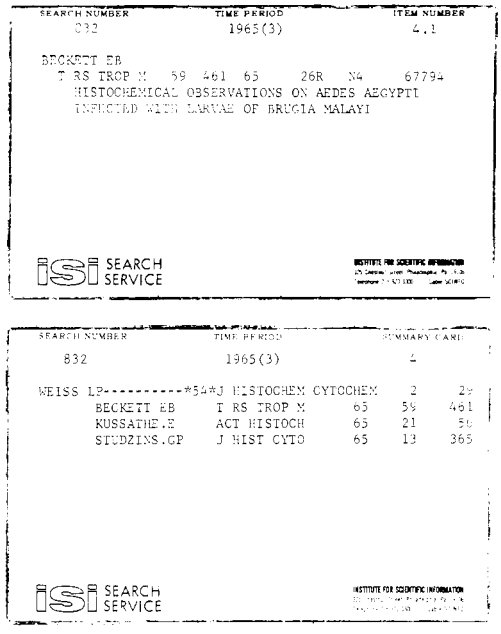

Figure 11. Sample search report cards.

microfilm for many years. Microforms generally can only be effective when really large files of data are involved.

In conclusion, there are a large variety of ISI services that cater to the small user. They begin with a tear and go all the way to a comprehensive tape leasing service. In the future we are planning telecommunications links for a real-time random access file covering over ten million reference and source citations. These services will probably not be cheap by conventional standards; but by the time such facilities are widely used and accepted, even by small users, they will not only seem cheap, but will, in fact, be low in cost because increased volume of usage will decrease costs.

As the appreciation of information services increases, and there is evidence this is happening, their use will probably increase exponentially, and the unit cost of storage and retrieval will go down. ISI services have been priced on a self-supporting and unsubsidized basis. Therefore, barring a completely unexpected increase in the world's literature, or great inflation, our charges will remain stable or go down. *Current Contents*, for example, has not had a price change in nine years despite the substantial increase in the literature covered and the improved features that have been added. Recently we lowered the price of *Index Chemicus* second copies. We have increased coverage in all our services without price increase. To the small user trying to plan a system and a budget years ahead, this is important.

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The Impact of the National Library of Medicine on the Small Information Group*

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The problems of the small information group in using services such as those of the National Library of Medicine are of great concern to me since I have spent almost 20 years in small- and medium-sized libraries. Indeed, a major reason for my coming to NLM was to help ensure that MEDLARS would serve the needs of this type of user.

There is a certain incompatibility in the requirements of small and large information systems. By its very nature, the large information system must address itself to a wide audience and must provide broad coverage; but to fill the needs of the small group, there must be provision for screening out what is not pertinent, what is of low quality, and what is redundant.

My viewpoint can be summarized by the simple statement: "The computer is here to stay." That which the

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The National Library of Medicine provides extensive services to the biomedical community which supplement and strengthen individual libraries and other information groups. In addition to traditional publications and interlibrary loan services, the Library provides information retrieval based on its scanning and indexing of the biomedical literature. Guidelines to enable a small information group to make the most effective use of a larger system are set forth.

the computer does best—manipulation of a single input for use in a variety of ways—is the keystone to the success of such programs, and is the primary reason for the impact of most large information systems on small information groups. If to any extent it becomes less necessary in the future for the small information group to repeat routines that can be and have been handled by central literature processing, then the large systems have achieved a certain degree of success.

This paper discusses the activities of NLM in relation to new developments and stresses the impact of these activities on small libraries. The NLM is established by law "to assist the advancement of medical and related sciences, and to aid the dissemination and exchange of scientific and other information important to the progress of medicine and to the public health." Thus it has a very broad charter and responsibility. During the past session of Congress, the Medical Library Assistance Act (Public Law 89-291) was passed "to provide for a program of grants to assist in meeting the need for adequate medical library services and facilities." When appropriations have been made to implement all aspects of this legislation, NLM will be in a position for the first time to give major assistance to medical libraries throughout the country, including support for constructing facilities, improving and expanding basic resources of medical libraries and establishing regional medical libraries, traning in medical library science, and a variety of biomedical scientific publications. This aspect of the Library's activities will not be discussed here, although it will undoubtedly have as much or more impact on the small information group as do the intramural activities of the Library. However, we are concerned here with a direct interaction between a central information group and other information groups throughout the country.

MEDLARS is an acronym for Medical Literature Analysis and Retrieval System. For the 2500 journals that are covered annually in MEDLARS, it provides the many outputs from a single input which I have just mentioned. In MEDLARS the single input is a reference to a journal article. Our scientifically trained indexers use some 6800 standardized terms from which an average of three are selected for *Index Medicus*, but around seven are used totally, the remaining four being in the computer for specialized searching. The outputs of MEDLARS fall into two areas. First, there are *Index Medicus* and other bibliographies produced for wide distribution on our Graphic Arts Composing Equipment (GRACE). Some of these bibliographies, such as the *Index of Rheumatology* and the *Index to Dental Literature*, are sponsored by professional societies which in a sense act as intermediaries between NLM and the small information group, since journal selection, criteria for selection, and search logic are tailored by a specific group to their needs. In working out a new bibliography a scientific group will also make recommendation for the introduction of new terminology into the system.

The second area of output includes the demand searches which we are presently producing at a rate of nearly 300 a month for users with a legitimate question who are willing to provide feedback on the effectiveness of the results. The most effective searches in terms of saving human effort involve a question with several different kinds of parameters, and many elements of each kind. For instance, a recent search on the effect of oral contraceptives on the liver was divided into effects of progestins, effects of estrogens, and finally, effects of the two combined. These searches are, of course, available to the small library.

In spite of the number of questions answered, we find that we frequently receive more questions than our human and machine resources can handle promptly, and have therefore moved toward the establishment of regional centers to take care of some of the needs which cannot and should not be handled centrally. The University of California at Los Angeles and the University of Colorado in Denver are already operating such regional centers, and tapes have been made available to the National Lending Library in England and the Karolinska Institute in Sweden. MEDLARS search centers are now being initiated at the University of Alabama, Harvard, and Michigan. Also anticipated is a subject-oriented center for which groundwork is presently being laid by the Pharmaceutical Manufacturers Association. In each case, personnel from the center come to NLM for an extensive training period so that they can handle questions at the remote center with the same degree of precision that can be used at NLM where the indexers and searchers work in close contact. Thus, the single input will in the future be used not only for manipulations at NLM; it will also be extended geometrically by duplication of tapes for manipulation in a number of other places.

Another method of bringing MEDLARS services closer to the small information group is through specialized information centers. Such centers usually cannot afford to scan the world literature, or even a substantial part of it, to ensure complete coverage of all pertinent published information. Through its ability of index a large amount of material (some 170,000 articles last year) the Library can provide the means of extracting the raw materials which can be used by the specialized information center for future refinement. To date, we have supplied a few such centers with demand searches for the purpose of alerting them to papers which they will want to analyze in depth. We have only scratched the surface of all the possible ways in which we might interact with such information groups. Whenever time and resources are available, we will surely find other means of supplying

them with information. At least one group plans to use titles of articles on our computer tapes for preparing permuted title indexes.

My concern with the Drug Literature Program in the past few months has been with expansion and improvement in a particular subject area: that of drugs and pharmaceuticals. We have brought to the Library a number of specialists in the areas of pharmacology, biochemistry, toxicology, pharmacy, and clinical investigation to take a critical look at our present activities from the viewpoint of the user, and to assist us in improving our system. We have, for instance, already made some changes in our pharmacology terminology with the assistance of a visiting scientist from Sweden, and with the cooperation of the American Hospital Formulary Service. We are also working on an Auxiliary Chemical Module to enable us to control references to individual substances more satisfactorily.

MEDLARS is not the only interaction between the Library and other groups. A major new program was initiated in January 1966, with the advent of the NLM *Current Catalog*. This publication is a computer-based alerting service and book catalog which is issued biweekly and cumulated quarterly and annually. Many American publishers make their medical monographs available to the Library before the actual publication date, so that they can be listed promptly in the *Current Catalog*. It contains all cataloging information including the NLM call number and subject headings applied, as well as the publication price when available. The biweekly issues are arranged by author and the title, but the quarterly and annual cumulations include subject listings as well. This publication is valuable to the small biomedical library in acquisition and cataloging.

The Library is involved in various stages of thinking and implementation of improvements to our current system, in order to carry out our mission of dissemination and exchange of scientific information even more expeditiously.

We have found that as MEDLARS services are used, there is an increased demand for original papers in individual libraries. We presently distribute each month some 14,000 photocopies of articles in lieu of the original publications. One of the areas in which we have been working is the use of microtechniques to store some of the materials and to make them more readily available for use by others. In addition, we are already planning a second-generation MEDLARS; an initial systems design and feasibility study are also under way.

As the large centers progress, the role of the individual information specialist in this changing information picture will alter in the next few years. He will have much less laborious manual searching to do. On the other hand, he is in a unique position to interpret the large system to the individual scientist with whom he works. Even more important from my point of view is the ability of the information specialist to interpret the needs of the individual scientist to the large system. Even though there is a limit to the amount of refinement which can be attained with an information system that is handling on the order of 200,000 articles a year, NLM has not yet reached that limit. It will be important in the next few years to get assistance from the individual scientist in defining our goals for improvement. Unfortunately, the individual scientist rarely has the time to communicate directly with the National Library of Medicine, and it may not be easy for him to think in terms of his long-range needs. The librarian or information specialist who is working with him on a day-to-day basis is, however, able to evaluate group requirements and to communicate them to the centralized service, whether it be NLM, NASA, or another.

With respect to predicting future requirements, I recently heard a speaker wonder what changes the MEDLARS planners would have made if they had known in 1961 what they know today. I can assure you that there are many. One can make quantitative guesses which may hit the mark, and some of ours have, but it is extremely difficult to predict the effect of qualitative changes in capabilities on systems use. It is in this area that I urge individuals to think in terms of what they would really like, rather than what they think they can get. I am personally convinced that there is a potential use of MEDLARS and other such information networks that is still several orders of magnitude beyond anything we have reached. Any assistance we can get from any sources in predicting what changes are needed and what the impact of these changes will be on systems requirements will be extremely helpful. This may sound naive in the world of the systems engineer and designer, but the technical systems worker can design soundly only on the basis of information on the needs of the ultimate user.

How does the individual librarian or information specialist prepare himself for his new role as communicator and interpreter? In the first place, he does not abandon an old system until he is sure that a new one will do his job more effectively or can be integrated with his present system for a combination that is better than either.

Second, more than ever before, it is necessary for the information specialist to keep well informed. We all have a responsibility for ensuring that short courses are available and that they are suitable to our individual needs. Many librarians and information specialists would do well to take regular courses in such subjects as systems analysis, computer logic, information theory, and classification theory.

Third, the information specialist or librarian recognizes that there are still both thinkers and doers in the national information system. In a recent visit to Russia my colleagues and I found it difficult sometimes to sort out what was actually operational and what was only a part of "Nash Plan." The Russian exchange delegation which visited America was probably equally confused. It is important to know whether one is dealing with an operational system or an idea. There are many important developments on the horizon which the thinkers are creating and studying as a part of our information research, but which we do not yet have the resources to implement. The information specialist needs to listen to the thinkers and to plan on the basis of the theories that are developing, but in terms of his objectives for the immediate future he needs to deal with the doers who actually have operational though imperfect systems. In short, he must become himself both a thinker and a doer if he is to continue in the main stream of information handling.