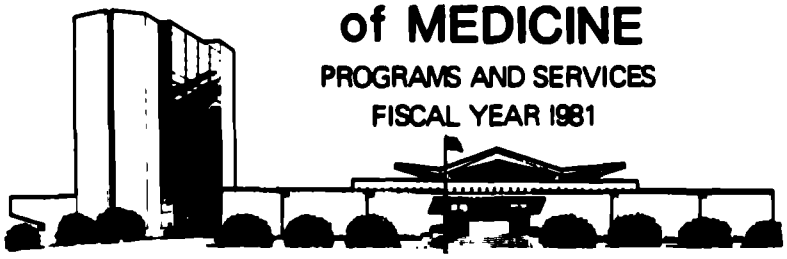
# NATIONAL LIBRARY of MEDICINE



PROGRAMS AND SERVICES
FISCAL YEAR 1981

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTES OF HEALTH

National Library of Medicine
Bethesda, Maryland
September 1982

# PREFACE

The year 1981 marked the 25th anniversary of the legislation that established the National Library of Medicine (NLM). The National Library of Medicine Act (P.L. 84-941) transferred to the U.S. Public Health Service the collections and staff of the Armed Forces Medical Library, which was founded in 1836.

The act requires NLM to acquire and preserve the literature of biomedicine, to organize the materials and publish catalogs and indexes, to make this literature available by loan and other methods, and to provide reference services and research assistance. NLM has had remarkable success over the past 25 years in fulfilling these obligations. NLM has been a pioneer in introducing computers and other new technologies to help improve biomedical communications. Many useful new bibliographic tools have been published, audiovisual programs have been augmented, and specialized services in such fields as toxicology have been instituted. Grant programs have assisted in developing new information services throughout the Nation, and a vigorous program of research and development has resulted in new applications of modern technology to the biomedical communications process.

Americans have always believed that literature and information have a public value, and thus they have supported schools and libraries as principal means to inform and educate the citizenry. This long-held belief now is being challenged by some commercial sector interests who view medical information as a commodity that should be sold for profit. These private sector interests argue that profit-making organizations can offer better service to those who are able to pay for it, a stand that ignores society's wish to provide equitable access to information. The development of successful computer-based online services by NLM, for example, is an apparent threat to at least one large foreign publisher.

Related to this conflict was the renewal of NLM's grant authorities under the Medical Library Assistant Act. At one time or another over the past year, almost every NLM grant program has been threatened with extinction. One witness, representing the commercial private information sector, testified against the renewal of all grant authorities except for resource grants. However, the testimony, letters, and other expressions of support from the health science and library communities were unprecedented. Finally, at the end of the fiscal year, Congress passed legislation renewing all of NLM's grant authorities, although only for 1 year and at sharply reduced funding levels.

We are gratified by the confidence in our programs expressed by a wide spectrum of the biomedical community--practitioners, health science librarians, professional associations, and former regents of the Library. To the extent that reduced budget and staff levels can be compensated for by ingenuity, cooperation, technology, and old-fashioned hard work, we hope to merit their continued confidence. However, the attack on NLM by profit-making members of the information industry presages a period of difficulty that will require a considerable investment of our time and energies in the future. The public will have to decide whether medical information is a commodity to be bought and sold for profit, or whether it serves the public good and thus should be freely available for easy and equal access to all eligible members of society.

The simple format of this year's annual report represents our response to the austerity imposed on many Government publications.

Martin M. Cummings, M.D.
Director
National Library of Medicine

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POLICY AND DIRECTION

Kenneth G. Carney
Executive Officer

## Board of Regents

At its three meetings in FY 1981, the NLM Board of Regents dealt with a number of important issues facing the Library. The renewal of the Medical Library Assistance Act was one such issue, on which the Regents took action by sending a unanimous resolution to the Secretary of Health and Human Services, Richard Schweiker, urging him to seek the introduction of legislation that would extend the act. Other topics addressed by the board were online user charges, the functions of the National Medical Audiovisual Center (NMAC), the development of MEDLARS III, guidelines for union lists, and a study of NLM being conducted by the Congressional Office of Technology Assessment.

The terms of two regents expired in FY 1981: Nicholas E. Davies, M.D., who also served as chairman for 1980-81; and Mr. James F. Williams, III. By the end of the year, one replacement had been named, Shirley Echelman, director of the Association of Research Libraries. Professor Martha Williams was elected chairman of the board for 1981-82.

## Financial Resources

The Department of Health and Human Services (DHHS) will begin FY 1982 operations under a continuing resolution based on the current (FY 1981) operating level plus mandatory increases. Figures for FY 1981 appear in table 1. The resolution provides DHHS with funds until November 20 and thus will allow time for Congress to complete action on appropriations for FY 1982. The proposed continuing resolution level for NLM on an annual basis is $45,902,000.

## Personnel

The first half of FY 1981 was devoted primarily to stabilizing the Library's personnel strength, which had been severely reduced because of the earlier transfer of NMAC from Atlanta. This task was complicated by the two hiring "freezes" imposed governmentwide, first by President Carter and then by President Reagan. The NLM staff reached a high of 483 at the end of February 1981; however, the number of employees tapered off to 472 by the end of FY 1981. Table 2 shows budgeted personnel ceilings for the past 4 years. A new ceiling control system based on Full-Time Equivalents (FTE's) was put into effect by DHHS in FY 1981.

In FY 1981, NLM initiated a new training program, the Librarian Career Development Program. This program was designed to select high-quality candidates who were in nonprofessional positions but held bachelor's degrees. The program gives these persons an opportunity to obtain an education leading to a master's degree in library science while providing on-the-job training within the Division of Library Operations. Two individuals were selected to begin the program in 1981.

Table 1
Financial Resources and Allocations
FY 1981
(in thousands of dollars)

| | | |
|---|---|---|
| Amounts available for obligation | | |
| Appropriation, NLM | | $44,666 |
| Plus: Reimbursements | | 2,140 |
| Total | | 46,806 |
| Amounts obligated for Extramural Programs | | 9,849 |
| Amounts obligated for Direct Operations | | |
| Lister Hill National Center for Biomedical Communications | 5,050 | |
| National Medical Audiovisual Center | 3,771 | |
| Office of Computer and Communications Systems | 5,839 | |
| Library Operations | 14,152 | |
| Toxicology Information Program | 3,147 | |
| Review and Approval of Grants | 1,804 | |
| Program Direction | 3,194 | |
| Subtotal, Direct Operations | | 36,957 |
| Total | | $46,806 |

Table 2
Budgeted Personnel Ceilings

| Program | FY 1978 | FY 1979 | FY 1980 | FY 1981 | FY 1981* |
|---|---|---|---|---|---|
| Office of the Director | 14 | 12 | 15 | 15 | 16 |
| Office of Inquiries and Publications Management | 5 | 5 | 5 | 4 | 4 |
| Office of Administration | 38 | 38 | 40 | 39 | 39 |
| Office of Computer and Communications Systems | 51 | 51 | 52 | 52 | 54 |
| Extramural Programs | 25 | 25 | 24 | 24 | 22 |
| Lister Hill National Center for Biomedical Communications | 35 | 30 | 46 | 47 | 40 |
| Specialized Information Services | 18 | 19 | 22 | 22 | 26 |
| National Medical Audiovisual Center | 88 | 76 | 74 | 74 | 54 |
| Library Operations | 221 | 212 | 217 | 218 | 217 |
| Total | 495 | 468 | 495 | 495 | 472 |

*Actual onboard strength.

The NLM Personnel Office has developed a recruitment manual for supervisors to provide supervisors with information on the regulatory aspects of Federal recruitment as well as information on interviewing, reference checking, and so on. The draft manual has been circulated for comments, and the final document should be issued in early FY 1982.

Staffing Activities. Duane Arenales was selected as Deputy Chief, Technical Services Division, Library Operations. Ms. Arenales was formerly Head of the Circulation and Control Section, Reference Services Division. She succeeded Betsy Humphreys.

Kenneth Carney was appointed NLM Executive Officer. Mr. Carney has been with NLM since 1968 and previously served as Deputy Executive Officer. Mr. Carney succeeded Philip Amoruso, who left NLM to be Executive Officer for the National Cancer Institute.

Lois Ann Colaianni was named Deputy Associate Director for Library Operations. Prior to coming to NLM, Ms. Colaianni was Director of Libraries at the Cedar-Sinai Medical Center in Los Angeles. Ms. Colaianni succeeded James Barry, who retired in November.

Kenneth Cooke was selected as Deputy Executive Officer, NLM. Mr. Cooke was formerly the Deputy Executive Officer, National Institute of Allergy and Infectious Diseases. Mr. Cooke succeeded Kenneth Carney.

Tamas Doszkocs, Ph.D., was named Chief, Biomedical Files Implementation Branch, Division of Specialized Information Services. Dr. Doszkocs was formerly Chief, Technical Services Division. Dr. Doszkocs succeeded Donald Hummel.

Christa Hoffman was appointed Head, Cataloging Section, Technical Services Division, Library Operations. Ms. Hoffman was formerly Associate Professor of Library Science at the University of Nebraska-Lincoln Libraries. Ms. Hoffman succeeded Lillian Kozuma.

Betsy Humphreys was selected as Chief, Technical Services Division, Library Operations. Ms. Humphreys was previously the Deputy Chief, Technical Services Division. Ms. Humprheys succeeded Dr. Doszkocs.

Sheldon Kotzin has been appointed as Chief, Bibliographic Services Division, Library Operations. Mr. Kotzin was formerly the Regional Medical Library Coordinator. He succeeds Grace McCarn, who left NLM in July 1981.

Henry Riecken, Ph.D., was appointed as Senior Program Advisor in the Office of the Director. Dr. Riecken is involved in the development and utilization of social science research and special analysis of selected areas in behavioral science. Dr. Riecken is on leave from his position as Professor of Behavioral Science, University of Pennsylvania School of Medicine.

Carolyn Tilley was named Head, MEDLARS Management Section, Bibliographic Services Division. Ms. Tilley had been a Technical Information Specialist in that section since 1972. She succeeds Yvonne Scott.

William Willmering was appointed Head, Serial Records Section, Technical Services Division, Library Operations. Mr. Willmering was formerly head of the Serials Department, Northwestern University Library.

James Woods, Ph.D., was appointed as an Expert in the National Medical Audiovisual Center. Dr. Woods is involved with the redevelopment of the NMAC audiovisual materials development program. Dr. Woods was formerly Director of Universal Laboratories and Educational Resources, University of Arkansas for Medical Sciences.

Awards. NIH Merit Awards for 1981 were presented to Melvin Beckelhimer, Office of Computer and Communications Systems; Jeanne Brand, Ph.D., Extramural Programs; Sheldon Kotzin, Regional Medical Library program; and Carol Spencer, Reference Services Division.

William Cooper, Ph.D., received the NLM Director's Award for his outstanding service to the Library as Associate Director for Planning and Acting Director, National Medical Audiovisual Center.

Joseph Leiter, Ph.D., received the NLM Director's Award for his leadership and accomplishments in the developmental stages of the MEDLARS III project.

Mary Corning received the Regents' Award for Scholarly or Technical Achievement for her book entitled A Review of the U.S. Role in International Biomedical Research and Communications.

## Equal Employment Opportunity

The theme of the NLM Equal Employment Opportunity (EEO) program for FY 1981 was training. Two 2-day training courses were held in December 1980 for approximately 90 supervisors, managers, potential supervisors, and members of the NLM EEO Advisory Committee. The training emphasized EEO responsibilities of supervisors and managers regarding personnel policy and practices in the employment, development, advancement, and treatment of employees. The main topics covered were affirmative action, legal mandates, EEO complaints, and personnel issues.

In March 1981, a 2-day training course was conducted for members of the NLM EEO Advisory Committee to help increase the effectiveness of this important body. Also, the committee members developed the FY 1981 NLM Affirmative Action Plan. The committee carefully reviewed the 1976 Affirmative Action Plan, incorporated the concepts learned in the various training sessions, and successfully revised and updated the plan. The FY 1981 NLM Affirmative Action Plan includes new policies for recruitment, education, training and development, promotions, communication and employee relations, and EEO program management.

Several significant changes were made in the committee's charter this year, in election procedures, eligibility of candidates, and eligibility of employees to vote. The committee also added a provision restricting voting on committee business to elected representatives.

## Modernization of the Building

The National Library of Medicine building was completed in 1962. Although the facility is still relatively young, the past 19 years have brought so many rapid changes in Library activities that the present building is inadequate. At one time, the Library building, which was designed for a maximum of 250 employees, housed a staff of 450.

The problem of space has been relieved by the recent construction and occupancy of the Lister Hill Center, which now houses most of the technical activities that have become an integral part of NLM over the past two decades. With this addition, the NLM building can once again serve as a library facility.

Congress recognized the serious problem of overcrowding of the Library facilities. When it appropriated funds for the Lister Hill Center building in 1976, Congress also included funds "to restore space in the NLM to its intended use." Although these funds will be used to restore some of the building's original facilities (for example, a recovery of much of the stack space that had been used for offices), the changes in staff and operations have made it impossible to simply revert the building to its original design plan. The facility requires, instead, a thoughtful redesign to accommodate more efficient levels of operation while creating pleasant and effective work settings.

From the outset of this project, it was apparent that the modifications would involve some major redistributions of and improvements to both the facilities and spaces assigned to each Library division. Therefore, the initial phase of the renovation program was a comprehensive study to identify these needs. The resultant report served as the basis for a contract that was awarded in the spring, and alterations and modifications to the Library building began in June 1981.

The renovation project is divided into four phases. Each phase will be followed by a moving period to allow personnel to be relocated so that the next phase can begin. Some of the Library's programs will be temporarily located in the Lister Hill Center building, including the indexing function and the Director's staff. The project is on schedule, and completion is anticipated by spring 1983.

Also included in the renovation project is the installation of a new and more efficient fire protection system to provide security for the NLM's priceless collection.

## Lobby Exhibits

Pre-Columbian medicine, with its rich associations in art and religion, was the subject of an NLM lobby exhibit shown from February through August 1981. Featured were 40 ceramic figures from NLM's own collection of pre-Columbian sculpture. Other materials on display included selections from the Library's book collections, paleopathological specimens borrowed from the Smithsonian Institution, reproductions from 16th century codices, and a facsimile of the Codex Badianus (1552), the first American herbal.

A display of some of the magnificent anatomical drawings of Leonardo da Vinci and the monumental De humani corporis fabrica of Andreas Vesalius

highlighted another exhibit, "The Evolution of Anatomic Illustration," which began in September 1981.

Prepared primarily from the collection of the History of Medicine Division, the exhibit presented samples from the early schematic and traditional forms of anatomic illustration to the scanning electron micrography and computerized tomography of the modern era. The earliest illustration on display was from a 15th century Persian manuscript that featured a schematic figure of the arterial system.

The exhibit also contained examples of the great 17th- and 18th-century anatomical atlases, with their impressive copperplate engravings; samples of pre-Vesalian anatomists Johannes Peyligk and Magnus Hundt; and the more refined drawings found in the publications by Jacopo Berengario and Johannes Dryander. More recent texts included the first English edition of Gray's Anatomy, Descriptive and Surgical (1858) and the classic texts by Spalteholz and Sobbota, which were popular in the early 20th century. Samples from the works of Max Brödel, Tom Jones, and Frank Netter were also included. This exhibit continued through January 1982.

LIBRARY SERVICES AND OPERATIONS

Joseph Leiter, Ph.D.
Associate Director, Library Operations

Library Operations, the largest NLM component, selects, acquires, catalogs, indexes, provides access to, and disseminates the material in NLM's collections. Library Operations has four operating divisions--Bibliographic Services, History of Medicine, Reference Services, and Technical Services; Medical Subject Headings (MeSH) Section; MEDLARS III; and the Regional Medical Library program. Each is discussed in this part of the report.

Several key indicators of the quality and level of service were maintained or improved in FY 1981. The fulfillment rate for lending original materials or photocopies was 87 percent. Turnaround time improved: 89 percent of photocopied loans were sent out within 4 days (compared with 86 percent in FY 1980); 37 percent of these loans were sent out within 1 day. The percentage of original loans supplied within 4 days improved from 68 percent in FY 1980 to 88 percent in FY 1981. See table 3 for circulation figures.

Table 3
Circulation Statistics

| Activity | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| Requests received | 417,613 | 434,533 | 415,315 |
| For interlibrary loan | 249,820 | 242,077 | 236,837 |
| For readers | 167,793 | 192,456 | 178,478 |
| Requests filled | 327,118 | 341,433 | 327,160 |
| For interlibrary loan | 186,172 | 179,770 | 175,454 |
| Photocopy | 168,787 | 163,830 | 161,017 |
| Original | 17,385 | 15,940 | 14,437 |
| For readers | 140,946 | 161,663 | 151,706 |
| Requests unfilled | 90,495 | 93,100 | 88,155 |
| For interlibrary loan | 63,648 | 62,307 | 61,383 |
| Rejected | 21,072 | 22,000 | 24,399 |
| Referred | 7,616 | 8,217 | 4,413 |
| Returned as unavailable | 34,960 | 32,090 | 32,571 |
| For reader service | | | |
| Returned as unavailable | 26,847 | 30,793 | 26,772 |

The Library officially closed its card catalog in January 1981. Until a user-cordial online catalog is available, assistance in searching CATLINE is provided by the reference staff. Patrons may also use the COM catalog (a dictionary catalog on Computer-Output-Microform) to locate monographs or audiovisual materials published after 1965. Cataloging statistics are shown in table 4.

Table 4
Cataloging Statistics

| Item | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| Completed cataloging | | | |
| Full | 13,530 | 14,352 | 11,203 |
| Limited | -- | 2,286 | 2,468 |
| Total | 13,530 | 16,638 | 13,671 |
| Volumes shelf-listed | 19,641 | 14,161 | 12,292 |

Table 5
Acquisitions Statistics

| Acquisitions | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| Current serial titles received | 22,172 | 22,753 | 23,364 |
| Publications processed | | | |
| Serial pieces | 174,318 | 179,089* | 174,585 |
| Other | 26,503 | 22,299* | 20,267 |
| Total | 200,821 | 201,388* | 194,852 |
| Obligations($) for | | | |
| Publications | 1,655,000 | 1,650,000 | 1,809,993 |
| Included for rare books | 80,000 | 51,000 | 70,408 |

*Adjusted figure.

The use of the online system has continued to increase. The number of online and offline searches rose from 1,812,000 in FY 1980 to 2,022,000 in FY 1981. More than 300 U.S. centers were added to the NLM Online User Network, bringing the total to 1,550. NLM extended the availability of its online databases to one new commercial database vendor (Dialog Information Systems) and to new foreign centers in Colombia and Kuwait. In January 1981, the Library provided online access to the MED77 file, which contains citations from 1977 and 1978. Together, MEDLINE and MED77 provide approximately 5 years of citations for online searching. MED77 has become the second most heavily used file and has been made available at both NLM and the Library's backup computer facility at the State University of New York at Albany.

Excellent progress has been made on building the National Biomedical Serials Holdings Database. Through a contract awarded in 1980, holdings statements for biomedical serials in more than 1,300 health sciences libraries throughout the Nation are being merged into one database. This database will be used to

produce regional and local union lists and to support an automated document delivery system.

Much staff time was spent in FY 1981 on two programs--MEDLARS III and the Regional Medical Library (RML) network. MEDLARS III focuses on the Library's internal operations and services, and the RML focuses on external services, although the programs are mutually beneficial. During FY 1981, MEDLARS III staff completed a schedule for implementing MEDLARS III and a detailed system development plan. The Regional Medical Library network staff completed the second round of competitive contracts to select libraries to serve as Regional Medical Libraries. The new contracts emphasize improving the provision of information to health professionals, network performance, resource sharing, and local self-sufficiency. These two programs represent major efforts that help NLM provide the highest level of information services to health professionals nationwide.

## Library Associates

The NLM Associate Program is an intensive postgraduate training experience that offers unique opportunities for recent library school graduates. It includes 1 year of various work assignments and classroom instruction in modern medical librarianship, automated handling of information, and advanced large-scale information storage and retrieval techniques.

Six associates were selected for the 1980-81 program: Peggy Beavers (University of Michigan), Ted Burch, Ph.D. (Florida State University), June Slach (University of Iowa), Sarah Anne Goodman, Ph.D. (Emory University), Karen Duerringer (University of Illinois), and James Kopp (Catholic University of America).

## Regional Medical Libraries

The RML program is a national network of 11 regional libraries, more than 100 resource libraries, and approximately 3,000 hospital libraries coordinated by the National Library of Medicine. The network provides access to information in support of health-care delivery, education, and research. Each RML coordinates the expeditious delivery of information to health professionals in its own region and cooperates with libraries throughout the network to provide nearly 2 million interlibrary loans and 2 million computer searches of the NLM online systems. Regional libraries also coordinate network library participation through consultations, training, workshops, and continuing education programs. In FY 1981, the coordination of the RML network was transferred to the Office of the Associate Director for Library Operations.

Network Activities. During FY 1981, NLM issued a competitive contract for RML service in Region V (Kentucky, Ohio, and Michigan) to Wayne State University and extended for one year the present contract with Emory University in Region VI (Southeastern States). Nearly $3 million was awarded to regional libraries to assist in the operation of their programs.

All regions strengthened their ability to locate sources for information desired by health professionals by improving regional locator tools. RML's coordinated the collection of journal holdings from major academic and hospital libraries for input to NLM's National Biomedical Serials Holdings Database.

Three regions--II, VII, and VIII--began developing online location systems. When fully implemented, all three regions expect to have an automatic routing capability.

The University of Nebraska became the second RML designated to assist NLM in training online search analysts. Regional staff held three classes in Omaha open to individuals from all regions. UCLA also offered classes, primarily to west coast users. Abbreviated 3-day classes were offered by NLM staff in all regions except the Pacific Northwest. These classes accommodate librarians who cannot travel to NLM for training.

Catalogers trained last year by NLM updated the Anglo-American Cataloging Rules (AACR2) for individuals in each region.

In cooperation with NLM's National Medical Audiovisual Center (NMAC), depository copies of NMAC-produced videocassettes were sent to one library in each region that agreed to provide these materials on interlibrary loan. Participating libraries also agreed to forward unfilled requests for videocassettes to NMAC for processing.

Several regional advisory committees were reconstituted to include a better balance of hospital librarians and medical school representatives. Communication between NLM and all RML's was improved with the use of electronic mail for prompt message transfer on topics ranging from contract negotiations to urgently needed answers to reference questions. Expansion of electronic mail is a promising alternative to travel in some RML-related activities.

RML Directors met twice in FY 1981, at NLM and at the annual meeting of the Medical Library Association in Montreal. Discussions focused on issues relating to document delivery, consistency in data collection, the impact of MEDLARS III, and national network program priorities.

As a result of anticipated reductions in Medical Library Assistance Act funding, the Library was compelled to accelerate its evaluation of the RML's. A new mission and programs statement as well as recommendations on configuration alternatives were prepared by NLM staff. These proposed changes were presented to a panel of consultants, and review by the NLM Board of Regents is expected in early FY 1982.

Region IV. The Mid-Atlantic Regional Medical Library, headquartered at NLM, provides biomedical information to health professionals in the District of Columbia, Maryland, North Carolina, Virginia, and West Virginia. In 1980, a regional plan was adopted as a guide for achieving the following objectives: greater resource sharing; improved bibliographic access; efficient, cost-effective document delivery; timely training and continuing education programs; and consultation and other services to small hospital libraries.

The RML IV document delivery policy, established in January 1980, placed more responsibility on the resource libraries and community-level institutions in the region to provide interlibrary loans. All requests to NLM now are made through a local resource library. With the recent addition of an Eastern Virginia Medical Library and the renewed participation of the 3 District of Columbia academic medical school libraries, the region has 15 resource libraries providing backup document delivery service to health professionals.

In FY 1981, the number of online centers increased from 231 to 290. Publications prepared this year include the Interlibrary Loan Policy Manual, the Online Center Directory, and manuals for three workshops.

MEDLARS III

The basic purpose of the MEDLARS III project is to introduce a much higher degree of automation into NLM's internal processing and external services and to make these benefits available to the health sciences library community at large. The system will be "open-ended," that is, in a state of continuous evolution. This approach will allow the incremental implementation of services as they are developed and also permit NLM to incorporate new technology without the need for a major systems redesign.

In general terms, MEDLARS III will improve the processes for acquiring literature; for creating, maintaining, and distributing bibliographic records; for retrieving bibliographic information; and for providing document delivery services. Several of these areas already take advantage of some degree of computerization, ranging from the highly automated bibliographic retrieval (MEDLINE) to the partially automated acquisitions and cataloging processes.

MEDLARS III has moved beyond the planning stage and into the implementation stage. Analysis of the functional requirements statement, which was completed at the end of FY 1980, shows six major integrated library functions and an integrated database with the option for distributed processing. The implementation of a system to meet the specifications highlighted by this analysis will meet the Library's operational requirements for the 1980's.

For the short term (FY 1982), minicomputer hardware and terminals have been purchased and are being installed for an early implementation in the indexing and the cataloging data entry functions.

In addition, a cathode ray tube (CRT) terminal forms capability is nearing completion in support of the Regional Medical Library interlibrary loan function at NLM and will be available in early FY 1982. For the midterm (FY 1982 and 1983), transition capabilities to bridge the gap to the ultimate MEDLARS III system have been identified and are being implemented. In particular, a subproject to convert software and to convert and store data from MEDLARS II to the national standard MARC format is underway. For the long-term MEDLARS III project, existing software available has been evaluated and narrowed to a select few. During FY 1982, a final selection will be made and a private-sector contractor engaged to complete MEDLARS III.

Subsequent to the completion of the library functional requirements statement by the task force at the end of FY 1980, a systems development team was formed at NLM. The director of the team and its members bring extensive experience in the creation of large data processing systems. The combination of experience and talent from both the data processing and library disciplines greatly enhances the prospect of success for this project.

The team has selected the best features from several modern methodologies for the disciplined analysis, design, and implementation of a structured MEDLARS III. These features have been codified in a project standard and are part of

the evolving project documentation and standards library. A newly installed automated project management system provides additional logistic support to the team.

The endeavors for the near term depend on both computer hardware and software. An existing Data General minicomputer has been enhanced with peripheral equipment to support the development effort and ultimately function as a production-distributed processing machine. An early implementation on this minicomputer will be a modified version of the Retrospective Data Entry System (RDES) to automate the manual labor involved in the cataloging operation. A hardware-compatible version of the Integrated Library System (ILS) developed by the Lister Hill Center is being considered for further automation of this specialized cataloging function because of its MARC record format. In addition, the MEDLARS III project documentation library is being assembled and managed on the same minicomputer.

As part of the effort to smooth the transition from MEDLARS II to MEDLARS III, a subproject is underway to modify an existing NLM data base management system (DBMS) to include the capability to treat the MARC record format. Upon completion of the software modification, data will be converted in a phased manner from the current MEDLARS II format to the standard MARC format. Also, in anticipation of improved library automation under MEDLARS III, the task of applying machine-readable indicators (MRI) to the NLM holdings has been initiated in conjunction with the appropriate software enhancements. The manual labor involved in placing the labels on holdings far outweighs the effort to create software to process the MRI data.

In an effort to capitalize on progress in the data processing field, the MEDLARS III team has evaluated 57 database management systems and 14 library management and/or text retrieval systems. During FY 1981, team members visited several sites with DBMS or library management systems with potential applicability to MEDLARS III. The capabilities of the best of these systems will be included as a baseline in the specifications to which the contract respondents will reply.

## Bibliographic Services Division

The Bibliographic Services Division (BSD) is responsible for indexing the literature for Index Medicus, entering the citations into the databases, and coordinating the training and utilization of NLM's online network.

High standards for indexing were maintained as the size of the online databases continued to grow. Concurrently, BSD staff began to design and test procedures through which the indexing of journal articles will be accomplished online to improve the timeliness of the Library's products.

Indexing. A total of 279,000 citations were added to the various NLM databases in FY 1981 (table 6). An analysis of this figure showed that 256,000 citations appeared in Index Medicus, 15,000 entries were placed in the MEDLARS database for special recurring bibliographies, 6,000 entries were for Hospital Literature Index, and 2,000 citations were for the Index to Audiovisual Serials in the Health Sciences.

Table 6
Bibliographic Services

| Services | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| Total items indexed* | 254,210 | 266,730 | 279,105 |
| For Index Medicus | 230,427 | 243,873 | 256,112 |
| Recurring bibliographies | 28 | 27 | 24 |
| Journals indexed for Index Medicus | 2,595 | 2,661 | 2,664 |
| Abstracts entered | 98,501 | 111,629 | 126,742 |

*Includes special list articles, audiotapes, and Health Administration citations.

New contract awards were made to firms to index the journal literature for Index Medicus. The contracts included a provision for some online indexing from remote locations. This follows the successful online indexing and revision of 500 citations by Index Section staff for inclusion in the MEDLARS database. Further development of an in-house online indexing capability is underway as part of the MEDLARS III activities. Functional requirements have been completed, terminals have been purchased, and contractual support for documentation and design should be completed in early FY 1982.

During FY 1981, Index Section staff, in cooperation with staff of the Office of Computer and Communications Systems, developed a computerized text dictionary designed to reduce typographical errors in the titles and abstracts of MEDLINE citations. As incoming citations are keyboarded, text words appearing in titles and abstracts are matched against the dictionary file. Nonmatches are automatically rejected and displayed for review. Misspellings are corrected and valid new words are examined for potential inclusion in the dictionary, which is updated monthly and regenerated annually. Establishment of this file has improved the quality of the database and provides greater effectiveness in free-text searching of MEDLINE.

Modifications to the input-edit programs included additional checks for the correctness of data entered into citations. These enhancements permit automatic insertion of Medical Subject Headings (MeSH) omitted from required combinations, provide additional messages warning of potential errors, and improve the quality of indexed citations.

A printed tool, Medical Subject Headings: Supplementary Chemical Records, was made available for internal distribution in February 1981. This MeSH supplement was generated from the online file developed during FY 1980. It complements the search capability provided in the online file by permitting direct indexer input of chemical terms that are not part of the controlled MeSH vocabulary.

MEDLARS Management Section. The MEDLARS Management Section is the public's contact point in the daily operation of the NLM Online User Network. The staff answers telephone and written inquiries about the various databases, maintains billing records, processes applications for access to the network, mails offline prints and offsearches, produces manuals and other descriptive materials, and coordinates training in the use of the online system. (Tables 7 and 8 show the increased numbers of online and offline searches, respectively, from FY 1979 to FY 1981.)

Table 7
Online Searches

| Online Database | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| AVLINE | 14,387 | 17,656 | 20,397 |
| BIOETHICS | 2,403 | 3,426 | 3,762 |
| CANCERLIT | 36,706 | 41,795 | 41,457 |
| CANCERPROJ | 5,713 | 5,002 | 3,700 |
| CATLINE | 184,667 | 208,639 | 191,314 |
| CHEMLINE | 46,149 | 59,767 | 55,039 |
| CLINPROT | 1,571 | 1,558 | 1,825 |
| EPILEPSYLINE | 2,028 | 2,511 | 2,448 |
| HEALTH | 23,387 | 46,971 | 61,564 |
| HISTLINE | 3,263 | 3,291 | 3,652 |
| MEDLINE | 548,469 | 682,802 | 741,632 |
| MED77 | -- | -- | 105,822 |
| MESH VOCABULARY | 2,870 | 6,582 | 19,044 |
| NAME AUTHORITY | 5,327 | 5,406 | 7,219 |
| POPLINE | -- | -- | 11,616 |
| RTECS | 9,788 | 12,537 | 14,747 |
| SDILINE | 19,394 | 18,978 | 17,551 |
| SERLINE | 23,577 | 37,197 | 37,645 |
| STORED SEARCH | 60 | 101 | 115 |
| TDB (TOXICOLOGY DATA BANK) | 10,953 | 9,820 | 14,243 |
| TOXLINE | 64,667 | 86,333 | 77,135 |
| TOXBACK74 | -- | -- | 2,612 |
| TOTAL | 1,005,379 | 1,250,372 | 1,434,539 |

Table 8
Offline Searches

| Databases | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| AVLINE | 17 | 29 | 21 |
| BIOETHICS | 6 | 13 | 35 |
| CANCERLIT | 1,394 | 3,778 | 6,026 |
| CANCERPROJ | 271 | 276 | 173 |
| CATLINE | 177 | 247 | 141 |
| CHEMLINE | 54 | 43 | 84 |
| CLINPROT | 23 | 11 | 6 |
| EPILEPSYLINE | 20 | 28 | 7 |
| HEALTH | 325 | 547 | 902 |
| HISTLINE | 8 | 5 | 7 |
| MEDLINE | 36,997 | 45,828 | 45,779 |
| MED77 | -- | 83,202 | 83,864 |
| MED75 | 91,956 | 106,358 | 94,975 |
| MED72 | 76,818 | 78,593 | 70,523 |
| MED69 | 56,867 | 62,269 | 56,409 |
| MED66 | 42,337 | 44,187 | 40,346 |
| MeSH VOCABULARY | 0 | 0 | 7 |
| Name Authority | 0 | 44 | 0 |
| POPLINE | -- | -- | 765 |
| RTECS | 82 | 134 | 257 |
| SDILINE | 71,173 | 108,978 | 147,109 |
| SERLINE | 8 | 17 | 15 |
| TDB (Toxicology Data Bank) | 74 | 99 | 185 |
| TOXLINE | 11,976 | 17,208 | 22,409 |
| TOXBACK* | 7,693 | 8,424 | -- |
| TOXBACK74 | -- | 578 | 8,919 |
| TOXBACK65 | -- | 545 | 8,578 |
| TOTAL | 398,276 | 561,441 | 587,542 |

*TOXBACK was divided into two new TOXLINE backfiles (TOXBACK74 and TOXBACK65) in September 1980.

Use of the online system reached a record monthly high in March 1981, with more than 16,000 connect hours logged at NLM and the State University of New York (SUNY) at Albany. All new users to the network access the SUNY computer for certain databases and are provided access to the NLM computer for databases not available at SUNY. Changes were made in the summer of 1981 with regard to the availability of databases at NLM and SUNY. The most important modification was that searchers with SUNY designated as their primary access point now have the most frequently used files--MEDLINE, MED77, and HEALTH PLANNING--available to them for online searching at SUNY. The toxicology files and CATLINE were removed from SUNY and made available to all users on the NLM computer, and one of TOXLINE's backfiles, TOXBACK74, was made available online at NLM to all users.

The number of domestic and foreign users increased to 1,892 in FY 1981. NLM and staff at Regional Medical Libraries held 44 training classes, with 956 individuals receiving initial or advanced training. Field classes were held in Los Angeles, Omaha, Milwaukee, Montreal (in conjunction with the annual meeting of the Medical Library Association), Detroit, Boston, Chicago, Philadelphia, Dallas, and New York.

In December 1980, the POPLINE database became available to all network users on the NLM computer after being searchable as a test file for 6 months. This file contains citations to population and family planning literature and was developed as a collaborative effort between NLM, the Population Information Program at Johns Hopkins University, and the Center for Population and Family Health at Columbia University. By October 1981, the file had grown by some 20,000 records, representing the Population Index materials from Princeton University for the publication years 1978 through 1981.

There are 24 recurring bibliographies currently in production; bibliographies on interferon, parkinsonism, and hepatitis were cancelled at the end of 1980 because of lack of funding. Work is in progress to develop a recurring bibliography for diarrheal diseases.

A SORT capability for offline prints and offsearches became available on the NLM and SUNY computers during the summer of 1981. This new feature arranges database retrieval in alphabetical or numerical order by data elements such as author, journal title, or call number.

Several of NLM's online databases continue to be available through agreements with two commercial database vendors. Bibliographic Retrieval Services (BRS) offers MEDLINE and its backfiles and the Health Planning and Administration database. Dialog Information Services provides access to MEDLINE and its backfiles.

History of Medicine Division

The History of Medicine Division continues to support research in this field by making available the resources of its varied collections and through its bibliographic publications and related activities. As always, public service comes first and continues to demand much staff time.

During the year, the Library added 290 books, some 133,000 manuscript items, and 570 prints and photographs to its historical collections (see table 9). Two incunabula were added: Aristotle's De generatione et corruptione, with the commentaries of Egidio Colonna and Marsilius van Inghen (Venice, 1500; Goff A-74); and Joannes Jacobus de Manliis, Luminare maius (Venice, 1499; Goff M-209). Other acquisitions included the second edition of Thomas Linacre's translation of Galen's Methodus medendi (Paris, 1526), Robert Remak's Observationes anatomicae et microscopicae de systematis nervosi structura (Berlin, 1838), and such rarities as an item printed by Benjamin Franklin, Every Man His Own Doctor (Philadelphia, 1736). Another long-desired addition to the Library's collection of the scientific works of Thomas Bartholin, a leading medical figure of the 17th century, was his De bibliothecae incendio dissertatio ad filios (Copenhagen, 1670), which describes the tragic loss of his private library.

Table 9
History of Medicine Activities

| Activity | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| Acquisitions | | | |
| Books | 417 | 329 | 290 |
| Modern manuscripts | 46,006 | 51,651 | 133,423 |
| Prints and photographs | 297 | 479 | 570 |
| Processing | | | |
| Titles cataloged | 2,789 | 2,709 | 2,870 |
| Modern manuscripts cataloged | 61,666 | 46,603 | 47,750 |
| Pictures indexed | 320 | 33 | 150 |
| Articles indexed | 4,787 | 5,266 | 4,863 |
| Pages microfilmed | 118,151 | 92,938 | 120,944 |
| Public Service | | | |
| Reference questions answered | 2,187 | 2,107 | 2,287 |
| ILL and pay orders filled | 2,107 | 2,596 | 2,244 |
| Reader requests filled | 3,923 | 4,551 | 6,348 |
| Pictures supplied | 2,474 | 2,151 | 1,913 |

Additions to the manuscripts and oral history collections included the initial deposit of the papers of Dr. Julius B. Richmond, former U.S. Surgeon General and Assistant Secretary for Health. A 3-hour autobiographical oral history interview also was conducted with Dr. Richmond. Other manuscript acquisitions included the papers of a long-time friend of the National Library of Medicine, Dr. Saul Jarcho, and the first installment of the archives of the American Surgical Association.

A milestone in the Division's bibliographic program was the completion of the cataloging of the Library's collection of some 15,000 18th-century dissertations, finally bringing together in a single file the Library's holdings of works printed before 1801. A special collection of several hundred early Chinese works was also cataloged by two scholars from the People's Republic of China. The Division has been cooperating with the Eighteenth Century Short Title Catalog (ESTC) of British books, a large international bibliographic project, by submitting records of its holdings; so far, approximately 3,000 records, about 50 percent of the Library's holdings in this category, have been forwarded to the ESTC center for North America at the University of Louisiana.

Looking to the future, the Division began an experimental study in collaboration with the National Medical Audiovisual Center to test the feasibility of applying videodisc technology to improve access to the Library's still picture collection. A study was conducted and a preliminary report prepared on the requirements for computerizing the cataloging records of the manuscripts and the prints and photographs collections in association with the development of MEDLARS III.

Staff members have contributed to medical historical studies by presenting the results of their research at professional meetings and academic institutions. During the year, Dr. James H. Cassedy served as vice president of the American Association for the History of Medicine, and Mr. Manfred Waserman was elected to its council. Dr. Peter D. Olch presented the keynote address at the opening ceremonies of the annual meeting of the American College of Surgeons and was Visiting Professor of Surgery at the Medical College of Wisconsin.

## Technical Services Division

The Technical Services Division selects, acquires, and catalogs biomedical literature, including monographs, serials, and audiovisuals, for the Library's collection. As part of its wider mission, it also disseminates authoritative cataloging data and coordinates the collection, organization, and distribution of serials locator and holdings data for the use of the health sciences community.

FY 1981 was a transitional year for technical services processing at NLM. Changes were made in key management staff, and adjustments were made to accommodate implementation of the Anglo-American Cataloging Rules, second edition (AACR2), termination of the card catalog, and increased technical cooperation with the Library of Congress (LC) and the National Agricultural Library (NAL). This year's achievements also included improvements to acquisitions procedures and continued building of the National Biomedical Serials Holdings Database.

NLM implemented AACR2 in December 1980, the starting date of the new cataloging year. The rules change was linked to two other important departures from the past: closing the card catalog and foregoing a degree of autonomy in NLM's cataloging practices in order to facilitate sharing of cataloging data among the three national libraries--LC, NLM, and NAL. In the future, the Library will become more compatible with the Library of Congress by closely following its rule interpretations.

To further assure compatibility of cataloging data, NLM joined the Name Authority Cooperation (NACO) project in July 1981. Under this project, NLM authenticates all name headings used in its CONSER serials cataloging against established NLM and LC records. New headings are submitted to LC in AACR2 form for inclusion in the LC authority file. The NACO project, closely monitored by NLM and LC's Network Development Office, will be expanded in FY 1982 to include more corporate headings and personal names used in NLM cataloging. Although conformity to LC has added substantially to the NLM cataloging load in 1981 by requiring many name revisions in the NLM authority file, the initial investment in time will lead to long-range benefits in sharing data, distributing cataloging workloads, and providing more timely authoritative data to LC and NLM users.

Conversion to AACR2 also strongly influenced the timing of NLM's decision to close the conventional card catalog. This historic event was officially noted at a ceremony on March 4, 1981, when NLM announced the availability of a new Computer-Output-Microform (COM) catalog for onsite patrons. Although patrons must still consult the card catalog for older works, most of their needs can be met by the COM catalog, which is produced from CATLINE and AVLINE and contains records for titles cataloged since 1965. As records converted to

machine-readable form in NLM's massive retrospective conversion project are added to CATLINE over the next 2 years, access to an increasing portion of the Library's collection will be available both in COM output and in the online file. At the same time, NLM is developing a user-friendly mode for public access to CATLINE as the long-term alternative to the card catalog.

Retrospective conversion is proceeding on schedule. The 3-year effort, begun in 1979, is converting records for 1801-1965 monographs in the NLM shelf list to machine-readable form. To date, 117,000 records have been keyboarded and released to the CATLINE database, where they are available to online users. After conversion is complete, NLM plans to publish COM products containing the entire file, which will replace the many different printed products currently covering records for NLM's modern collection of monographs. COM products scheduled for release during the coming year include a 5-year cumulation of the National Library of Medicine Current Catalog 1976-1980, Health Sciences Audiovisuals, and NLM Name and Series Authorities.

The Cataloging Section's key concerns continue to be quality of bibliographic data and timeliness in making records and materials available to the public. Priorities include insuring effective utilization of scarce cataloging resources to handle the stream of biomedical literature published annually and acquired by the Library. To this end, a new priority scheme to assign items to full and limited cataloging was developed and put into effect in midyear. This scheme emphasizes full-level cataloging of serials and current core medicine monographs in English--material of prime interest to the U.S. health sciences community--and expands the program to provide access through limited cataloging to NLM's substantial cataloging backlog of foreign-language materials and older English-language monographs. Approximately 8,600 full and 3,500 limited cataloging records were added to the CATLINE file in FY 1981, providing network access to both types of material. In FY 1981, NLM expanded efforts to use contract support to catalog foreign-language monographs and older materials.

A trial program to evaluate online vendor access to NLM's monograph in process file (INPROC) as a way to reduce NLM processing time and duplication of books shows promise and will be expanded in early FY 1982. After training, staff members of one of NLM's principal U.S. bookdealers now search INPROC prior to supplying books on approval. If no record of a title is found, the vendor creates a brief bibliographic record in the file with a message that the item will be supplied. Experience to date has been favorable, with the number of duplicates supplied by the dealer reduced to zero.

Selection/Acquisitions staff members, in cooperation with the Reference Services Division, also have developed improved procedures and guidelines for selecting and retaining hard-copy U.S. technical reports. In the past, the Technical Services Division has acquired hard copies of many reports also available in the Library on National Technical Information Service (NTIS) microfiche. Although it is useful to acquire some important materials in both formats, in many cases the microfiche format and access through the NTIS indexes and database are sufficient for NLM users' needs. The new procedure will decrease the number of U.S. technical reports that NLM must catalog while meeting the needs of NLM patrons.

The Technical Services Division made measurable progress with several projects related to the collection of serial holdings statements for the NLM National Biomedical Serials Holdings Database. The contract awarded in July 1980, which was designed to establish a control number link between like titles in NLM's serials database and 21 external files, will be completed late in 1981. The holdings database itself will be built in the fall of 1981 and will include summary holdings statements for more than 1,300 libraries in the 11 regions of the Regional Medical Library network. In 1982, the data collected will be used to produce a variety of regional and local union lists in hard copy or COM for distribution by the Regional Medical Library network and to support the eventual routing of document requests in MEDLARS III. A subset of the current holdings data collected, including holdings statements for network resource libraries, will also appear in the online SERLINE file. Current locator information for these libraries will also appear in Health Sciences Serials in 1982.

A related development is the Online Computer Library Center's (OCLC) agreement to allow NLM title control numbers to be input to the Ø69 field, enabling OCLC participants to have their holdings data transferred automatically to NLM's holdings database. NLM and OCLC staff are planning a contract to add the NLM title control numbers to retrospective serial records in OCLC by the end of 1982. NLM is also working with the Research Libraries Information Network (RLIN) to develop procedures for adding NLM control numbers to the RLIN database.

NLM's internal check-in file has grown continuously, primarily from the addition of machine-readable data from the offsite check-in program, which now covers about 60 percent of the serial titles received. NLM staff also use the file to check in serial annuals and continuation volumes received directly at the Library. In late 1981, the in-house COM publication for serials will display serial check-in data for staff use in verifying the receipt and availability of specific serial issues for interlibrary loan, onsite patron use, and other purposes.

## Reference Services Division

The Reference Services Division is the Library's principal public service arm in the areas of reader, reference, and bibliographic services and interlibrary loans and is responsible for maintaining and preserving the general collection.

Requests for interlibrary loans dropped slightly again this year, as did demand for material from the general collection for use in the Reading Room (table 3); however, reference requests increased slightly (table 10).

An era ended at NLM when the Library's Xerox Copyflo machine, which had been in daily use in the interlibrary loan program for more than 20 years, was removed. Prior to the development of high-quality office copiers, NLM used microfilm cameras on wheels, which were moved up and down the stack aisles to film journal articles for interlibrary loan. NLM then processed the film in-house and produced paper copy from the film using the Copyflo. The difficulty in obtaining service and parts for the old machine and the availability of improved copiers resulted in the complete replacement of the film/Copyflo system by office copiers housed on special carts. The copiers produce clearer copy at lower cost and with a lower rate of retakes than the former method of

Table 10
Reference Services

| Service | FY 1979 | FY 1980 | FY 1981 |
|---|---|---|---|
| Requests by telephone | 13,494 | 11,102 | 12,399 |
| Requests by mail | 729 | 389 | 427 |
| Readers assisted | 32,241 | 31,614 | 30,957 |
| Total | 46,464 | 43,105 | 43,783 |
| Reading room users registered | 29,758 | 28,710 | 25,407 |

reproduction. The Copyflo and other photographic equipment were transferred to the Library of Congress, whose Photoduplication Service has the facilities to maintain them.

As a result of this change, the Photoduplication Section was merged with the Circulation and Control Section, bringing together all interlibrary loan processing components. One benefit of this merger was the opportunity to expand the capabilities of the staff and offer additional opportunities for job mobility and advancement by providing training and experience in library technician functions.

A reorganization of the Reference Section eliminated separate Public Services and Specialized Services units and replaced them with coordinators, each of whom is responsible for a major program activity. This change eliminates an artificial division of functions and responsibilities and has already resulted in a more efficient utilization of staff.

A small beginning made this year should eventually lead to the automation of the circulation function. DOCLINE, a prototype file for controlling interlibrary loan traffic, was used to monitor the circulation of interlibrary materials loaned in the original form and to prepare computer-produced overdue notices. In addition to circulation control, the system generated management information reports from which data were drawn for an NLM Associate project to analyze monograph interlibrary loan traffic. With minor modifications, the data sets developed for the project can be used in the future to show trends and forecast traffic patterns.

The Division initiated a new Specialized Bibliography Series. Each volume will contain citations drawn from a combination of manual and computerized searches. The first volume, Biomedical Effects of Volcanoes, was prompted by requests for information following the eruption of Mount St. Helens in Washington State.

The Division continues to produce Literature Searches; in FY 1981, it added 29 new titles, sent out more than 70,000 searches, and maintained a mailing list of 458.

The Division continued to provide orientation and training to visiting librarians. In addition, two trainees selected for a newly established Librarian Career Development Program (LCDP) were accepted for orientation and assignment to daily operations. The LCDP consists of a 2-year work-study curriculum, culminating in a degree in library science from an area university and assignment to an operating component of the Library.

Reference Section staff offered workshops to area county public librarians to acquaint them with selected medical reference works suitable for use in public libraries. The workshops were well received and will improve the service by public libraries in providing health information.

An important part of the renovation of the Library building is the installation of additional air-conditioning equipment in the stack area on B level. To accommodate two rooms to house this equipment, a sizable portion of the monograph collection was shifted using summer student help, and reconstruction continued without delay. The initial phases of the renovation were completed with only brief and minimal impact on the provision of public services.

Medical Subject Headings (MeSH)

The 1982 MeSH contains 117 new subject headings, representing concepts that had no directly corresponding headings in the 1981 MeSH. An additional 58 new headings replaced existing terms. Also, 51 obsolete or excessively specific terms were deleted without replacement. Again, a large number of cross-references were added to guide the user to the most appropriate heading. The MeSH changes affect numerous subject areas, with special attention to immunology and various biological taxa.

The MeSH chemical file, which was introduced in late 1980, has been well received by users with interests in chemistry. Five thousand new chemical terms were added during the year. The use of the computer to provide an appropriate MeSH subject heading for each chemical in the MeSH chemical file has enhanced the consistency of chemical indexing in Index Medicus. A printed version of the updated and revised chemical file is in preparation and will be made available to the public through the National Technical Information Service.

Table 11
Growth of Collections

| Collection | Previous Total (Sept. 1980) | Added in FY 1981 | New Total |
|---|---|---|---|
| Book materials | | | |
| Monographs | | | |
| Before 1500 | 565 | 2 | 567 |
| 1501-1600 | 5,564 | 19 | 5,583 |
| 1601-1700 | 9,755 | 57 | 9,812 |
| 1701-1800 | 23,383 | 141 | 23,524 |
| 1801-1870 | 39,463 | 34 | 39,497 |
| Americana | 2,297 | 3 | 2,300 |
| 1871-Present | 406,592 | 7,425 | 414,017 |
| Theses HMD | 281,517 | 31 | 281,548 |
| Pamphlets | 172,021 | -- | 172,021 |
| Bound serial volumes | 629,832 | 27,624 | 657,456 |
| Volumes withdrawn | (25,958*) | (324) | (26,282) |
| Total volumes | 1,545,031 | 35,012 | 1,580,043 |
| Nonbook materials | | | |
| Microforms | | | |
| Reels of microfilm | 29,175 | 2,624 | 31,799 |
| Number of microfiche | 74,654 | 12,155 | 86,809 |
| Total | 103,829 | 14,779 | 118,608 |
| Audiovisuals | 36,386 | 1,741 | 38,127 |
| Pictures | 73,274 | 570 | 73,844 |
| Manuscripts | 935,570 | 133,423 | 1,068,993 |

*This figure includes all volumes previously listed in the "Brief-listed INPROC" category. These volumes were either removed from the collection or will appear in the "Monographs: 1871-Present" category as they are given full or limited cataloging.

## COMPUTER AND COMMUNICATIONS SYSTEMS

Harry D. Bennett
Director, Office of Computer and Communications Systems

The Office of Computer and Communications Systems (OCCS) provides data processing and data communications support for all elements of the Library. It has a critical supporting role for Library Operations and Specialized Information Systems. Computer analysts and programers work closely with subject area specialists to determine their data processing requirements and to convert these requirements into new or improved data processing capabilities. OCCS also provides systems and programing support for the MEDLARS II system and is responsible for short-range MEDLARS III projects to be implemented prior to the transition to that system in 1984.

### Equipment

NLM installed an IBM 370/168 multiprocessor system to replace its IBM 370/158 system in September 1980. The new system, which has a commercial list price of approximately $9 million, was obtained from the National Institutes of Health's Division of Computer Research and Technology for $600,000. It has three times the capacity of the previous NLM data processing system and will meet the estimated 20 to 25 percent annual growth of NLM's data processing requirements through 1984.

The system was installed in the computer facility located in the new Lister Hill Center building. The move of all NLM computer services was completed as scheduled over a 3-day weekend. In addition to the IBM 370/168 multiprocessor system, the Data General S/200 minicomputer system was replaced by the Data General S/350 system, and a Datagraphix 4550 Computer-Output-Microfilm system was installed.

In 1980, an agreement was reached with the State University of New York (SUNY) at Albany to add databases to its system and absorb additional workload to reduce the use of the NLM computer system. With its new computer system, NLM is now able to shoulder the major workload burden of the online bibliographic service. NLM has reviewed the use of SUNY's system and decided to restructure the backup service SUNY provided. The database mix at SUNY was changed so that the MEDLINE and Health Planning databases, including the new MED77 database, were available online and the toxicology databases, which had been mounted at SUNY the previous year, were made available at NLM only. In addition, a new capability was provided at NLM to permit SUNY-only users to access NLM for all databases when the SUNY facility is not available.

Considerable emphasis was placed on taking advantage of the capacity of the new 370/168 system. Additional disc storage and storage control units were installed, and the new equipment provides improved data and program security, improved programer and user productivity, a graphics capability for use throughout NLM, and improved access to the Telenet and Tymnet communications services. In addition, a new compiler language--PASCAL--was installed to support MEDLARS III development.

## Bibliographic Retrieval

Several enhancements and extensions were implemented in the ELHILL retrieval system this year. Although the last phase of the cooperative programing effort with the British Library, known as ELHILL 3.2, was completed in August 1980, implementation was deferred until June 1981 to allow for extensive internal and external testing. ELHILL 3.2A allows for the sorting of offline prints and offsearches according to user-specified or system-defined sequences. In addition, new procedures were developed to permit database updates to be made while the online service is running.

In January 1981, the MED77 database was made available online. This database consists of bibliographic citations covering 1977 and 1978. MED77 immediately became the second most used database of the online system, accounting for 10 percent of the total use. Its mounting was made possible by the increased processing power and disc storage of the new computer system installed in December 1980. This file was made available to SUNY-only users online at the SUNY facility in June 1981 when the SUNY databases were restructured. MED79 will be implemented at both NLM and SUNY in December 1981, thus providing 5 years of Index Medicus citations online. The mounting of other backfiles is being considered and will depend on the acquisition of further disc storage.

In January 1981, CATLINE was made available to NLM users on Saturdays. In August, NLM announced extended hours (starting in September) and Saturday hours (starting in October) for all users and all databases.

Much of the MEDLARS support effort is not directly visible to NLM users. Instead, quality is taken for granted. In 1981, significant changes to the MEDLARS system were implemented in citation processing, expansion of the MeSH vocabulary, expansion of CATLINE with the addition of retrospective (prior to 1964) records, and the accommodation of AACR2 standards. A dictionary validation process for title and abstract fields was implemented for bibliographic citation input. The dictionary is dynamic and is changed to reflect trends in the appearance of terms in the literature. The online file maintenance capability was expanded to permit multiple concurrent access rather than single access. New edits were implemented across fields, so that check tags are now cross-validated to MeSH terms. Improvements were made in the accuracy and quality of terms appearing as descriptors in citations. Finally, a consolidated error report was developed that presents all edit and dictionary warning messages in a concise format for review and correction. Internal documentation was initiated on new programing efforts, and a users' guide was produced for the dictionary maintenance process.

Support was given to the expansion of the MeSH vocabulary by more than 5,000 chemical terms. An automated procedure was developed (to replace a manual posting process) that keeps a frequency count of the occurrence of a chemical name in the MEDLINE citation file. Year-end processing was expanded to include the registry number (RN) and MeSH geographic tree (ZN) elements.

Major changes to the CATLINE database and all supporting processing programs were implemented to accommodate AACR2. The Name Authority input process (MEDNAM) was expanded to accommodate many more concurrent users, and CATLINE was expanded by over 50 percent to hold retrospective records, which will continue to be added. Security measures were added to all input programs so

that online users are limited to the elements they can modify in the online file. Internal documentation was generated for year-end processing and file regeneration.

## INQUIRE

This year, improvements were made in INQUIRE, the database management system, to support the ever-growing number of users, and a database to assist these users was developed. This database provides support for INQUIRE release documentation, manuals, and training sessions. In addition to general enhancements, new applications were developed during this year.

The major INQUIRE software enhancement installed this year is the generalized full-screen processor and data dictionary. This software module will support data creation and maintenance. The first major application will be in the Regional Medical Library interlibrary loan project. This project supports MEDLARS III and represents the first step toward automation of interlibrary loans.

## Computer-Output-Microform (COM)

In November 1980, OCCS installed the Datagraphix COM equipment, including the 4550 computerized recorder, film processor, and duplicators. This equipment permits processing of 16mm microfilm and 105mm microfiche, both of which are produced at NLM in 48X reduction. Additional proprietary software (COMET) was used to generate eye-readable indexes unique to the strobe search readers now in use in the public and staff areas of NLM. OCCS produced the first issue of the COM Catalog in February. Several processing changes have been made as a result of initial difficulties encountered in its generation. Other applications of the COM allow NLM to replace massive hard-copy listings such as the master serials listing used in the NLM public and staff areas; the Health Sciences Serials, a quarterly microfiche publication available through the Government Printing Office; the network transaction log; and ELHILL statistics maintained by the MEDLARS Management Section of Library Operations.

## MEDLARS III Support

In FY 1981, OCCS provided 45 work-months of support to the MEDLARS III project. Primary responsibilities were related to "front end" processing, i.e., the development of online cataloging and online indexing capabilities. These two projects will provide professional catalogers and indexers with direct access to a computer system.

The catalog process is supported on the Data General/350 minicomputer with the data entry software used for the retrospective conversion of the card catalog. Capabilities provided are data entry formatted screens for capture and input editing of monograph, serials, and audiovisual data in the online production cataloging stream. On a daily basis, completed records will be loaded into the 370 system for required processing before being added to CATLINE. This system will be operational in early FY 1982.

Front-end indexing of the journal literature is being developed for the 370/168 multiprocessor system. Initial system specifications and indexer screens,

including a users' guide for indexers, have been developed. The system will begin operation in April 1982.

Communications

Two principal data communications activities took place this fiscal year: all communication services were relocated to the new computer facility and to the Lister Hill Center's Resources Center; and development continued on the coaxial cable local area network for NLM and the Lister Hill Center building.

Relocating and re-engineering the communications facilities to the new IBM 370/168 MP system and the new Data General 350 minicomputer went smoothly. All of the communications had to be re-engineered; in many cases, new circuits were installed.

Much progress has been made in implementing NLM's Local Area Network (LAN). NLM coordinated the procurement for Bus Interface Units (BIU's) for four Federal agencies: NLM; Tri-Medical (Army, Navy, Air Force) Information Services (TRIMIS); NASA-Lewis Research Center; and Wilford Hall (U.S. Air Force). The BIU's will be used to connect a variety of CRT terminals, word processing systems, printers, and microcomputers to many host computer ports via a broadband coaxial network. Delivery of the units will begin in the first quarter of FY 1982.

Construction began in August 1981 for host computer BIU's (CBIU's), each of which will service up to 16 concurrent users. They may be tied together to handle a greater number of asynchronous users. Larger numbers of users will access the host computer synchronously through another access medium.

An overall design has been completed for (1) providing a gateway from the LAN to public networks; (2) providing synchronous access to large numbers of users; (3) dial-in access to the LAN; and (4) out-dialing to non-LAN host computers. This design will permit terminal-to-terminal, terminal-to-computer, and computer-to-computer communications via the LAN or to remote hosts/terminals.

Operational testing was scheduled for late 1981 on the LAN in the Lister Hill Center building. The system will be extended to the NLM building when the renovation is completed.

SPECIALIZED INFORMATION SERVICES

Henry M. Kissman, Ph.D.
Associate Director,
Division of Specialized Information Services

The Symposium on Information Transfer in Toxicology, which took place in the Lister Hill Center auditorium in September 1981, marked 15 years since the release of a President's Science Advisory Committee Report that led to the establishment of the Toxicology Information Program (TIP) at NLM. Based on the recommendations of this Report, TIP--the major responsibility of NLM's Division of Specialized Information Services--developed the following primary objectives: (1) to create computer-based toxicology databases from the scientific literature and from the files of collaborating industrial, academic, and governmental organizations; and (2) to establish and operate toxicology information services for the scientific community.

Much effort during FY 1981 involved assessing data banks being developed under TIP's supervision and NLM-sponsored activities at the Oak Ridge National Laboratory. These external program evaluations were conducted by the Toxicology Information Program Committee (TIPCOM) of the National Academy of Sciences and the Federation of American Societies for Experimental Biology (FASEB). The Division has established a planning and evaluation group that will be involved in assessing the Toxicology Data Bank and other services, helping to plan a new hazardous waste disposal information activity, and coordinating a project-based management system within TIP.

## Online Services

TOXLINE, the Registry of Toxic Effects of Chemical Substances (RTECS), CHEMLINE, and the Toxicology Data Bank (TDB) were available to online users both at NLM and at the State University of New York (SUNY) in Albany until June 1981. At that time, these databases were removed from SUNY and access to them was only via NLM. TOXBACK74 was made available at NLM for online searching.

TOXLINE. TOXLINE, a bibliographic retrieval service, is an extensive collection of citations and abstracts derived in large part from published journal literature dealing with human and animal toxicity studies and the biological effects of drugs, pesticides, food additives, industrial and household chemicals, radioactive materials, and toxic pollutants. TOXLINE is updated monthly and, including its backfiles, now encompasses more than 1.2 million records.

The Toxicology Document and Data Depository (TD3), added to TOXLINE on a test basis at the end of FY 1980 (and described in last year's report), became operational in February 1981. This subfile has citations to Government reports, along with associated abstracts, key words, and ordering information.

During the TOXLINE/TOXBACK regeneration in 1980, the files were redistributed, by year of primary publication, into three files: TOXLINE (references to articles published from 1977 to date); TOXBACK74 (references from 1974 to 1976); and offline TOXBACK65 (pre-1974 references).

In 1981, the TOXLINE file was used for approximately 11,000 hours of connect time. This figure includes its use at SUNY until June 1981. TOXBACK74,

available for online searching in the last 4 months of FY 1981, was used for some 300 hours of connect time. More than 24,000 offsearches were executed and more than 2.6 million citations were requested to be printed from TOXLINE, TOXBACK74, and TOXBACK65.

NLM's new SORT capability allows offline sorting of records at the user's initiation. This capability offers advantages to the TOXLINE searchers. The precoded sort of Author, Title (AUTI) is particularly useful for grouping duplicate citations that result from the subfile structure of TOXLINE.

RTECS. TIP provides two online fact retrieval services, the Registry of Toxic Effects of Chemical Substances (RTECS) and the Toxicology Data Bank (TDB). RTECS is an online, searchable version of the National Institute for Occupational Safety and Health (NIOSH) publication of the same name. The file contains acute toxicity data for 48,569 substances and chronic toxicity data if a carcinogenic, mutagenic, or teratogenic effect was reported in the reference cited. Detailed mutation data are presented in the toxic effects field, with notations for 20 specific mutagenicity tests. For many substances, the file also contains information on threshold limit values, recommended air standards, aquatic toxicity data, carcinogenicity testing status, and eye and skin irritation data. In FY 1981, more toxic effects terms were added to the controlled vocabulary used in searching RTECS. RTECS contains records organized around a chemical substance and includes chemical identification data such as CAS registry numbers, synonyms, molecular formulas, and Wiswesser Line Notations.

TDB. The Toxicology Data Bank (TDB) describes chemical substances that may be hazardous and have significant human exposure potential. For these substances, TDB has data on chemical structure and nomenclature, chemical and biological properties, usage, and potential effects on the environment. Data are extracted from monographs such as textbooks and handbooks by staff at the Oak Ridge National Laboratory. Data content is evaluated by the Peer Review Committee, a group of scientists associated with the NIH Toxicology Study Section.

By the end of FY 1981, the online file contained some 2,500 completed records; another 750 records, including updated versions of older TDB records, were in various stages of development. In choosing compounds for inclusion in TDB, high priority is given to compounds selected for testing by the National Toxicology Program.

CHEMLINE. CHEMLINE, NLM's online chemical dictionary, allows the user to search for nomenclature and structural information about chemical substances mentioned in other NLM online files and in the Toxic Substances Control Act (TSCA) Chemical Substances Inventory of the Environmental Protection Agency. After regeneration in April 1981, CHEMLINE contained more than 500,000 records for chemical substances known by more than 1 million different names. Total online usage was 4,400 hours.

LADB. The Laboratory Animal Data Bank (LADB) was developed to provide baseline biomedical data from experimental control animals of species and strains commonly used in laboratory research and bioassays. LADB became available as a public service in January 1980, providing online services and an offline search and consultation response center. Evaluations by a user assessment panel provided by the Federation of American Societies for Experimental Biology recommended that LADB become a nongovernmentally supported program.

Termination of interagency financial support because of budgetary constraints brought this recommendation to implementation earlier than expected. As a result, the LADB database and accompanying software were made available to the private sector under NTIS licensing procedures in August 1981. Battelle Columbus Laboratories has indicated its intent to offer LADB services under the license arrangement and to maintain the system without interruption as one of its online services.

Query Response Services

The TIP sponsors the Toxicology Information Response Center (TIRC) at the Oak Ridge National Laboratory to provide a variety of literature search services. During the first 10 months of FY 1981, TIRC completed 385 searches in response to requests. Most requests came from other Federal agencies that have interagency agreements with NLM for this type of information support.

During FY 1981, the interagency agreements for TIRC services, reported in previous years, continued to be maintained. Also, the Information Response to Chemical Concerns (IRCC) project, sponsored by several Federal agencies, continues to provide sponsoring organizations with "express" literature searches (48-hour turnaround). A secondary objective is to produce comprehensive annotated bibliographies on current topics in toxicology selected by the IRCC project committee as being of general concern to the sponsoring agencies and the biomedical community.

Publications

Annotated Bibliographies. In 1981, NLM renegotiated a cooperative agreement with the Federation of American Societies for Experimental Biology for printing and promoting annotated bibliographies on current topics in toxicology. Four more publications became available in 1981 under this agreement:

- Chemical Waste Disposal--Chemicals Identified in Terrestrial and Aquatic Waste Disposal Processes, A Selected Bibliography with Abstracts, 1964-1979;
- Health Aspects of Urea-Formaldehyde Compounds, A Selected Bibliography with Abstracts, 1964-1980;
- Toxicity of Selected Vanadium Compounds, A Bibliography with Abstracts, 1965-1980; and
- The Effects of Environmental Chemicals on the Immune System, A Selected Bibliography with Abstracts, 1969-1980.

These bibliographies were produced by the Toxicology Information Response Center as part of the above-mentioned IRCC project. Copies are available for purchase from FASEB, Special Publications, 9650 Rockville Pike, Bethesda, MD 20814.

TOX-TIPS (Toxicology Testing-in-Progress). The Toxicology Information Program manages TOX-TIPS for the DHHS Committee to Coordinate Environmental and Related Programs. TOX-TIPS is a monthly publication that reports planned or ongoing

toxicological tests of chemicals by governmental, industrial, and academic laboratories. Descriptions of epidemiologic studies to determine toxic chemicals and their effects are also included. The rapid publication of this information is designed to prevent the unknowing duplication of these expensive studies. Reports for the publication are obtained by voluntary contributions. The May 1981 issue (no. 60) of TOX-TIPS introduced, on a trial basis, a literature alerting service, "Methods of Testing Chemicals for Biological Effects." Citations to the recent journal literature as well as statements and reports from the Federal Register and various Federal agencies are included. Plans have also been made to reference older documents. TOX-TIPS is published monthly through the National Technical Information Service at an annual subscription rate of $35 for domestic mailings and $70 for mailings outside of North America.

Collaborative Projects

Chemical Substances Information Network. The Toxicology Information Program continued to collaborate with other agencies on the development of the Chemical Substances Information Network (CSIN). CSIN is intended to be a national network linking multiple, geographically dispersed databases containing information about the uses and effects of chemical substances. A major TIP activity was the development of a Chemical Structure and Nomenclature System (CSNS) to support the identification of chemical entities or classes and to identify CSIN-related files containing data on various chemicals. The announcement of the commercial availability of two sophisticated online chemical search systems obviated the need for building such a capability specifically for CSIN. Therefore, TIP is now supporting an effort to develop a chemical substance locator function for CSIN component files. A second related interagency effort dealing with the creation of a Chemical Information Resources Directory (CIRD) for CSIN was completed in FY 1981.

National Toxicology Program. Another important area of collaboration concerns information support services provided by TIP to the National Toxicology Program (NTP) under an interagency agreement that began in FY 1980. Several accomplishments resulted from this collaboration in FY 1981. A numbering system for all unique NTP compounds was devised and implemented to provide a uniform method by which all groups in NTP can recognize and refer to the chemicals considered for and used in toxicological research and testing projects. The first edition of NTP Chemical Registry Handbook, describing 919 compounds, was produced for use by NTP scientists and administrators.

Information on toxicological tests and organizations performing these tests, as listed in NTP's Review of Current DHHS, DOE and EPA Research Related to Toxicology (FY 81), was computerized to produce tables and indexes by CAS registry numbers, chemical names, and test categories. Tables and indexes were also produced for the FY 81 NTP Annual Plan, which lists all chemicals scheduled for toxicological testing in FY 1981 by NTP. The Annual Plan also presents the results of testing during FY 1980.

TIRC carried out comprehensive literature searches for 23 chemicals in FY 1981 in support of NTP's long-term testing. In addition, quarterly current awareness searching was instituted by TIRC for 62 chemicals under study by NTP.

The technical direction of the NTP-sponsored Environmental Mutagen and the Environmental Teratology Information Centers at the Oak Ridge National Laboratory is one of TIP's tasks under the Library's agreement with NTP. A detailed system and information processing study of these centers was carried out in FY 1981 by a contractor under guidance from TIP. Many recommendations from this study will be implemented by Oak Ridge National Laboratory during FY 1982.

Symposium. The Toxicology Information Program had lead responsibility for organizing the Symposium on Information Transfer in Toxicology, held at the Lister Hill Center in September 1981. This symposium was another interagency project sponsored by the DHHS Committee to Coordinate Environmental and Related Programs and the Interagency Toxic Substances Data Committee. Twenty-five speakers and panelists, along with 192 participants, examined the state of the art as well as the technical, legislative, economic, and international aspects of the information transfer process in toxicology. Registrants represented 22 States, the District of Columbia, and Canada. The Planning Committee intends to publish the proceedings of this symposium.

AUDIOVISUAL PROGRAMS

William G. Cooper, Ph.D.
Acting Director, National Medical Audiovisual Center

The National Medical Audiovisual Center (NMAC) has been a part of the National Library of Medicine since 1967 and is responsible for planning and administering a national research and development program to improve the quality and use of audiovisual learning materials in health professions education. In March 1980, the NMAC facilities were moved from Atlanta to the Lister Hill Center building. Following that move, the staff spent the early part of 1981 in planning for the redevelopment of NMAC physical facilities and rebuilding a drastically reduced staff.

NMAC has assumed an important leadership role in the application of innovative technologies. As a complement to the Lister Hill National Center for Biomedical Communications and other NLM program divisions, NMAC offers the health professions community models and assistance in carrying out effective biomedical communications.

In FY 1981, NMAC evaluated its programs and projects to decide how it could meet the future needs of its constituents. Based on a review of NMAC's mission, the staff developed program areas under which all projects and activities could be defined. These program areas are (1) constituency services; (2) training, consultation, and clearinghouse functions; (3) information and distribution services; (4) audiovisual and computer-based educational materials development; (5) NLM film archives; (6) research and evaluation; and (7) training facilities coordination.

## Constituency Services

The NMAC Health Professions Resource Group was established in FY 1981 to cooperate with the health professions community and to set standards for program design and performance that match the requirements for integrating instructional media into health science curriculums. Through the establishment of an internal information clearinghouse, NMAC will continue to monitor trends, changes, and problems in health professions education that call for application of educational materials.

## Training, Consultation, and Clearinghouse

The NMAC Training and Consultation Program designs, conducts, and evaluates instructional workshops and seminars that help health professionals to develop and use instructional materials in a variety of audiovisual formats. Workshops that have been tested and proven effective at NMAC are shared with field training centers throughout the country. During FY 1981, 419 health professionals participated in 22 workshop sessions conducted at NMAC and at field training centers. In addition to the two existing workshops--"Developing and Evaluating Audiovisual Instructional Materials" and "Designing Simulation Activities"--a new workshop was offered, "Using Videotechnology to Teach Communication Skills." An alternative training format was designed for the lecture skills workshop and will be completed next year.

NMAC staff planned and conducted several workshops and training sessions during the year on such topics as student evaluation of instruction, preparation of instructional objectives, instructional applications of videodisc and computers, and careers in dentistry. These sessions were conducted in conjunction with individual institutions and professional societies.

A review of the existing offsite training program was begun during 1981 in the hope that NMAC training programs could be coordinated more effectively with the Regional Medical Library (RML) network. Such cooperation would enable NMAC programs to serve regional needs as well as to coordinate NMAC resources and activities with those of the RML's.

The development of the NMAC Learning Resource Laboratory (LRL) was a major accomplishment of the training program. The LRL serves as a demonstration center for state-of-the-art applications of technology in health sciences education. During FY 1981, 555 persons visited the LRL--227 were NLM/NMAC staff, 305 were from around the United States, and 23 came from 16 foreign countries. Programs in the use of microcomputers, videodisc, and simulation for teaching health professions education are underway.

NMAC will continue to provide consultative services to its constituents, both in and out of the Federal Government. To maintain the effectiveness of these services, the information clearinghouse mentioned previously will serve as a network of resources, personnel, and media technology programs in health sciences during FY 1982.

Information and Distribution

A major objective of NMAC is to distribute health sciences audiovisual materials and information. The 1981 edition of the National Medical Audiovisual Center Catalog: Films for the Health Sciences was published by the Government Printing Office in July but not in time to markedly affect the volume of loan requests, which remained about the same as last year's figure of 18,000. See table 12 for request and shipment information.

In February 1981, the Videocassette Interlibrary Loan Program was initiated. Its procedures represent a modified NLM policy on interlibrary loans, as applied to monographs and books. The program takes advantage of the established biomedical communications network through the Regional Medical Library system. The videocassette collection at NMAC includes some 1,000 titles. In addition, satellite collections of 300 titles, all of which are NMAC productions, have been placed in each of the 11 regions in the RML network in an effort to decentralize the service. The list of regions appears in table 13.

During the past year, NMAC staff members have been monitoring the Audiovisuals onLINE (AVLINE) Materials Review Contract with the Association of American Medical Colleges (AAMC). AVLINE now lists more than 10,000 titles and is a major bibliographic tool for identifying health science audiovisuals. The existing AVLINE review process, which has been in operation since 1973, is being phased out, and AAMC is exploring alternatives for evaluation, including the involvement of professional societies and the producers themselves. The publication of "Attributes of Quality in Audiovisual Materials for Health Professionals" in the July issue of the Journal of Biocommunication is a step in this direction. A paper entitled "AVLINE, a Data Base and Critical Review

Table 12
Selected Statistics, NMAC

| Activity | Number |
|---|---|
| Films requested | 15,789 |
| Films shipped | 14,990 |
| Videocassettes requested | 621 |
| Videocassettes shipped | 369 |
| Titles added (film and videotape) | 228 |
| Titles to the National Audiovisual Center for sale | 1 |
| Teaching packages sold through NAC | 1,316 |
| Onsite surveys and consultations | 2 |
| NMAC-based consultations | 51 |
| Monographs distributed | * |
| NMAC-based workshops (132 participants) | 6 |
| Regional workshops (287 participants) | 16 |
| Audiovisual units completed | 3 |

*Monographs transferred to NTIS in February 1981 for distribution.

Table 13
Videocassette Loan Satellite Sites

| Region | Site |
|---|---|
| 1 | Tufts University |
| 2 | College of Medicine and Dentistry of New Jersey |
| 3 | Penn State University |
| 4 | University of North Carolina, Chapel Hill |
| 5 | Wright State University |
| 6 | University of Miami |
| 7 | University of Illinois at the Medical Center |
| 8 | Creighton University |
| 9 | University of Oklahoma at Oklahoma City |
| 10 | University of Oregon |
| 11 | University of California, Los Angeles |

System of Audiovisual Materials for the Education of Health Professionals" details the history of the AVLINE project and is scheduled for publication in the Journal of Medical Education in early 1982.

During FY 1981, NMAC transferred its publications to the National Technical Information Service for distribution. This change has facilitated constituent access to the materials. NMAC will continue to provide lists of the publications in NTIS to interested persons. The staff also received and responded to information requests from NMAC constituents, frequently concerning the availability of NMAC-sponsored project reports and AV materials.

Audiovisual and Computer-Based Educational Materials Development

Much of FY 1981 was spent on acquiring and installing electronic and audiovisual equipment in the center's new facilities. FY 1982 will find NMAC again fully capable of producing, recording, and editing health science teaching/learning materials in both 2-inch and 3/4-inch videotape format.

Graphics and still photography laboratories produced thousands of audiovisual work units as their responsibilities expanded to include support services and product development for other elements of the Library. Before the government-wide freeze on new audiovisual productions, several projects were begun. Seventeen audiovisual productions are now in various stages of development.

The first in a series of slide/tape and videotape programs to support the teaching of the history of medicine was completed. The slide/tape, entitled the "The Palpable Osler," describes the life and accomplishments of Sir William Osler. Next in the series is a two-part program on Dr. John Shaw Billings, who was the first director of NLM. These units were researched and were well along in the development process by the end of FY 1981. They will be completed and distributed in FY 1982.

NMAC plays a major role in collaborative efforts with the Lister Hill Center to explore the potential usefulness of computer-aided vieodisc technology in (1) the storage and retrieval of visual archival materials; (2) the rapid and widespread transfer of information contained in experimental knowledge bases such as the Human Genetics Knowledge Base; and (3) the development of improved teaching/learning materials for undergraduate, graduate, and continuing medical education students. As an example of the last category, a videomicroscopy project was initiated in early 1981. This project involves developing and testing instructional units recorded on videotape for final transfer to programmable videodiscs to support pathology teaching. Individual and institutional members of the pathology education community will participate in key stages of the project.

NMAC staff members have also collaborated with NLM's History of Medicine Division and the Lister Hill National Center for Biomedical Communications (LHNCBC) Health Professions Applications and Communications Engineering Branches in the recording, transferring, and programing of still and motion videotape materials being prepared for final recording on computer-programable optical videodisc.

## NLM Film Archives

The National Medical Historical Film Program serves as a major national resource for information on motion picture materials pertinent to the history of the health sciences. At its May 1981 meeting, the Board of Regents clearly mandated that NMAC take a leadership role in this area. Steady progress has been made in carrying out the board's recommendation, including the development of a detailed policy statement, an inventory of the existing core collection, the physical setup, and the beginning of a cataloging system and information clearinghouse to allow rapid retrieval and preparation of lists and catalogs. Although the program is the responsibility of NMAC, it draws upon existing NLM mandates, activities, and expertise where appropriate.

## Research and Evaluation

To define NMAC's objectives in the area of research and evaluation, an NMAC research-evaluation agenda has been prepared that will be used as a basis to discuss and plan future activities.

A specially commissioned major review article on media use was prepared by NMAC staff for the editors of the forthcoming edition of the Encyclopedia of Educational Research. Other writing projects included proposals for studies of AVLINE use and AV selection processes, AV materials needs of NMAC constituents, test item banking methods, and AV use to serve disadvantaged students. As a prelude to a collaborative project with the National Institute on Aging, an extensive bibliography of the gerontological literature, especially information on the psychological aspects of aging, was prepared. This material is suitable for incorporation into medical curriculums. A more selective bibliography on test item banking in health professions education was also completed. Staff members developed a reading file on computer literacy and a paper reviewing the state of the art in videodisc technology.

Evaluation projects begun or completed by the staff include (1) an analysis of sales by the National Audiovisual Center of NMAC-derived and NMAC-produced AV materials, (2) supervision of the ongoing field tests of the Advanced Terminal System, (3) analysis of the characteristics and "productivity" levels of AV producers whose materials are listed in AVLINE, (4) execution and reporting of evaluations for the EEO and Discovision staff training workshops, (5) supervision of the ongoing study and survey of the NMAC film and video loan programs, (6) preparation of plans for evaluating the pathology-microscopy videodisc project, and (7) development of an "experimental" constituency contact reporting system.

## Training Facilities Coordination

Through its Office of Training Facilities Coordination (OTFC), NMAC schedules and manages the majority of NLM teaching/learning facilities. The OTFC provides space, audiovisual equipment, and audiovisual support services for conferences, seminars, and workshops that are sponsored by both NLM and non-NLM programs in the Lister Hill Center building and NLM. Formal operating policies governing the use of NLM conference and training facilities were established by the OTFC.

LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS

Lionel M. Bernstein, M.D., Ph.D.
Director, LHNCBC

The research and development program of the Lister Hill National Center for Biomedical Communications (LHNCBC) is a mixture of basic and applied research and development activities. Activities are generally directed toward helping libraries and their patrons in the way they use books, journals, and reports and developing new delivery systems and novel methods of accessing knowledge.

On April 30 and May 1, 1981, NLM's newly formed Board of Scientific Counselors met for the first time to review the scientific and technical aspects of the intramural research and development program of the Lister Hill Center. The following are members of the Board:

William Ruhe, M.D., American Medical Association, chairman
William Stanley Brown, Ph.D., Bell Laboratories
Eugene De Loatch, Ph.D., Howard University
Edith Levit, M.D., National Board of Medical Examiners
J. C. R. Licklider, Ph.D., Massachusetts Institute of Technology
Harry Pople, Jr., Ph.D., University of Pittsburgh
Samuel Dwyer, III, Ph.D., University of Kansas, Kansas City
Stephen Pauker, M.D., Tufts University School of Medicine.

Three members of the NLM Board of Regents--Edward J. Huth, M.D.; Charles E. Molnar, Ph.D.; and James Williams, II--also attended the meeting.

The Board of Scientific Counselors reviewed the following Lister Hill Center projects and programs:

The Electronic Document Storage and Retrieval Program;
The Video Processing Laboratory;
The Integrated Library System;
The Digital Videodisc Program;
Distributed Information Delivery;
The Advanced Terminal System; and
The Knowledge Base Research Program.

They found these programs to be scientifically and technically sound but recommended that high priorities should be assigned to the Knowledge Base Research Program and related medical computer science research activities, the Integrated Library System, the Electronic Document Storage and Retrieval Program, and the Video Processing Laboratory.

## Health Professions Applications Branch

The Knowledge Base Research Program (KBRP) is a major research effort that addresses the need for rapid transfer of new medical findings and research information to health practitioners, particularly the practicing physician. This experimental program's goal is to contribute to more effective access to, and use of, available biomedical information in solving the daily problems of diagnosis, prognosis, and treatment of illness by exploring these variables in the domains represented by viral hepatitis, peptic ulcer, and human genetics.

The principal activities of the KBRP involve computer representation of quality filtered information from the enormous, frequently redundant, mass of biomedical literature so that relevant and accurate information is available to health care practitioners. A knowledge-based system can be described as an integrated, computer-represented, medical information system in which current biomedical literature in specific areas is identified, selected, reviewed, synthesized, and indexed by computer science and content experts. This task requires the close collaboration of intramural and extramural scientists from medicine, medical computer science, and communication and information sciences. Methods for efficient literature identification, knowledge acquisition, knowledge base construction, representation, and access are being investigated in conjunction with content identification and representation. This effort has three major components:

- Medical content research (textual and visual information),
- Medical computer science research, and
- Biomedical communication processes research.

Medical Content Research. This component consists of three subject areas, which are in different stages of development. The Hepatitis Knowledge Base is undergoing continuous updating and evaluation. Editing and maintenance, as well as separate programs for access, now exist on two NLM minicomputers. A separate computer system, the Electronic Information Exchange System (EIES), is used for electronic mail and computer conferencing with 10 consulting experts.

The formative evaluation of the Hepatitis Knowledge Base is now largely complete. Carried out over a 2-1/2-year period with the collaboration of King Research, Inc., the study focused on methods used to construct, validate, and update text; evaluated the acceptability of content to potential knowledge base users; and conducted a limited field test of the present online system.

The Peptic Ulcer Knowledge Base has the strong support of the Center for Ulcer Research and Education (CURE) at the University of California at Los Angeles and the Wadsworth Veterans Administration Hospital, Los Angeles. A synthesis of clinical literature in peptic ulcer has been assembled during the past year, and a panel of experts is reviewing the initial database.

Work on the Human Genetics Knowledge Base is also progressing. Additional experts are being engaged, and the extensive text database derived from the fifth edition of Mendelian Inheritance in Man has been edited, revised, and updated. A monthly, semiautomated citation and abstract search provides the basis for revising the text of the Human Genetics Knowledge Base. Interim computer support by NIH's WYLBUR system allows text input and editing in collaboration with the Johns Hopkins University Medical Center.

Both the Peptic Ulcer and the Human Genetics Knowledge Bases will be moved to the DEC-20 computer.

The visual (nontextual) content of the Human Genetics Knowledge Base is being developed in conjunction with the Communications Engineering Branch and the National Medical Audiovisual Center. An integrated facility is being established to investigate the application of videodisc and magnetic disc technologies to this visual information.

Medical Computer Science Research. Medical computer science research is integral to the concept of a knowledge base research program. Activities address research and development into methods for the effective utilization of computer-based medical information, communications, and user support. Efforts are directed toward the design and implementation of methods for convenient retrieval and presentation of information and systems that allow the development of decision support systems for use by health professionals.

The Lister Hill Center recently acquired a Digital Equipment Corporation (DEC) System 20 with a KL processor, 1.25 million 36-bit words of memory, five 176 megabyte disc drives, two tape drives, a line printer, and network interfaces. DEC System 20's are used by most major research and development projects in knowledge-based systems, medical computer science, and artificial intelligence and computational linguistics in medicine. With this system, NLM for the first time will have the hardware and software to support research in the development of medical knowledge bases and to collaborate with other leading scientific and academic institutions.

This computer system will provide computer messaging (electronic mail); a database management system; programing languages such as INTERLISP-10, PASCAL, and SAIL; full-screen text editors; document preparation systems; and interfaces to the ARPA, Telenet, and Tymnet computer networks.

Biomedical Communication Processes Research. This research area, as related to the Knowledge Base Research Program, is concerned with project evaluation; quality filtration of the biomedical literature; and the interpersonal, institutional, and man-machine processes of information transfer and knowledge utilization. Research areas addressed during the past year include field testing and evaluating the Hepatitis Knowledge Base, understanding the organization and structure of formal and informal channels of communication in the biomedical community, quality filtration and reduction of the biomedical literature, a variety of bibliometric tools, and the information needs of health practitioners.

Computer Technology Branch

Integrated Library System. The development of the LHC Integrated Library System (ILS) was begun in 1977 to address the present and future automation needs of biomedical libraries. The Army Library in the Pentagon has served as a test bed throughout the project, and the system has been operational there since April 1980.

In August 1980, ILS Version 1.0 was made available to the public for a licensing fee of $2,000 through the National Technical Information Service (NTIS) as PB80-202658. The basic capabilities provided by 1.0 were the Master Bibliographic File (MBF), the circulation system, serials check-in, and online catalog access.

In August 1981, ILS Version 2.0 was released to NTIS. New features include the ability to batch load MARC records directly to the MBF; authority file maintenance procedures to allow editing, records merging, and cross-reference additions; the capability to define patron registration parameters at each ILS site; public catalog access; and a generalized terminal handler.

Three ILS licenses and more than 600 ILS reports have been procured from NTIS. NTIS has responded in writing to some 500 requests for information on ILS. Of the three licenses, one was purchased by the Welsh Medical Library at Johns Hopkins University, one by Dataphase, Inc. (a vendor of minicomputer-based library automation systems), and the third by Avatar, Inc. (a newly organized firm founded to provide vendor support for ILS). Several other institutions are in preliminary stages of acquiring the ILS.

ILS developments have both near-term and long-term uses in NLM. ILS presently supports the NLM Staff Library, and its use to support interim requirements during MEDLARS III development is being explored.

Advanced Terminal System. The Advanced Terminal System (ATS) project was an outgrowth of the wide variety of computer-based education (CBE) systems that have been developed over the past decade. Each CBE system developed has used different hardware and different languages to support its courseware.

The ATS project involved the development and manufacture of a new computer terminal that would work with PLATO, function as a normal terminal in a computer network environment, provide PLATO graphics capability for other CBE systems, and provide graphics capability for nongraphics systems.

Three generations of terminal prototypes have been developed. The latest prototype works as a PLATO terminal, provides a stand-alone local CBE system, functions as a dumb or an intelligent computer terminal, and has a graphics capability. It also allows authoring in online environments as a stand-alone unit using PILOT.

The Advanced Terminal System is a stand-alone microcomputer system containing two microprocessor subsystems: the Master Control Processor (MCP) subsystem and the Graphics Control Processor (GCP)--plus two AM 9511 floating point processors. The MCP subsystem consists of a Z-80 microprocessor, 64 K bytes of RAM, two floppy disc drives, and serial I/O. The GCP consists of a Z-80 microprocessor, 20 K bytes of ROM, 48 K bytes of RAM, ASCII and PLATO keyboards, a touch panel, and plasma panel display. The GCP subsystem acts as an intelligent alphanumeric/graphics terminal. The MCP subsystem is a general purpose microprocessor that can support any microprocessor application the user chooses.

In the fall of 1980, the National Medical Audiovisual Center assumed primary responsibility for field testing the Advanced Terminal System. Two contracts were awarded for field testing. The first went to the Ohio State University College of Medicine, Division of Computing Services for Medical Education and Research, to study courseware transportability and networking with the ATS. The second field test contract is with the University of Tennessee Center for the Health Sciences, Division of Computer-Based Education, and includes a subcontract with the University of Texas Health Science Center at Dallas. Both groups are studying networking with the ATS. The data gathered and the experience gained will aid in determining the usefulness of the ATS and the future role of LHNCBC in computer-based education.

In June 1981, the LHC 8080 PILOT was submitted to NTIS for dissemination. LHC 8080 PILOT is a derivative of LHC ATS PILOT, the computer-based educational

language developed as part of the ATS project. Release of LHC 8080 PILOT provides the community with the most powerful version of the PILOT language available.

Distributed Information Delivery System. The Distributed Information Delivery System (DIDS) project is investigating and developing the technology for delivery of full-text databases in low-cost microprocessor-based systems. The emphasis in developing this system has been on ascertaining whether or not an efficient delivery system emulating minicomputer-based delivery of a hierarchical database can be designed using a high-level structured language and implemented in low-cost microcomputers. The initial target cost for the total system is less than $10,000, which is the approximate cost of a reasonably complete office microcomputer system.

The DIDS evaluation prototype currently consists of a PASCAL microEngine system with two 8-inch floppy disc drives, a Hewlett Packard 2645A terminal, and two floppy diskettes containing the delivery system code and the sample database (a portion of the Hepatitis Knowledge Base). The response characteristics and the user cordiality of the microprocessor-based system have been judged to be comparable to those available on a time-share minicomputer system that also accesses the Hepatitis Knowledge Base. Comparisons have indicated that the microprocessor system has implemented all the essential features of the larger system, provided adequate response time for text retrieval operations, and utilized a user-cordial screen display.

Digital Videodisc Program. The goal of this program is to allow the storage and retrieval of digital information on optical videodiscs using commercially available mastering and replication and commercially available videodisc players. The potential for inexpensive publication of machine-readable data is based on the existing commercial processes established to master and replicate videodiscs for the entertainment industry. At present, the cost of replication in quantities between 100 and 1,000 is less than $10 per disc. Another important factor is the density of digital information that may be stored on one videodisc--potentially 1 billion characters per disc. This capacity is equivalent to storing more than 1,000 novels per disc, or all of MEDLINE on one to three discs.

The LHC Videodisc Research and Development Program began in 1977. As originally planned, it had two phases:

- Phase I: Videodisc Interface Unit Development, and
- Phase II: Error Detection and Correction.

The Videodisc Interface Unit (VIU) has been developed and is being used to support the present experiments. The VIU permits high-level computer control and retrieval of specific preselected frames on a videodisc.

The research objectives of phase II are to determine the maximum density of data storage achievable, assuming no errors; identify the errors produced as a result of commercial videodisc production; and test error correction algorithms. Intraline and interline dropout tests have been performed on two sets (10 discs each) of analog discs from different masters; a third set of discs is currently being analyzed. Preliminary findings indicate that data words

stored across video lines, that is, using multiple lines, will lose a small enough number of symbols per word because of dropouts to be within practical error correction capabilities. However, some dropouts may be as long as an entire video line; intraline errors of this length will be difficult to correct.

Communications Engineering Branch

Video Processing Laboratory. The Video Processing Laboratory (VPL), a research facility within the Lister Hill Center, is being developed to support research and development in image processing technologies that will allow the use of video, audio, graphics, and textual material in the development of health information systems. Long-range program objectives that will aid the storage, processing, and transmission of health information by this facility include document image enhancement, signal format conversion, and bandwidth compression. At present, the main focus of VPL activities is the development of a facility for the premastering of videodisc materials.

As a premastering facility, the VPL houses advanced systems to store, process, assemble, and evaluate premastered video images. VPL also can capture a limited number of images and allow the simulation of segments of a videodisc before the final mastering process. The purpose of the premastering process is to enhance and assemble segments of video images, with or without narration, onto a 1-inch videotape along with the necessary control and identification signals. Enhancements include color enrichment, image identification by tilting and captions, multiple image framing, partial deletions, size reduction, changes in image orientations, superimposition of external image material, and noise reduction. These techniques provide an enriched video image for presentation to the health professional user. Examples of such presentations are illustrated information supplementing text from computer databases and a standalone video system accompanied by audio instructional material.

The premastering of single frame video material is in the developmental stage. The VPL is used to evaluate image quality and to quantify image degradations during the premastering processing. Identification of the sources and levels of signal degradation is critical to developing and evaluating techniques to enhance and restore degraded images and to reduce noise. This facility is a prototype for future operational systems and will consequently have a major impact on the research and development of new methods for creating and revising audiovideo materials for interactive educational systems.

Electronic Document Storage and Retrieval. The long-range goal of this program, a collaborative effort with NLM's Library Operations, is to develop an electronic document storage and retrieval (EDSR) system that will support the Library's mission as a national archive for biomedical literature (print and nonprint). The first phase, now underway, is to design, develop, and evaluate a prototype system to electronically capture, store, retrieve, and display documents acquired by NLM. The program eventually will allow for the entry of machine-readable information.

The first phase of this program includes the design and development of a prototype system with features such as high-resolution document scanning capability, high-density storage capacity (implemented by magnetic discs), rapid

retrieval capability, and the capability for high-resolution soft-copy and hard-copy display.

The second phase will expand the prototype system to include an archival storage capability implemented by an optical disc system. The projected capacity of such a system, in the neighborhood of $2 \times 10^{10}$ bits per disc, is equivalent to storage of more than 5,200 pages of journals or monographs without incorporating compression techniques. Implementing a suitable compression technique that delivers a 20:1 compression ratio, and the projected increases in optical disc storage density by an order of magnitude, will permit the online storage of about half a million pages on a single optical disc. Furthermore, the development of "juke-boxes" or disc packs to allow automatic access to multiple discs will greatly increase the online storage of library materials.

In summary, an EDSR system would (1) provide an electronically implemented archival storage capability for NLM; (2) be capable of interfacing with other automated library systems such as MEDLARS III and the Integrated Library System; and (3) permit a decrease in the ILL turnaround time between the arrival of a request for a document and its delivery.

The Wired Lister Hill Center Building. The Communications Engineering Branch supervised the installation of a coaxial cable network linking all Lister Hill Center offices, laboratories, meeting rooms, and the auditorium. The broadband channels in this network offer the potential for the internal distribution of digital data, word processing, and interoffice electronic mail; the rapid electronic distribution of documents; and high-quality video.

The next phase of this project involves the design and construction of an interactive video distribution network. Its uses will include the distribution of television from the Lister Hill Center building and auditorium, signals from the NIH cable system, and received broadcast television. These signals could be received in laboratories, conference rooms, and office areas throughout NLM and other parts of NIH.

## EXTRAMURAL GRANTS AND CONTRACTS

Ernest M. Allen, Sc.D.
Associate Director for Extramural Programs

An account of NLM's Extramural Grants Program during FY 1981 would be incomplete without a report on legislative activities to renew the Medical Library Assistance Act (MLAA). Through 15 years and five previous extensions, NLM's authorizing grant legislation has been considered by the Congress to be of unquestionable value.

However, despite the backing of the Department of Health and Human Services for a 3-year extension, and despite support by health professionals and institutions, the Omnibus Reconciliation Act (Public Law 97-35) of August 1981 substantially cut NLM's assistance programs. The law extends the programs for 1 year at a level of $7.5 million, $2.3 million less than the 1981 appropriation. Moreover, at various times during the year, four of the six grant programs were considered for repeal. Ultimately, all programs are sustained in the reconciliation agreement.

NLM takes pride in the many achievements made possible through its grant assistance, as noted in previous annual reports. They are also exceptional in that it was not necessary to increase massively the Federal investment to achieve them. In the decade of 1971-80, for example, the NIH budget in constant dollars increased 49 percent, while NLM's extramural budget decreased 15 percent.

The MLAA appropriation in 1981 provided support for 66 new grants and 72 awards for continuation of grants made in prior years. Support was also continued for nine Regional Medical Library contract awards. The total MLAA expenditure in FY 1981, was $9,830,000 (see table 14). New grant initiatives were considered and discussed by the Board of Regents, but in the absence of the stability of a longer term authority with adequate funds, their implementation has of necessity been postponed.

### Training Grants

The National Library of Medicine's Training Grants Program in health science and computer technology was begun in 1972. One of its objectives is to promote a more effective integration of computer technology into all phases of clinical medicine--teaching, practice, and research. In FY 1981, $1,307,930 was spent to support this program. Of that amount, 72 percent covered direct trainee expenses (stipends, tuition, etc.), with the remainder reimbursing the grantee institution for some of the added expenses generated as a result of the training grant.

The 10 training locations are the University of California, San Francisco; Duke University; the University of Alabama; Ohio State University; the University of Minnesota; Case Western Reserve University; the University of Missouri at Columbia; the University of Illinois; the University of Virginia; and New England Medical Center Hospital in Boston. During FY 1981, 79 individuals were supported in these training programs: 35 predoctoral students and 44 postdoctoral. Twenty-four of the predoctoral trainees were seeking a doctoral degree. Of the postdoctoral trainees, 35 were physicians.

Table 14
Extramural Grant and Contract Programs
(in thousands of dollars)

| Category | FY 1979 | | FY 1980 | | FY 1981 | |
|---|---|---|---|---|---|---|
| Research | (22) | $1,658 | (32) | $2,794 | (31) | $2,774 |
| Resource Projects | (44) | 1,735 | (26) | 1,003 | (21) | 895 |
| Resource Improvement | (34) | 284 | (47) | 593 | (35) | 747 |
| Training* | (10) | 1,472 | (10) | 1,638 | (10) | 1,308 |
| Special Scientific Projects | (7) | 215 | (6) | 143 | (7) | 289 |
| Regional Medical Libraries* | (9) | 2,848 | (8) | 2,967 | (9) | 2,999 |
| Publications* | (35) | 750 | (35) | 787 | (34) | 818 |
| TOTAL | (161) | $8,962 | (164) | $9,925 | (147) | $9,830 |

Note: Figures in parentheses refer to number of projects.

*Includes contract funding.

The National Library of Medicine hosted a meeting of the 10 training program directors in May 1981. Selected trainees from each of the programs were also present and briefly described their research activities. The occasion allowed for discussions between the visitors and the staff of the Lister Hill Center and also an opportunity to visit the Center's laboratories.

Although the role of information technology in the health sciences is rapidly expanding, the reasons that led to the founding of this training program 10 years ago are still valid. The Board of Regents, in fact, has urged NLM to help establish a professional identity for the field of medical information problem-solving that would require additional training centers, along with career development and sustained research support. The Board of Regents also urged NLM to help promote such a corrollary program, possibly in collaboration with some other component of NIH.

In addition to training grants, NLM has a contract with the Council on Library Resources to support management interns at selected major health sciences libraries. The objective of this program is to provide an experience that will qualify librarians for director-level positions. The interns supported in FY 1981 were Robert J. Sekarak, the Dana Medical Library, University of Vermont, who spent the year at the Taubman Medical Library, University of Michigan; Kenneth R. Weeks, the University of California, San Francisco, who interned at the Countway Library, Harvard University; and Joan S. Zenan, the Savitt Medical Library, University of Nevada, who trained at the Columbia University Health Sciences Library. Nine health sciences librarians have completed internships since 1979, and three of these have become library directors.

## Medical Library Resource Grants

Resource grants provide support for health sciences libraries and related health information organizations. Such libraries range in size from the small working collection of a community hospital to libraries of large academic health institutions. Resource awards are designed to ameliorate the many deficiencies found in these libraries. The fundamental theme of the resource program is to facilitate the improvement of information services to health professionals. The program gives two kinds of awards: Resource Project Grants and Resource Improvement Grants.

Resource Project Grants. Medical Library Resource Project Grants enable established health sciences libraries to undertake new services or to expand existing ones. Among the seven project grants awarded in FY 1981 (for a total of $353,433) were three to establish learning resource centers by supporting staff, audiovisual software, and equipment. These grants were to a hospital, a consortium of 15 institutions, and a center for developmentally disabled persons. In addition, Montana State University in Bozeman received 3 years of support to establish a statewide network of health sciences libraries for the purpose of sharing personnel and information resources. Another project grant was awarded to the Health and Welfare Planning Association in Pittsburgh to develop a health education materials resource center for health professionals in a 10-county area of southwestern Pennsylvania.

Resource Improvement Grants. Improvement grants assist health sciences libraries either individually or in consortia to establish basic collections of books and journals. Awards to single institutions are for 1 year in amounts up to $4,000, with a matching amount of $1,000 contributed by the institution. In FY 1981, 18 such awards for a total of $69,308 were made, all to hospitals located in primarily rural areas.

Consortium improvement grants feature 2 years of funding, with the first year devoted to planning and organizing the consortium and the second year to purchasing books and journals. Support in the first year may include the salary of a full-time employee (usually the consortium coordinator) and related planning expenses such as travel and union list compilation. Grant funds for the second year may continue the salary support and also pay up to $4,000 for each consortium member to purchase books and journals. Twelve consortium-type improvement grant awards were made during FY 1981, and these also went to institutions located in primarily rural areas.

## Special Scientific Project Grants

These awards make it possible for eminent authorities to prepare and write definitive treatises on major health topics. Grant support allows the awardees to complete the demanding work of medical scholarship in a timely way. The awards support investigators in the tasks of retrieving, organizing, and integrating enormous amounts of material scattered throughout the health literature. The resulting treatises appeal to a broad professional readership by offering a documented, authoritative interpretation of an important subject area.

The awards in this small program are made only after selective review by a multidisciplinary panel. This year, Dr. Jay Katz, Yale University Law School,

received an award for work on the ethical and legal implications of professionals' interactions with their patients or clients. Of particular interest is the comparison of the patient-physician pattern with that of the lawyer-client. Dr. Eric Cassel of Cornell University Medical College received an award to describe physician-patient interviews in terms of what physicians intend to convey and what they actually say and hear. This work should be especially interesting to those who treat patients from varied ethnic and economic backgrounds.

Research Grants

Better dissemination of health knowledge in an information society raises numerous fundamental issues about how knowledge is organized, retrieved, and used. The computer sciences and the telecommunications technologies have great potential for putting knowledge more effectively at the disposal of the health professional. However, realizing this potential remains a great challenge. Although NLM's research grant authorities make possible a variety of research, development, and demonstration activities, there are actually two major identifiable programs.

- Computers-in-Medicine. An outcome of recommendations by a distinguished task force, this program includes studies in knowledge representation, clinical problem-solving and decisionmaking, database management, and attributes of medical language.

- Librarianship and Health Information Science. Research in this area includes studies and applications of techniques for better organizing, retrieving, and disseminating of recorded health knowledge, as well as investigations of new roles for information providers and better ways to use available information services.

Research in these areas calls for talented, highly skilled workers who combine an understanding of medicine and health care with a thorough grounding in information-related disciplines. Such persons are rare, and institutions willing to support their research with adequate facilities and resources are not common. Accordingly, to encourage growth in this field, the Research Grant Program supports not only senior-investigator-initiated projects but also offers special awards to favor the younger or beginning investigator. Special awards for this purpose include New Investigator Research Awards, of 3 years' duration, for investigators whose doctorates were earned within the past 5 years; and Research Career Development Awards, covering salary only, to investigators with more than 3 years' experience after the earned doctorates who demonstrate a clear potential for further professional contributions. These awards encourage institutions to allow the awardee to conduct full-time research.

During the year, NLM's research grant support included 5 Program Projects, 21 investigator-initiated projects, 7 New Investigator Research Awards, and 3 Research Career Development Awards. The total FY 1981 expenditure under the Medical Library Assistance Act in the research area was $2,774,000.

## Publication Grants

The Publication Grant Program provides selective, short-term support for a variety of nonprofit publications in the biomedical sciences, thus expediting access to health information for U.S. health professionals. Both domestic and international resources are used, the latter derived through Special Foreign Currency Agreements and collaborative, bilateral programs in several countries. The Library's international biomedical publication program, authorized under Public Law 480 and administered by the International Programs Branch of the Extramural Programs Division, is described in the next chapter.

Projects prepared and/or published under the domestic program include critical reviews and monographs on special areas of medical research and practice; publications on biomedical communications and in library and information science; secondary literature tools in the health sciences (biomedical handbooks, guides, bibliographies, etc.); proceedings of scientifically significant symposiums; temporary support for periodical publications; translations of current foreign biomedical monographs; and scholarly research monographs in the history of medicine.

During FY 1981, 34 publication grants were awarded, totaling $818,303. Of these, 14 were new awards. The continuing emphasis on high-quality but low-cost projects that are scheduled for early publication is reflected, in part, in the average amount of a publication grant in FY 1981, which was $24,068, including both direct and indirect costs. Over 50 percent of the funding-supported publications related to health-care delivery.

Among the studies published in FY 1981 that had received support in the Publication Grant Program was Dr. Ching-Chih Chen's Health Sciences Information Sources (Cambridge, MIT Press, 1981). This volume is a large reference guide for health sciences librarians, library school students, physicians, and others relying on health sciences library resources. The Library's continuing interest in the history of medicine is reflected in Dr. Saul Jarcho's The Concept of Heart Failure: From Avicenna to Albertini (Cambridge, Harvard University Press, 1980). Dr. Jarcho's book is the product of many years of historical research into the origin of concepts of congestive heart failure.

Interest in the ethics of medical practice and biomedical research was evidenced in the support and publication of volume 6 of the annual Bibliography of Bioethics (Detroit, Gale Research Company, 1980). This bibliography is sponsored and prepared by the Center for Bioethics, Kennedy Institute of Ethics at Georgetown University. It represents the first attempt to identify the central issues of bioethics, to develop an indexing language appropriate to the field, and to provide comprehensive, cross-disciplinary coverage of current English-language materials on bioethical topics. (For a complete listing of books, periodicals, and journal articles received in FY 1981 resulting from NLM publication grants, see appendix 2.)

## INTERNATIONAL ACTIVITIES

Mary E. Corning
Assistant Director for International Programs

The international programs of the National Library of Medicine illustrate the impact of a national resource on international communications. The programs are based on cooperative undertakings and are a natural extension of domestic functions.

### International MEDLARS Agreements

Table 15 lists the existing non-U.S. MEDLARS Centers and the nature of their access to the system. The new center at Colombia was established in 1981. The participating organizations in Colombia are the FUNDACION OFA para el avance de las ciencias biomedicas and the Fondo Colombiano para Investigaciones Cientificas y Proyectos Especiales (COLCIENCIAS). One of the objectives of FUNDACION OFA is the improvement and accessibility of information for the biomedical professions and the improvement of the quality of education in the health sciences. An agreement also was reached between the National Library of Medicine and Kuwait's Minister of Health for the future implementation of a MEDLARS arrangement.

Table 15
NLM MEDLARS Partners

| Tapes | Tapes/Software | Online NLM |
|---|---|---|
| Germany* | Australia | Canada |
| Japan | PAHO | Colombia |
| | Sweden* | France |
| | United Kingdom* | Italy |
| | | Kuwait |
| | | Mexico |
| | | South Africa |
| | | Switzerland |

*Supplemental online access.

### Cooperation With the Chinese Academy of Medical Sciences

The National Library of Medicine has a cooperative quid pro quo arrangement with the Chinese Academy of Medical Sciences, Institute of Medical Information. This arrangement was implemented in February 1981 with the arrival of Dr. Shi Ji-zhao and Dr. Ma Jixing to work for approximately 5 months on the Chinese traditional medical literature in the NLM collection. Dr. Shi and Dr. Ma identified, verified, and described about 800 items, and the information they developed is being entered into the Library's cataloging records and the computer system and made available to scholars. In return for the work of

Dr. Shi and Dr. Ma, the Library will provide two Chinese with training in modern medical library management and indexing.

Dr. Shi is an internist at the Capital Hospital (formerly of Peking Union Medical College), which is associated with the Chinese Academy of Medical Sciences. Her experience has been in clinical work, teaching, research, and medical administration. She has been active in cooperative research programs that have combined both traditional and Western medicine. Dr. Shi is a member of the Chinese Medical Association, the editorial board of the Journal of Chung Hua Internal Medicine, the State Scientific Technological Community, the Board of Regents of the Chung Hua Chinese Traditional Medical Association, the Science Committee of the Chinese Academy of Medical Sciences, and the editorial board of Acta Academiae Medicinae Sinicae and has published extensively on hepatic diseases.

Dr. Ma is a traditional Chinese medicine physician who is currently an Associate Research Fellow in the Department of Medical History and Literature of the Academy of Traditional Chinese Medicine. He has conducted research in Chinese medical history, the history of acupuncture and moxibustion, the history of Chinese materia medica, and ancient Chinese medical literature. Dr. Ma has been a professor at the Advanced School of Traditional Chinese Medicine in Peking, a member of the editorial committee of the Journal of Traditional Chinese Medicine, and was formerly editor-in-chief of the Chinese Quarterly of Acupuncture and Moxibustion. In addition to many journal articles, he has written numerous monographs, including "Histology and Anatomy" and "Concise Acupuncture, Moxibustion, and Orthopedics," and has contributed to "Medical Bamboo Slips of Han Dynasty Unearthed in Wu Wei," "Ancient Chinese Medical Gymnastics" (silk scroll unearthed in Ma Wang Dui), and "Prescriptions for 52 Kinds of Diseases" (silk scroll unearthed in Ma Wang Dui). Dr. Ma has also conducted research on historical relics, including ancient scrolls, medical instruments, and medical stones.

## Collaboration with the World Health Organization

The National Library of Medicine and the World Health Organization (WHO) Special Program for Research and Training in Tropical Diseases continued to cooperate in the publication of the Quarterly Bibliography of Major Tropical Diseases. This bibliography is prepared from the MEDLINE system, and WHO distributes it to scientists in institutions in tropical countries. The diseases included in the bibliography are those identified by WHO for special attention: filariasis, leishmaniasis, leprosy, malaria, schistosomiasis, and trypanosomiasis. WHO distributes approximately 5,000 copies of the quarterly publication.

The experimental program between NLM and WHO for the provision of MEDLARS searches and interlibrary loans (photocopies of journal articles) to developing countries of the WHO regional offices in Africa, Southeast Asia, the Eastern Mediterranean, and the Western Pacific continued. Under these arrangements, WHO has supported the equivalent of one and one-half persons in residence at NLM. The level of activity is modest and it does respond partially to existing needs; however, it also emphasizes that developing countries continue to have significant needs for biomedical and health information that remain unsatisfied.

## Collaboration With the Pan American Health Organization

The Library's Assistant Director for International Programs is a member of the Scientific Advisory Committee for the PAHO Regional Library of Medicine (BIREME). BIREME is unique in the world as a regional resource. In the past year, it responded to 43,000 interlibrary loan requests, provided services from its subset of the MEDLINE database, held two training courses for Latin Americans, produced a Latin American Index Medicus, and fostered networking within Brazil and among Latin countries.

## Special Foreign Currency Program

The Library's Special Foreign Currency Program, authorized by Public Law 83-480, as amended, made 21 new awards during FY 1981. Under this program, appropriations of U.S.-owned local foreign currencies are available for scientific writing projects in cooperating countries, including Egypt, India, Israel, Pakistan, Poland, and Yugoslavia. The program is currently funded also through collaborative, bilateral agreements in Israel and Poland. This program enhances the Library's ability to procure and disseminate published information important to the progress of biomedical sciences and public health, using foreign scientific personnel and resources.

The projects are multiyear; during FY 1981, there were 89 active projects, totaling an equivalent of $1,202,123 in foreign currencies. Over 50 percent of the program is currently carried out in Egypt and Poland, and about 20 percent in India. New critical reviews and monographs in health fields constitute 45 percent of the projects; foreign translation projects represent another 28 percent. Of these 89 active projects, 25 are translations from Russian, and 11 are from German.

Projects in the six cooperating countries have included the preparation of critical reviews of biomedical research and practice; the translation of significant current and historical monographs in the biomedical sciences; publication of major international symposium and conference proceedings; and publication of authoritative bibliographies and other literature tools in special public health fields. These projects span a broad subject range, including history of medicine, cancer, heart disease, psychology, and physiology. Examples of new projects begun in FY 1981 are a translation of a Russian study on the neurophysiological investigation of a systems mechanism of behavior; a historical study, by a leading Egyptian scholar, of the health of the pharaohs; and the publication of a bibliography on ticks and tickborne diseases.

Among the studies published in FY 1981 under this program was The Effects of Atherosclerosis (New York, Pergamon Press, 1981). This book is the second major translation produced under the collaboration on cardiovascular disease within the U.S.-U.S.S.R. joint program and the NLM Special Foreign Currency Program. The book presents original research on atherosclerosis conducted in the Soviet Union and was edited by Dr. James Muller, Harvard Medical School, and printed in India. Another significant study is Dr. Ewa Osetowska's Tissue Neuropathology of Viral and Allergic Encephalitides (Warsaw, Poland, 1980; distributed through the NTIS). This book is a critical review of the world literature on the pathomorphology of viral and allergic encephalitides, with some emphasis on the types of encephalitis with which the late author worked

personally in Poland as founder and director of the Department of Comparative Neurology at the Polish Academy of Science. (For a complete list of books and articles resulting from the Special Foreign Currency Program received in FY 1981, see appendix 3.)

Visitors and Specialized Training

NLM continues to receive about 1,000 international visitors yearly. In FY 1981 individuals came from 50 countries. Interests included biomedical and health research, education, health-care information, library science, biomedical and health information programs, and national resource establishment. Formal delegations were received from France, Japan, Nigeria, India, the People's Republic of China, and Sweden. Special training programs were arranged for Mrs. Christine Deschamps, Librarian-in-Charge, Bibliothèque Interuniversitaire de Médecine, Paris, France; Mlle. Annick Le Cann, Conservateur, Bibliothèque de l'Université, Nice, France; Mr. C. Dabral, Deputy Director, Directorate General of Health Services, Ministry of Health and Family Welfare, New Delhi, India; Dr. B. S. Jangi, Editor and Overall In charge of Life Sciences Journals of CSIR, New Delhi, India; and Mrs. Liliane Frenkiel, Director, Medical Library, Ben Gurion University of the Negev, Beer-Sheva, Israel.

Training in connection with cooperative MEDLARS agreements was provided to Dr. Jose Macias, Mexico; Miss Fleurette Gregoire, Canada; Mrs. Maria Elena Piegas, BIREME; Miss Yolanda de la Carrera, Colombia; and Messrs. Habia Al-Faras and Mohammad Al-Hamad, Kuwait.

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Videotapes

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