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On-Line Services in Medicine and Beyond

A national and international bibliographic information network for science and technology is now evolving.

Davis B. McCarn and Joseph Leiter

On 29 October 1971, the National Library of Medicine (NLM) initiated a nationwide, on-line, bibliographic retrieval system as a general service for the biomedical community. This service, called MEDLINE, now allows almost instantaneous, interactive searching of over 400,000 citations from the world's biomedical serial literature. After a year, the service was supporting an average of 25 simultaneous users, 43 hours per week; in October 1972, 10,605 searches were processed—a rate of nearly 140,000 searches per year. Service is provided through a data communication network that allows access through a local dataphone call in any of 40 major metropolitan areas across the nation. Over 120 institutions with over 200 terminals are using the service. The communications network also has a node in Paris and is being used regularly by the French MEDLARS center for a trial period. The Canadian MEDLARS center is a regular part of the network. The MEDLINE data base is also operated from a computer in Sweden, and access is provided by remote terminals in six locations in Sweden through regular telephone lines. MEDLINE is the first generally accessible, on-line, interactive information service. It constitutes the first national and international telecommunications-based science information network.

Background

Interactive systems for timesharing were developed and demonstrated successfully in 1963 by two parallel projects, one at the Massachusetts Institute of Technology and the other at the System Development Corporation, both funded by the Advanced Research Projects Agency of the Department of Defense. Project MAC at Massachusetts Institute of Technology concen-

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trated primarily on interactive computing, while the System Development Corporation concentrated on data base management systems. By 1964, the corporation had developed a rapid bibliographic retrieval system, ORBIT (On-Line Retrieval of Bibliographic Information—Timeshared). The capabilities of such a service were first tested under the aegis of the Department of Defense in 1965, when a large (200,000 citations) bibliographic file on literature relating to foreign technology was made available as an on-line service via leased lines to selected military organizations. This service demonstrated the feasibility of such services and also proved that an on-line service could greatly increase the use of an information base over that of a comparable batch search service. (Most of the systems built in the early 1960's, before economic direct access storage became available, required sequential searching of magnetic tapes. Since such magnetic tape systems require that the entire file, consisting of many tapes, be processed to satisfy a search, many searches were usually processed together as a "batch" to achieve reasonable economy in operating the service.) This system also demonstrated that searches negotiated at a terminal were quite different from those submitted preformulated to a batch system, since they tended to retrieve a more limited number of citations at a terminal than did searches using batch systems. Of even greater significance was the ability of an on-line, instantaneous response to provide the user with opportunities to sample the data base and modify his strategy.

The development of several important retrieval systems in wide use today occurred between 1965 and 1968. These included: Data Central; Lockheed's Dialog and its offshoot, the RECON system of the National Aeronautics and Space Administration; and the search system of the Biomedical Communications Network of the State University of New York. Each of these systems supported one or more retrieval services to a limited clientele over leased, private-line communications. The appearance of a nationwide service awaited the development of appropriate communications and the availability of high-speed disk storage.

This period was characterized by a preoccupation with the computer problems associated with on-line searching. A multiplicity of searching alternatives were developed on various systems. The analysts working on such systems were polarized into two groups: one convinced that searching, based on manual or machine indexing with subject terms assigned to documents from a controlled vocabulary, was adequate and a second convinced that "full text" (usually of titles and abstracts) searching was the wave of the future. Often the terminal language for inputting a request looked more like a programming language than one suitable for untrained users. Because of the limited number of users in these systems, little attention was paid to developing rapid and efficient search procedures that would afford rapid response time to the on-line user.

MEDLARS

The NLM initiated a program for access to the biomedical literature nearly 100 years ago. *Index Medicus,* a guide to the medical literature, was first published in 1879. In 1962, the library began to develop a computerized system for the production of *Index Medicus*; the system went into operation in January 1964. This computer system, called MEDLARS (Medical Literature Analysis and Retrieval System), incorporated the first operational photocomposition system. As a by-product, the system could provide individualized bibliographies ("demand searches") for a requesting health professional. The demand for such services grew with time and with the size of the computer file, reaching a peak in 1970 with a total of 24,000 searches. The search service was provided, at times, from 10 computers in the United States and 11 computers in foreign countries. Foreign MEDLARS centers were established in Australia, Canada, France, Germany, Japan, Sweden, the United Kingdom, and at the World Health Organization in Geneva.

To obtain a search, a qualified health professional submits a written request describing the details of the information he needs. This request is then "formulated" by a trained analyst, coded into the vocabulary of MEDLARS for input to one of the computers, and processed on the computer. The output is reviewed by the same search analyst who had formulated the query, and finally, in 3 to 4 weeks, the

Table 1. List of ELHILL commands.

Command name	Abbreviation	Function
EXPLAIN	EX	Allows user to obtain on-line explanation of any command or program message
VERSION	VERS	Allows user to set routing messages to one of three levels: symbolic, short, or full
FIND	FD	Allows user to enter a search statement without receiving the readiness cue
NEIGHBOR	NBR	Retrieves index terms that are alphabetic neighbors of the search term and indicates the number of postings for each
DIAGRAM	DIAG	Allows user to trace the structure of search statements, especially when search statements have been formed by combination of other search statements
ERASEBAK	ERSBK	Allows user to erase some specified number of search statements
ERASEALL	ERSLL	Erases all previous search statements
RESTART	RST	Allows user to erase all stored records of interactions with program and start over again
PRINT	PRT	Causes program to print out information desired. User has many options, such as on- and off-line, format, elements to be printed, and relevance
STOP	STOP	Allows user to stop the program at any point during the operation
TREE	TREE	Causes thesaurus display of terms hierarchically related to specified term
MESHNO	MNO	Provides MeSH classification number of specified term
COMMENT	COMMENT	Allows user to type in comments, which are stored for system personnel
NEWS	NEWS	Provides user with announcements and so forth

```
PLEASE LOG IN:

USER NAME:  nlm

PASSWORD:  med
;mednlm02

THIS TERMINAL IS CONNECTED TO THE MEDLINE RETRIEVAL FILE SET

HELLO FROM ELHILL II.  DO YOU WISH THE NEW-USER OR EXPERIENCED
USER FORMAT?  TYPE N OR E AND STRIKE THE CARRIAGE RETURN KEY.


USER:

e

PROG:

SS  1 /C?


USER:

"version short all"                          (The version command expands
                                              output messages to a more
PROG:                                         intelligable form)

SS  1 /C?---SEARCH STATEMENT  1 OR COMMAND?


USER:

psychoses, manic-depressive                  (First subject to be searched)

PROG:

PSTG---NUMBER POSTINGS (828)                 (Number of citations contain-
SS  2 /C?---SEARCH STATEMENT  2 OR COMMAND?   ing this term)


USER:

lithium                                      (Second subject)

PROG:

PSTG---NUMBER POSTINGS (1199)                (Number of citations contain-
SS  3 /C?---SEARCH STATEMENT  3 OR COMMAND?   ing the second subject)


USER:

1 and 2                                      (Asks for citations with both
                                              of subjects)
PROG:

PSTG---NUMBER POSTINGS (253)
SS  4 /C?---SEARCH STATEMENT  4 OR COMMAND?


USER:

3 and review                                 (Qualifies request to be only
                                              review articles)
PROG:

PSTG---NUMBER POSTINGS (25)
SS  5 /C?---SEARCH STATEMENT  5 OR COMMAND?


USER:

"print 2"                                    (Prints the most recent 2
                                              citations)
PROG:


AU- HOLLISTER LE
TI- MENTAL DISORDERS--ANTIPSYCHOTIC AND ANTIMANIC DRUGS.
SO- N ENGL J MED 286 984-7 4 MAY 72


AU- DAVIS JM
AU- FANN WE
TI- LITHIUM.
SO- ANNU REV PHARMACOL 11 285-302 1971
SS  5 /C?---SEARCH STATEMENT  5 OR COMMAND?


USER:

"stop"

PROG:

BEFORE STOPPING, HAVE YOU ENTERED AN AT SIGN (@) FOR EACH INTELLECTUAL
SEARCH?  (YES/NO).  PLEASE DO SO BEFORE ANSWERING YES.


USER:

@                                            (Input of search completion
                                              symbol)
USER:

yes

PROG:

GOOD-BYE!
```

Fig. 1. Sample MEDLINE dialog (computer output is in capital letters; input from the terminal is in lower-case letters; notes appear in parentheses at the side).

requester receives his bibliography. The entire MEDLARS file now contains 1.7 million citations, but only about 800,000 are maintained in a current file that is routinely searched. A limited number of searches are processed against the total file. The data base is searched with the same controlled vocabulary used in indexing the documents containing about 8500 hierarchically arranged subject terms. These procedures are typical of batch systems like MEDLARS.

NLM On-Line Experiments

In the fall of 1967, the NLM began to experiment with on-line bibliographic search services. It first installed and evaluated the on-line service (ORBIT) for the foreign literature mentioned above. ORBIT was then used to experiment with a data base in neurology. These experiments helped in specifying the capabilities necessary for an on-line service for the biomedical literature (*1*). To verify these specifications, the NLM also contracted, in 1969, for a review of extant on-line bibliographic retrieval systems (*2*). As a result of this evolutionary and analytic approach, the NLM began early in 1970 to develop an on-line search system, since it was clear by this time that a flexible, reasonably effective, and useful retrieval system could be developed. It was equally clear that, in order to ensure a reasonable demand for service, both a high-quality data base and efficient, economical access were essential. The rationale for choosing a specific biomedical data base for an initial pilot study became evident when the NLM began publication of *Abridged Index Medicus* (AIM) in January 1970. This new publication was an index to 100 top journals in clinical medicine, and its acceptance by the biomedical community suggested that a data base covering the literature in these journals would be a useful file. The problem of access appeared solvable if a computer could be connected to the Teletypewriter Exchange Network (TWX). Since TWX terminals already existed in almost 500 medical institutions, the heavy costs of procuring terminals could be avoided if these could be used for the search service.

The NLM therefore planned and contracted for an experimental service—AIM-TWX, which was provided from an IBM 360/67 computer at the System Development Corporation. That computer was the first to be connected without special arrangements to the TWX network, and the system became operational in June 1970. The response of the medical community to this service was enthusiastic. Experience with AIM-TWX (*3*) demonstrated the viability of a network and identified the need for an expanded on-line system from the NLM. Planning for such a service began early in 1971.

Table 2. Data elements in the MEDLINE file.

Citation element	Searchable
Author(s)	X
Title	X
Source	
Language	X
Publication year	X
Entry date to the NLM computer system	X
Medical subject headings (MeSH)	X
MeSH class number (hierarchial code)	X
Journal code	X

MEDLINE

Access to the MEDLINE retrieval service is provided by a simple language at a typewriter-like device connected through a telephone line to the computer at the NLM. When a word or words are entered at the terminal, the computer assumes, unless told otherwise, that it should attempt to search on them. A word or words in quotation marks are commands to the computer to do something other than search—for example, to print a set of retrieved citations. The basic commands are given in Table 1, with a brief indication of their function. Figure 1 is an actual short dialog showing a subject search. Table 2 lists the elements of information in the data base and indicates their searchability.

The base of bibliographic citations in MEDLINE consists of all the references published in *Index Medicus* from January 1970 to the present for approximately 1200 journals. Since the entire printed *Index Medicus* covers about 2200 journals, MEDLINE thus includes about 60 percent of the material in *Index Medicus*. A study (*4*) of MEDLARS indicated that the top journals provide about 75 percent of the retrievals, and MEDLINE covers this group.

There are, on the average, 12.3 subject terms assigned to describe each citation in MEDLINE. The average citation is printed in *Index Medicus* under about three of these headings, identifying major aspects of the article. The remaining headings describe more specific or secondary aspects of the article. One may search MEDLINE for all citations indexed by any given subject heading or for only those citations that were printed under the subject heading in *Index Medicus*. The former search would, on the average, yield several times as many citations.

Although the indexing process is closely controlled and reviewed, it is subject to the vagaries of human judgment. Therefore, searching is partly an effort to identify how a given subject may have been indexed. To assist in this process, personnel at each institution that uses MEDLINE are trained for 3 weeks in the intricacies of indexing and search, including the use of strategy employing the Boolean "and," "or," and "and not" operations. Usually such extensive knowledge is not necessary to use the system, but these experts are available to assist

Table 3. Summary of networking alternatives.

Method	Cost to NLM ($ per month)	Cost to users ($ per month)	Total costs ($ per month)
Direct-distance dialing	2,100	73,000	75,000
Federal telecommunications system*	35,000		35,000
INWATS (inward wide area telephone service)	77,600		77,600
Leased multiplexor network (six cities)	13,500	42,000	55,500
Leased multiplexor (West Coast)	33,800	8,500	42,000
TYMSHARE network	13,200	38,400	51,600
Western Union Datacom	12,700	50,000	62,700

* Use of the federal telecommunications system is not permissible under regulations of the General Services Administration.

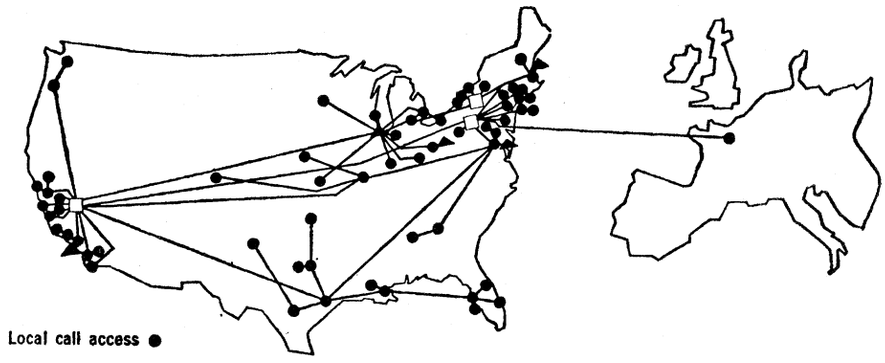

Fig. 2. National Library of Medicine–TYMSHARE's international remote-computing network (as of November 1972).

users in formulating complicated searches, should they be needed.

In February 1971, the NLM, with the assistance of the National Bureau of Standards, began an investigation of possible "backbone" communication networks that would offer the remote users of the on-line system an opportunity to lower their individual communications costs (*5*). Based on the experience with the AIM-TWX pilot project, there was concern that the use of any centralized retrieval system would be severely limited unless the communications costs of the users could be reduced.

Although the cost per search on the computer could be reduced to about $3, the cost of a long-distance, direct-dial call to perform such a search could run over $6. Thus, it appeared that communications could amount to two-thirds of the cost of using the service and that the cost per search would increase with the distance of the user from the computer. The study referred to above (*5*) investigated costs of alternative methods of communication. Table 3 summarizes the results of this study.

As a result of this investigation, the NLM decided to minimize the communication costs to the user by subsidizing a basic skeleton network that would provide local or low-toll costs to a large proportion of the user groups. Initially, the NLM negotiated contracts with the Western Union Corporation and TYMSHARE, Inc., for data communications services.

The NLM implemented a two-phase approach toward the development of this network.

Phase 1 Network

The phase 1 network, which went into operation in December 1971, provided local telephone access to the NLM computer for all the regional medical libraries and MEDLARS centers in the NLM's regional medical library network. In addition to the NLM, which acts as the library for the Middle Atlantic region, the other ten regional libraries are: Francis A. Countway Library of Medicine, Harvard Medical School, Boston; New York Academy of Medicine, New York City; Library of the College of Physicians of Philadelphia; Vera Parshall Shiffman Library, Wayne State University, Detroit; A. W. Calhoun Medical Library, Emory University, Atlanta; The John Crerar Library, Chicago; Medical Center Library, University of Nebraska, Omaha; library, University of Texas Southwestern Medical School, Dallas; Health Sciences Library, University of Washington, Seattle; library, Center for the Health Sciences, University of California, Los Angeles.

Access consisted mainly of Western Union Datacom service, supplemented by leased telephone lines. A channel was provided in each of these ten cities in order that the libraries could use 300-word-per-minute terminals. Other MEDLINE users with teletype-compatible terminals (for example, 100-word-per-minute ASCII) were able to obtain access to the NLM computer by calling any one of the following cities: Albany, Cincinnati, Atlanta, Denver, Dallas, Sacramento, or Bethesda, Maryland. In addition, TWX terminals with an alternate use arrangement, permitting the use of lower-cost telephone lines, provided access to the network through the above cities. One 300-word-per-minute channel was also available in Sacramento and Cincinnati. Those with IBM 2741-compatible terminals obtained access to the NLM computer by placing a long-distance call to Bethesda.

Phase 2 Network

The second phase of the MEDLINE network went into operation in February 1972 and largely replaced the Western Union Datacom and leased telephone lines with a commercial network operated by TYMSHARE, Inc. This network provides toll-free access to the NLM computer from over 30 different cities in the United States. A smaller number of Western Union and leased telephone lines, segments of the Phase 1 network, were retained to supplement the geographic coverage of the TYMSHARE network and to provide a backup in the event of network failure. The Western Union network has now been phased out, and the TYMSHARE network has been expanded to over 40 nodes, including one in Paris. Figure 2 identifies the network of TYMSHARE.

Usage

The MEDLINE service is now used by over 120 institutions with terminals. This group includes about 100 medical schools, independent medical libraries, and selected federal institutions. These institutions provide their own terminals, line costs (if any) to the nearest node in the network, and staff costs for the operation of the service. Most important, they agree to extend the service to health care professionals who are not among their usual clientele. This commitment is intended to improve the flow of medical information to professionals in health care delivery, medical education, and biomedical research.

The service is nearing completion of the first phase of its development, at which time there will be MEDLINE service in all medical schools. The next phase will extend the service to major health care institutions, or consortiums of such institutions, that have the library resources to deliver the documents located through MEDLINE.

The use of MEDLINE has increased rapidly. Beginning in September 1972, an average of 25 simultaneous users has been supported. The service can serve a maximum of 50 simultaneous users, a limit that is occasionally reached. Vagaries in both software and communications have made it difficult to arrive at exact measurements of usage. It has been possible, however, to develop reliable figures for the number of off-line prints. The system can

print a bibliography on the printer in the computer room rather than at the terminal. Although most users are satisfied with a printout of a small number of citations at the terminal, about one-third of the users print only a few citations at the terminal and then ask for the complete bibliography off-line. These off-line prints are mailed the next day to the address specified by the requester. Table 4 shows the number of these off-line prints produced each month since the service was begun.

Table 4. MEDLINE off-line prints.

Month	Number
November 1971	106
December	123
January 1972	158
February	284
March	1029
April	1302
May	1330
June	2286
July	2212
August	3042
September	2540
October	3531

In July, the system was modified to record the number of searches actually performed. Since the computer could not identify the completion of a search in the interactive system, users were asked to type in the @ symbol when they had completed a search. Initial statistics showed inconsistent use of this mechanism, so the "stop" message was revised to include a request for the @ symbol. The procedure is followed reasonably well now. Figures derived from user-input counts indicate that, during 4-week periods, 9800 searches were performed in September and 10,605 in October; these correspond to projected annual figures of 127,000 and 138,000 searches, respectively.

The MEDLINE service operates on an IBM 370/155 at NLM. The data base and the associated indexes are stored on IBM 3330 disk units. Telephone and network connections are handled by an IBM 2703 communication controller. This controller has over 80 data lines from the Bell Telephone Network, the Federal Telephone System, the Teletypewriter Exchange Network, and the network of TYMSHARE, Inc. The majority of MEDLINE users have portable, quiet terminals, which can be used with any telephone; the telephone fits into the terminal and connects it to the computer. The terminals have printing mechanisms that operate at 300 words per minute, three times the speed of the standard teletypewriter. Later models are sufficiently quiet to be placed in library reading rooms. All terminals provide a typewritten output which can be used to locate the desired documents. A machine-readable output such as punched-paper tape can also be generated, and it has occasionally been used to transmit output to remote users in only a few minutes.

The retrieval program for MEDLINE is ELHILL II, a derivative of the ORBIT system, and it has been performing exceptionally well. As part of the daily statistics on the system, the mean response time and the distribution of response times are summarized. (Response time is the amount of time between the input of any message, command, or search statement and the output from the computer to the terminal.) With 20 users, the average response time is 3.2 seconds; with 42 users, it is 5.23 seconds and 90 percent of the responses are dispatched in less than 10 seconds.

Expansion of On-Line Services at NLM

In September 1972, a new service was added for those who wish to search only the most recent literature. All citations from the forthcoming issue of *Index Medicus* are made available for on-line searching several weeks before that publication can be printed and distributed by the Government Printing Office. Called SDILINE (Selective Dissemination of Information On-Line), the new service allows the selective dissemination of information to researchers and practitioners, based on a profile of their interest.

Several other services will be developed in 1973. The *Current Catalog* of the NLM, containing about 130,000 monographs cataloged since 1965, will be made available for searching in a manner comparable to that provided by MEDLINE for the serial literature. In addition, this service will give medical libraries access to the NLM cataloging data, thus reducing the cost of their own cataloging. A serial locator file will be available to identify the location in over 100 major medical libraries of over 5000 substantive serials. Thus the health professional who needs a specific document will be able to determine on-line the appropriate library from which to request it. Finally, planning for a file of audiovisual materials in medical education is well advanced.

Network Services

The NLM computer is not the only information service computer on the network. Administrative information and news are provided through one of the computers of TYMSHARE, Inc. The NLM has developed a service called TOXICON for the retrieval of bibliographic information in toxicology. Its data base is available through a commercial service that is also connected to the network. In addition, a number of experiments in medical education are under way; these experiments have connected the computers of Massachusetts General Hospital, Ohio State University, and the University of Illinois to the network in order to provide a variety of clinical, self-assessment, and computer-aided instruction programs to the network. The NLM plans to connect another computer to the network in order to provide additional and backup searching capability for the MEDLINE service. Thus, the NLM communication network now supports six computers and plans to add another, all of them networked in such a way that a user calling a local phone number can switch from one to another without ever redialing.

Such developments have even broader implications for other fields. A small number of technical data bases in the field of education and in other sciences are being made available in on-line search nodes on computers connected to the TYMSHARE network. The existence of more than 100 academic medical libraries in the MEDLINE network and the establishment of a low-cost, dial-up link to Europe via the Paris TYMSHARE node have made commercial development of other on-line bases on a common network extremely attractive. Thus, there is a real potential for extending this type of application into a national (or even international) network of science information services.

There are, however, some constraints on the development of such information networks. Retrieval services are generally more expensive than timesharing computer services, which use smaller partitions of computer core and require very limited storage capacity. Thus, timesharing computer services now cost $10 to $15 per terminal connect hour. Retrieval services, on the other hand, because of very large data storage costs and program core requirements, are currently priced at $30 to $50 per connect hour.

In addition, many of the larger retrieval systems are transitional, having been designed and developed for batch search and publication systems. Some data bases are of limited quality and consistency in their indexing; exposure to more users and the ready comparisons that will result from extensive testing in the "marketplace" will inevitably result in a much needed shakedown of information systems. It is anticipated that very significant improvements in the quality of the content of such data bases, as well as major improvements in the ease and flexibility of the interactive dialogue between user and data system, will result.

Attitudes will also have a major effect on the growth of on-line services. The library community must be reoriented toward providing greater user access; libraries must be prepared for the expensive innovation (in the period of austerity) that on-line systems demand. Further, the measures of the performance of information retrieval systems—precision and recall—are largely inappropriate to on-line systems, just as they are inappropriate for printed indexes and card catalogs. New measures of effectiveness will be necessary, measures which do not assume that on-line users are seeking complete information or exhaustive bibliographies.

Future

In spite of the constraints, it now appears highly probable that major growth in on-line information services can be expected, growth comparable to that of timesharing computing services in the late 1960's. This growth, however, depends on networking. The mass user market that networking makes possible will exert pressure for quality services. It will no longer be necessary or even desirable for one computer center to process many data bases for its local users, with the attendant high storage and operating costs, as has been the pattern in some university computer centers. Even providing rapid service on one good file will strain the capabilities of some large computer centers. Networking would allow specialization in other services, such as economic modeling and linguistic processing.

It also seems clear that the competition among retrieval systems will become even greater. High usage rates and cost competition will redirect efforts from development of more elaborate systems to development of more efficient ones. Performance and the "user interface" will become matters of critical importance as the market chooses among competing services. Finally, the development of large systems will certainly have an eventual impact on the design and manufacture of computers; new pressures will develop for faster, cheaper storage, and the associative memory may become a necessity.

It is evident, therefore, that the ability to implement a major MEDLINE network of more than 120 institutional users in a period of 1 year reflects a maturation of many of the on-line and network developments of the past several years and presages a major extension to a wide variety of applications in the fields of science, technology, and education during the current decade.

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NEWS AND COMMENT

Public Relations: A Federal Focus on Health

The health of the people is really the foundation upon which all their happiness and all their powers as a state depend.—BENJAMIN DISRAELI

The week of 9 July was a big week for health in Washington. On Monday, Health, Education, and Welfare (HEW) secretary Caspar Weinberger went out to the National Institutes of Health (NIH) and told an overflow crowd of scientists that their training grants program is being partially restored to life.

On Tuesday and Wednesday, the government gave a health gala that it called a "federal focus on health." It was a 2-day public relations venture in which the government tried to get its point of view across, on its own terms, to some 130 science reporters. As Charles C. Edwards, assistant secretary for health, put it: ". . . In calling this conference today, we wanted to better describe what we are trying to do, what our philosophy [is], what some of our goals are. We feel quite strongly that we have been at times misrepresented. I think part of the reason we have been misrepresented is because we haven't done a good job of presenting our own case. . . . We wanted you to know what the real story was."

Everyone who is anyone in the federal health establishment was there to tell the story. Weinberger and Edwards were there. So was Edwards's deputy, Henry Simmons, who used to work with him at the Food and Drug Administration when Edwards was commissioner. Presidential counselor Melvin Laird, who dealt with HEW appropriations when he was in Congress and who had a hand in the early prosperity of NIH, put in an appearance. James Cavanaugh, associate director of the Domestic Council and a man who likes to keep a low profile, was there, although, unlike the others, he made no formal remarks. There was speculation that the President himself might drop in, but he never did.

The first day, the health gala took place in the old Executive Office Building next to the White House. The