the University of Pennsylvania, has discussed this role and makes the claim that academic libraries "must develop a new kind of information or data services librarian on their reference staffs whose function it will be to publicize these services and maintain extensive files of information on their scope, contents, cost, and availability. These reference specialists will also guide users to the most appropriate services, help them to build and maintain their interest profiles, and provide assistance with the business aspects of dealing with vendors."[3]

The University of Pennsylvania is one of the first institutions to establish a data services office, within the university library, to fulfil these functions.

THE ROLE OF THE INFORMATION SERVICES LIBRARIAN

What are the implications of all of this for library education? It seems obvious that we must now be training librarians who are capable of assuming the role discussed above. These information services librarians must:

a) Be fully aware of what is available in the way of data bases and of centers providing service from these.
b) Be able to choose the data base most appropriate to any particular information need whether for current awareness or retrospective search purposes.
c) Know how to obtain service and perhaps be capable of evaluating and choosing between various suppliers of service.
d) Be able to evaluate various competing and overlapping data bases.*
e) Be capable of constructing searching strategies and user interest profiles, possibly for a number of different data bases involving differences in vocabularies and in searching logic.
f) Be capable of searching files in an on-line, interactive mode. Again, the librarian may need to know more than one language of interrogation.
g) Know a considerable amount about indexing techniques and vocabularies (indexing languages), as well as searching strategies, in order to be able to exploit machine-readable files effectively and efficiently.
h) Be able to interact successfully with users in order to determine the precise nature of their information needs.

PUBLIC LIBRARIES AS SUPPLIERS OF INFORMATION

It seems likely that greatly expanded capabilities for information service in the 1970's will not be restricted to very large libraries or even to widely available data bases. Some libraries are now creating their own specialized machine-readable files and are offering service from these to users. Public libraries are among these. The minicomputer, a small and relatively inexpensive machine, puts data processing capabilities within the reach of even quite small institutions. Some librarians are beginning to recognize that public libraries have an increasingly important role to play in the provision of information service and in creation of new files, where needed, to provide this service. As one important example I would like to quote Ken Dowlin, Director of the Natrona County Public Library in Casper, Wyoming. Dowlin[5] has this to say about the role of the public library as a supplier of information: "Public libraries are going through a period of great change. Historically they have provided the majority

* Some criteria for evaluating data bases, suppliers of service, and information services in general have been presented elsewhere by Kuipers, Lancaster and Thorpe.[4]

of their services to educated people; have emphasized collection development in the area of literature and history; and have been essentially a middle-class institution. For public libraries not only to survive, but to play an important role in the community, they must change their operations to reflect the idea that information is their most important product. Most libraries say that they do provide information, but few of them consider information in its fullest context. The information I refer to could be provided by one institution. Not only information needed for education and self-education, but information needed for everyday life should be provided."

Dowlin goes on to identify three technologies that libraries must use to provide information service in the 1970's and beyond: the computer, microfilm and cable television. He points out that "it will be necessary for librarians to become familiar with these technologies so that they can adapt them to their own purposes, and hence expand the capabilities of the technologies themselves in relation to library usage" and he has this to say about the application of these technologies in libraries:

"1. The computer is generally hailed as a revolution in American life that has had or will have as large an impact as the industrial revolution. Libraries can no longer say "we can't afford them," "they don't do what we want to," or any of the other excuses that are heard. The primary reason computers have not been able to do what libraries want them to is because librarians have not applied themselves to refining them as a tool for library purposes.

2. Libraries have in many ways overlooked or only superficially looked at microfilm. Microfilm has been around for a long time. Virtually every library in the country has some type of microfilm, generally periodicals, where it is used to save space. Few libraries have used microfilm as a way of capturing source information in such a way that it can be readily utilized as part of the overall information package.

3. Cable television is being viewed, depending on one's viewpoint, as a major technological revolution in this country, or as a bust. The Sloan Commission, which did an exhaustive study on cable television's implications for the future, predicts that by 1980 more than 60 percent and as much as 80 percent of the homes in this country will be wired for cable. Many people feel that the commission is wildly optimistic. There is a general consensus, however, that cable television is on the verge of becoming a major factor in our lives. The Natrona Country Public Library was the first public library in the country to operate a cable television channel on a full-time basis.* I will not go into details on the background; it is sufficient to say that we are operating the channel, we have demonstrated that it can be done, and we have demonstrated that it is a tool that can be used by the library.

The Natrona Country Public Library has recently received $81,000 from the Natrona Country Commissioners to design, implement, and operate a microfilm information system. The initial purpose of this system will be to convert county records to microfilm and to design the continuing system for capturing this type of information on microfilm. Many aspects of this system lend themselves readily to our "normal library operations." We will be able to use the microfilm to capture a variety of information, primarily related to our own locality. We can use it to convert the information into a standard format so that it can be handled under normal procedures. As a part of that microfilm project, we have the funds for the use of a computer (an NCR model 101) for a maximum of eight hours per day.

Hopefully, in the next one to five years, we will be able to utilize the capabilities of the cable television system, the microfilm system, our own traditional library system, and the computer to answer the informational needs of the people of the county. The system will use microfilm, or the traditional book, periodical or pamphlet file to store bulk information, or it will use videotape. The computer will be used to index all of this information to the great degree necessary to utilize it rapidly. The computer may also be used to provide limited storage for informational items which have a high frequency of usage. This type of information file will be determined by using the computer to operate our management information system, thereby predicting requests for types of information or specific items of information. The cable television system will be used to provide one of the communications links with the user. We will be able to utilize three methods to communicate with our patron: in person on the premises; via the telephone, which plays a very important role in our services; or via cable television, which will become increasingly important as we develop the methodology and the mechanics to answer questions quickly. Television

Cable television in this library is being used not only for providing programs but to provide a "video reference service", whereby graphic images can be transmitted to a domestic TV receiver.6

> also gives us the added capability of storing information in the videotape format. It may also be used to capture, at the time of occurrence, items about the community that are of an important informational nature.
>
> Many public libraries now consider themselves information centers for the community. This is certainly a heartening trend. In order to make this concept fully effective, however, two adjectives must be added to the words *information center.* Those two adjectives are i*mmediate* and *comprehensive."*

This lengthy quotation from Dowlin reflects what one progressive public library is doing in the area of information service. But this is just the beginning. We are likely to see many other developments of this type in other libraries.

THE FUTURE:TRENDS AND PROBLEMS

But what of the future? What are the likely development and future needs? We have certainly not seen the end of the growth of machine-readable data bases. More of these will become available, perhaps in increasingly specialized subject areas. Many more will become available to libraries for direct on-line access. The cost of access will undoubtedly decline, as computing and communications costs continue to be reduced, as iess expensive terminal devices become available, and as more networks and other cooperative arrangements are established. Machine-readable sources will become increasingly important in the provision of information services in all types of library, and there will be a growing need for librarians who know these resources and how to exploit them effectively.

But there are a number of problems that still need to be solved. There are now so many machine-readable files that it is difficult to know which one is the most appropriate to use for any one information requirement. The problem is not one of knowing what exists at a general level (e.g., in agriculture, medicine or physics), but to know which data base is likely to have the most or the best information on some specific topic, such as "ultrasonic machining of metals", "design of clothing for extremely cold climates", or "stresses in aircraft structural panels at supersonic speeds". For any particular topic there may be a number of data bases of possible use. The problem is to decide which one to use or, more precisely, to decide in what order of priority they should be searched. The situation differs from that of deciding which printed index to use. Printed indexes are usually close at hand in the library and it is fast and inexpensive to do a preliminary check in order to decide which one is likely to be most productive in a more complete search. But not all machine-readable indexes will be close at hand and it can be both costly and time-consuming if we choose the wrong one to search.

What we really need is some center or service that will tell us rapidly which data base is most likely to have payoff for any particular request. What we need, in fact, is some type of "search tester". This search tester (ST) must contain more than *descriptions* of data bases; these things already exist, including one in machine-readable form.[7] The ST must contain the *vocabularies* of these data bases, including a count of the number of times each word or descriptor occurs in the file. In response to a request, which would in fact be a preliminary search strategy, the ST would determine, using term match and term frequency criteria, which data base is most likely to be productive for this request. In fact, the search tester will *rank* data bases in order of their probable utility in relation to the request. Such a tool should be created and maintained by some national or international information center (perhaps an obvious candidate in the United States would be the National Referral Center for Science and Technology) and would give rapid response to any other center or library by telephone or teletype. More usefully, perhaps, the ST data base could be maintained on-line for remote interrogation by libraries and other information centers.

A second problem will arise as libraries gain access on-line to many different data bases. Unfortunately, different systems have different languages of interrogation. The commands and searching protocols of ORBIT (as used by SDC and in MEDLINE) are not the same as those used in RECON or DIALOG, and these are all different from STAIRS, Data Central, the New York Times Information Bank, and so on. Suppose a large library has access to five different on-line systems. Not only will their vocabularies and indexing policies differ, but their query languages and search procedures will also vary, perhaps quite considerably. This makes extremely difficult the job of the information services librarian, who must switch from one language and searching mode to another. Since it is unlikely that these various systems will change to adopt some standard language, the only solution to the problem may be to develop some master switching language, either:

a) some type of "intermediate lexicon", transparent to to the user, which, when incorporated within a bibliographic network, will translate the commands and protocols of one system into the commands and protocols of a second, thus permitting a searcher to use the language with which he is most familiar, or
b) some form of "Esperanto", a common language that everyone must learn and which would be acceptable to and translatable into the language of many different systems.

Some minor steps have been taken in this direction. Some systems, including ORBIT, incorporate a "rename" command whereby the individual terminal user can change any or all of the commands of a system into a form with which he is more familiar. M.I.T. is now working, with funding from the National Science Foundation, on the development of a switching language which could be used to achieve compatibility among a number of different on-line retrieval systems.

The third problem I want to highlight has been with us for some time, but it is a problem that is now being magnified by the other developments we have discussed in this paper. In the last decade we have seen great advances in bibliographic searching capabilities. But the output of almost all information retrieval systems consists of bibliographic references or, at the most, abstracts. While we have made giant strides in reference retrieval we have done comparatively little, at least in the United States, to seek comparable advances in the retrieval and delivery of documents. All of these bibliographic services may be viewed *as aperitifs.* They whet the appetite. But the main course may never be delivered or it may appear only after the appetite has waned. We now have the anomaly that a physician at some hospital or other medical center in the United States may be able to find references on a particular disease or form of therapy, from a vast data base of medical articles, in ten minutes or less. But he may have to wait several days to obtain the actual documents through a regional medical library or through the National Library of Medicine itself. In fact, the searcher should be able to view the full text of any document in a particular data base in approximately the same time frame that he needs to retrieve a bibliographic reference. Some systems already provide the on-line searcher with the ability to access a remote microform store. Having identified some promising citations, the searcher can request that the text or the actual articles be transmitted from the microform store and displayed at this viewing station. This type of facility exists with the New York Times Information Bank, with the Intrex system at M.I.T., and in several engineering organizations where it is used, for example, for the transmission of engineering drawings. By "remote" microform store we mean, in this case, one in the same building or building complex. Although it is already possible to transmit microform images over great distances (e.g., from a national library to many other libraries in the country) a number of problems still exist in this area, including the problems of cost, of legibility, of copyright, and of reliability of mechanical devices needed to locate a particular fiche and position a particular image for transmission.

I am convinced that these problems will be solved in the next few years, that they must be solved, and that. perhaps within the next decade, librarians will not only be able to search remote data bases on-line but will be able to view microimages of any item in these data bases on the same terminal and in approximately the same time frame.

In this paper I have tried to summarize some important developments, occurring within the last ten years, affecting the provision of information services by libraries, to identify some problems, and to suggest some possible future trends — although no-one knows exactly what new developments will take place, even in the next five years. I would like to conclude with a quotation from an earlier paper I wrote on the education of librarians. It is equally appropriate here:

"In many ways libraries have changed remarkably little, in their services and operations, in the last century. It is almost certain that this period of comparative stability is over and that the "library of the future" may be considerably different from the traditional library we have become accustomed to. We cannot predict exactly what this library of the future will look like, although we can foresee certain probable, broad trends. It is clear that the next 25 years are likely to be extremely exciting technologically. We are just beginning to scratch the surface of the possibilities for applying technological advances to problems of information transfer. Rapid developments are taking place in such activities as computer-aided instruction, networking, on-line computer technology, microform technology, cable television, mass digital storage, machine processing of text, and publishing and distribution methods. Some of these developments, collectively, may result in significant overall improvements in future methods of information handling. Librarianship will be greatly affected by these developments. Libraries will be entering a period of great change and the curricula of our library schools must reflect this. Above all else, we must educate librarians capable of adapting to the changes that new technologies will inevitably bring."

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RESUMO

As bibliotecas estão atravessando um período de grandes mudanças devido à crescente disponibilidade de bases de dados, legíveis por máquina, e sistemas de recuperação da informação. Alguns produtores de bases de dados estabeleceram redes a nível nacional e internacional a fim de torná-las disponíveis. O fato de que poucas instituições tenham um nível de demanda que justifique operações deste tipo levou ao desenvolvimento de centros de disseminação de informação científica e ao desenvolvimento de buscas on-line. Em relação a estas mudanças, o bibliotecário está assumindo o papel de intermediário entre os usuários e a massa de dados bibliográficos existente em forma legível por máquina.

O Instituto Brasileiro de Informação em Ciência e Tecnologia (IBICT) do CNPq mantém, em convênio com a Universidade Federal do Rio de Janeiro, um *Curso de Pós-Graduação (Mestrado) em Ciência da Informação ÍCPCI)* e um de Especialização, *Curso de Documentação Científica (CDC).*

Os Cursos exigem para fins de inscrição os seguintes documentos:
a) formulário de inscrição;
b) histórico escolar do curso de graduação;
c) curriculum vitae comprovado;
d) comprovante de compreensão da língua inglesa;
e) dois retratos 3 x 4 ;
f) cartas de referência (para Mestrado).

Matrícula
Os candidatos selecionados deverão efetuar a matrícula mediante o pagamento de taxa fixada anualmente.

MESTRADO EM CIÊNCIA DA INFORMAÇÃO

Objetivos
Formar docentes capazes de preparar profissionais da informação segundo as necessidades de suas regiões.
Formar pesquisadores e desenvolver pesquisas no campo da informação cujos resultados sirvam de subsídios à formulação de política científica e tecnológica.
Preparar profissionais capazes de atuar em sistemas de informação científica e tecnológica.

O Curso compreende um elenco de disciplinas obrigatórias:
Recuperação da Informação
Teoria e Sistemas de Classificação
Indexação e Thesaurus I
Automação de Sistemas de Informação
Metodologia da Pesquisa
Estudo de Problemas Brasileiros
e outras, optativas, que dão ao aluno condições de escolher seu campo de atuação. Essas disciplinas integram as áreas de concentração:
Administração de Sistemas de Informação/Documentação
Transferência da Informação

*Vagas:*20
Duração mínima: 18 meses
Inscrição: setembro/outubro
Bolsas: As bolsas de estudo são concedidas pelo CNPq ou pela CAPES através do IBICT.

CURSO DE DOCUMENTAÇÃO CIENTIFICA

Objetivo
Preparar pessoal de nível superior para atuar na área da informação e documentação.
Para obter o certificado do Curso o aluno deverá cursar obrigatoriamente "Estudo de Problemas Brasileiros" e escolher 8 dentre as 10 outras disciplinas oferecidas.

Disciplinas
Administração de Sistemas de Informação
Introdução à Ciência da Informação
Introdução ao Processamento de Dados
Linguagens de Indexação
Metodologia da Pesquisa
Métodos Quantitativos
Padrões do Registro Bibliográfico
Recursos Informativos em Ciência e Tecnologia
Reprografia
Teoria dos Conjuntos

Vagas: 20
Duração: março a agosto
Inscrição: novembro/dezembro