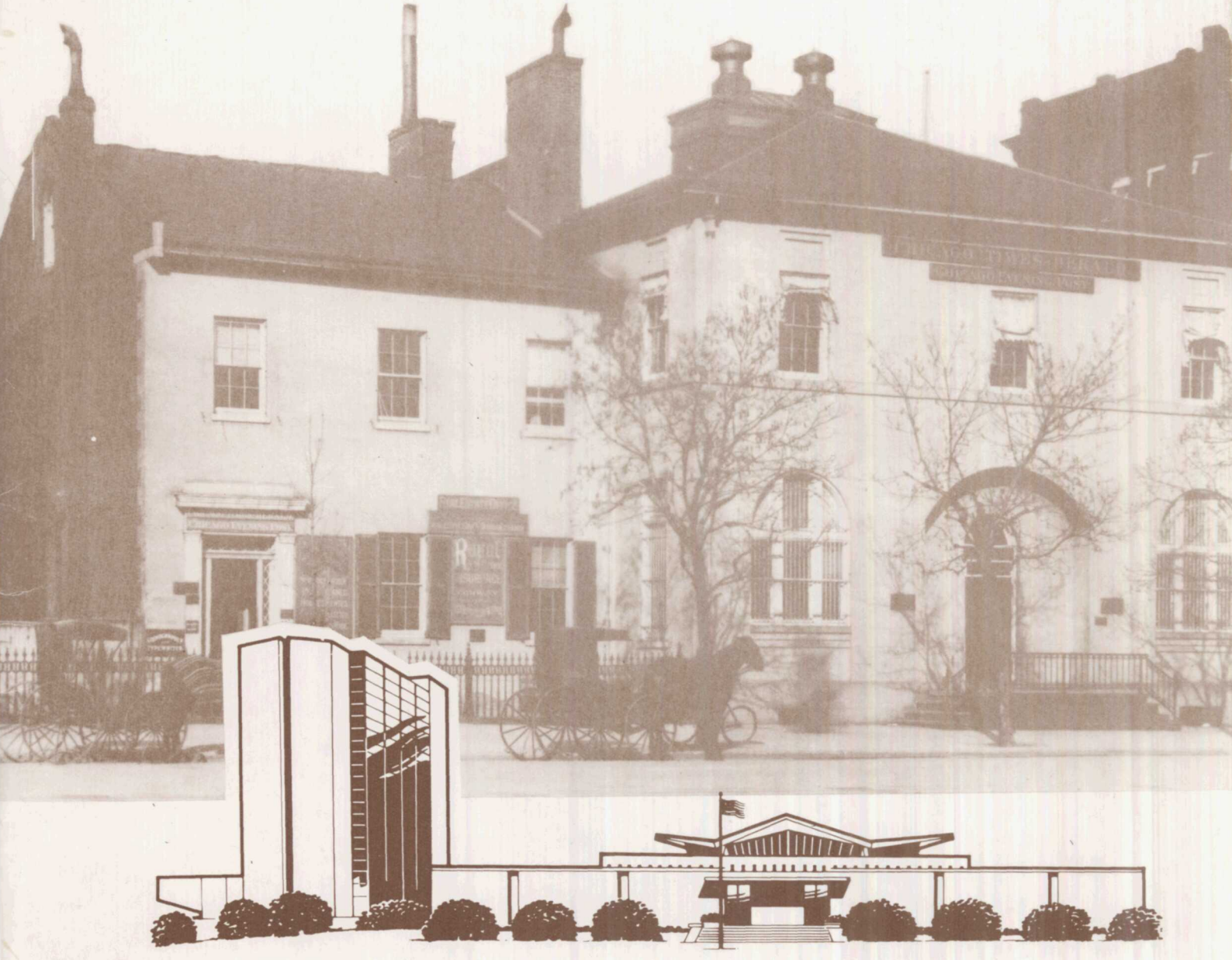
NATIONAL LIBRARY OF MEDICINE

PROGRAMS AND SERVICES FISCAL YEAR 1980



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
National Institutes of Health

COVER: The Riggs' Bank Building at Fifteenth Street and Pennsylvania Avenue, N.W., in Washington, D.C., was the site of the Library of the Army Surgeon General's Office from 1862 to 1866. The collection remained a part of the military establishment until 1956 when legislation sponsored by Senators John F. Kennedy and Lister Hill transferred it to the Department of Health, Education, and Welfare and created the National Library of Medicine. The Library now occupies two buildings on the campus of the National Institutes of Health in Bethesda, Maryland. This photograph dates from the 1890's.

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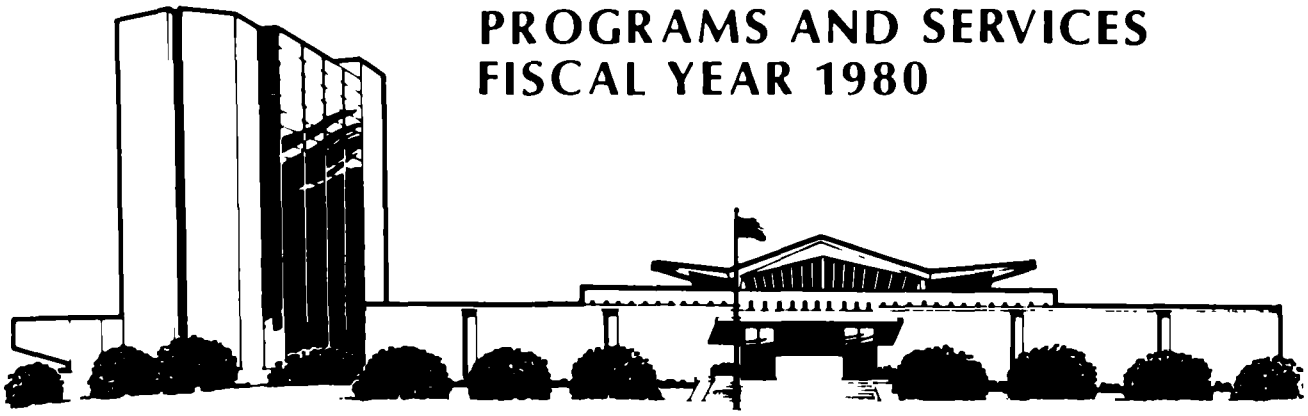

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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National Library of Medicine
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Preface

Academic, industrial, governmental, and health professionals continue to make heavy use of NLM's library and information services. We are gratified that increased fees for specialized information have not inhibited requests for service The effective work of the MEDLARS III Task Force which defined the functional requirements of NLM computer-based technical processing and library services deserves special recognition.

This was the year that the Library finally realized its ambition of more than a decade to erect a specialized communications center to accommodate many of its diverse programs. The 10-story Lister Hill Center building was dedicated on May 22, 1980, in a ceremony that was inspiring and dignified. We owe a debt of gratitude to the many people who have worked long and hard to see the new Center completed, particularly staff of the Library, the Board of Regents, officials of the National Institutes of Health, supporters within the Congress, and the many friends of this institution in the health-science community at large. We hope to repay this debt and the trust placed in the Library by using the new facility effectively to develop improved biomedical communications services that will ultimately benefit all Americans

Martin M Cummings, M D

Director
National Library of Medicine

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From Dioscorides, *Virtutum simplicium medicinarum liber*, Lyons, 1512.

Policy and Direction 1

Philip D. Amoruso, Executive Officer

The critical importance of managing an enterprise as complex and many-faceted as the National Library of Medicine (NLM) was highlighted this year as never before. Beginning with the introduction of MEDLARS in the early sixties, there has been a gradual but steady accretion of responsibilities and programs that have changed the nature of the institution. The cumulative impact of these changes was literally made concrete this year with the completion, dedication, and occupation of the Lister Hill Center building.

The task that confronts the Library's managers today is how to coordinate the many elements of NLM so that they work together to achieve the Library's goal. Simply stated, that goal is to collect, organize, and make available—as expeditiously as possible—published knowledge in the health sciences. In a simpler era, this meant purchasing books and journals, indexing and cataloging their contents, and making them available on interlibrary loan. It is much more than that today.

Managing people and money to accomplish goals is a challenging task in a national organization with such wide-ranging responsibilities as research and development, audiovisual communication, grants management, the provision of specialized information services in areas such as toxicology/pharmacology, and the operation of a large and sophisticated computer system. These programs must be managed so that they complement NLM's venerable role as a repository for and source of the world's scientific and scholarly biomedical literature. More than this, however, it is the task of those who direct these programs to envision the greatest potential for the communication of biomedical knowledge and then to strive to achieve that goal.

The colocation of all NLM programs in a single "communications complex" on the National Institutes of Health campus will be of inestimable help. The variety of staff now assembled there is astonishing: In addition to medical librarians are education specialists, computer programers, historians, systems designers, audiovisual technicians, grants management specialists, physicians, indexers, toxicologists, and many others. As the Library develops its plans to expand its computerized library processing and network services (MEDLARS III), and as it tests new methods to capture, store, and disseminate knowledge to health practitioners, this wealth of talent will be invaluable.

Board of Regents

Another managerial element of great importance to NLM is the role of the Board of Regents as its members evaluate programs and recommend policy. Besides reviewing grant applications this year, the Regents studied a number of vital issues affecting the Library and its services: The efforts of NLM to procure new computers; an evaluation of the Regional Medical Libraries (RML's) and the initiation of competition for RML contracts; and the development of MEDLARS III.

The highlight of the three meetings of the Board of Regents in FY 1980 was the dedication of the Lister Hill Center Building in conjunction with the meeting on May 22.

The terms of three members expired in August 1980: S. Richardson Hill, Jr., M.D., Doris Merritt, M.D., and Cecil Sheps, M.D. The Secretary of Health and Human Services named three new members: Gwendolyn S. Cruzat, Ph. D., Professor of Library Science, University of Michigan; William D. Mayer, M.D., President of the Eastern Virginia Medical Authority; and Charles E. Molnar, Sc. D., Director of the Computer Systems Laboratory at Washington University in St. Louis.

The Board unanimously elected Nicholas E. Davies, M.D., as Chairman of the Board for 1980-81 to replace Dr. Hill, whose term had expired.

Lister Hill Center Building Dedication

*We must develop a communications system so that the miraculous triumphs of modern science can be taken from the laboratory and transmitted to all in need.**

Front view of the Lister Hill Center building, dedicated on May 22, 1980.

May 22, 1980, marked a milestone in the history of the National Library of Medicine as its new Lister Hill National Center for Biomedical Communications was formally dedicated. Previously separated divisions of the Library have now come together for the first time, marking a significant opportunity for mutually beneficial interaction. The Center houses a number of the Library's programs; a major component, of course, is the Lister Hill National Center for Biomedical Communications, the research and development component of NLM. This division began organizationally at NLM in 1968, the result of the same resolution that authorized the building. Initially housed within the existing Library building, the Center has pioneered in the application of the latest computer and communications technology to the problems of information transfer.

In addition to the Lister Hill Center, the new building also houses the closely related programs of the National Medical Audiovisual Center (NMAC). Originally a part of the Center for Disease Control, NMAC was transferred organizationally to the Library in 1967. However, because of space limitations in Bethesda, NMAC had remained in Atlanta, Ga.

Other Library divisions in the new building include programs that either began or were greatly expanded after the original NLM building was occupied in 1962. These include Extramural Programs (first authorized in 1965) and the Toxicology Information Program (1966). The MEDLARS operation—the computers and the network management personnel—are also part of the new facility. In addition, one floor of the building has been turned over to the National Institutes of Health's Fogarty International Center.

*Lister Hill, 1965. These words are engraved in marble in the lobby of the new building, above a bronze bust of Senator Hill.

Secretary of Health and Human Services, Patricia R. Harris, delivered the dedication keynote address. Other participants in the ceremony are, from left, NLM Director Martin M. Cummings, M.D., the Honorable Paul G. Rogers, Lois Ann Colaianni, Under Secretary of Health and Human Services Nathan J. Stark, Assistant Secretary for Health Julius Richmond, M.D., S. Richardson Hill, Jr., M.D., and the guest of honor, Senator Lister Hill.

Some 200 invited guests participated in a full day of activities, highlighted by an afternoon address by Patricia R. Harris, Secretary of the Department of Health and Human Services (DHHS). In the morning, visitors viewed a film of the history of the Library and the new Lister Hill Center and then saw firsthand the impressive $23-million facility.

Following a special luncheon, the U.S. Navy Band's Ceremonial Unit played at the dedication ceremony, which Lister Hill himself attended. There he heard tributes paid to his leadership as the Senate's "Statesman for Health." A member of Congress for 47 years, he sponsored many of the most important pieces of health legislation enacted in this century. Among others, he cosponsored the legislation that in 1956 created the National Library of Medicine; in 1962, he gave the keynote address at the dedication of the Library building.

The audience for the dedication was composed of an impressive array of leaders in the health field: medical educators, librarians, information scientists, directors of the Regional Medical Libraries, the NLM Board of Regents, directors of the international MEDLARS centers, officials from the Department of Health and Human Services, and friends from the library and health-science community.

NLM Director Martin M. Cummings, M.D., first welcomed the guests and Lister Hill. The keynote speaker, DHHS Secretary Patricia R. Harris, was introduced by the Assistant Secretary for Health and Surgeon General of the Public Health Service, Julius Richmond, M.D. Secretary Harris spoke of the many changes in American life that have taken place since 1923, when Hill first entered Congress. She called the new building a "dramatic step toward overcoming the communications problems faced in the biomedical sciences," and "a fitting tribute to a man who cared deeply about the health of the American people."

Former Senator Hill, for whom the Lister Hill Center is named, signs the guestbook for the dedication. Looking on are the Senator's twin sister, Mrs. C. G. Laslie, and his son, L. Lister Hill, both of Montgomery, Alabama.

Following the Secretary's address, Hill heard tributes from the Honorable Paul G. Rogers, former U.S. Representative from Florida; S. Richardson Hill, Jr., M.D., President of the University of Alabama and Chairman of the NLM Board of Regents; and Lois Ann Colaianni, President of the Medical Library Association.

After a brief reception on the outdoor terrace of the new building, guests returned to the auditorium for a program of scientific papers on the theme "Perspectives in Biomedical Communications." Lionel M. Bernstein, M.D., Director of the Lister Hill Center, chaired this event, during which five leaders in communications shared their viewpoints on the field's current status, as well as its future directions, with colleagues. W.N. Hubbard., Jr., M.D., President of the Upjohn Company and former Chairman of the NLM Board of Regents, emphasized the importance of health care delivery, particularly its humanistic value and its relationship to biomedical communications. Sune Bergstrom, M.D., Rector Emeritus of the Karolinska Institutet, described the positive impact of modern information transfer in many countries and also reflected on the pressing need for improved information technologies in underdeveloped countries. Robert Wedgeworth, Executive Director of the American Library Association, detailed the important and changing role of libraries in biomedical communications.

Two final papers provided perspectives on current and future information technologies with their wide-ranging impact on information transfer. Lewis Branscomb, Ph. D., Vice President and chief scientist, IBM Corporation, discussed "Working Smart: New Roles for Computers," and William O. Baker, Ph. D., Chairman of the Board of Bell Laboratories, spoke on "The View from the Field of Information Science." The Library plans to publish these five papers in 1981.

Financial Resources

The National Library of Medicine's FY 1981 appropriation of $44,389,000 provides $389,000 more than that of FY 1980. NLM thus will be able to maintain its basic library services, enhance its research and development program by taking advantage of the capabilities offered by the new Lister Hill Center building, and continue to develop a more fully automated library information system, MEDLARS III. Table 1 shows the budget allocation for FY 1980.

Table 1
Financial Resources and Allocations
FY 1980
(in thousands of dollars)

Amounts available for obligation	
Appropriation, NLM	$44,000
Less: Enacted rescission	21
Plus: Reimbursements	2,374
Total	46,353
Amounts obligated by Extramural Programs	9,925
Amounts obligated for direct operations	
Lister Hill National Center for Biomedical Communications	5,714
National Medical Audiovisual Center	4,450
Office of Computer and Communications Systems	6,228
Library Operations	10,806
Toxicology Information Program	4,140
Review and Approval of Grants	1,858
Program Direction	3,232
Subtotal, Direct Operations	36,428
Total	$46,353

Personnel

During FY 1980, the NLM personnel office concentrated its efforts in two areas: Completing the transfer of functions of the National Medical Audiovisual Center (NMAC) from Atlanta, Ga., to Bethesda, Md., and emphasizing recruitment efforts to fill vacant positions that resulted both from the NMAC transfer and the hiring freeze imposed at the end of FY 1979.

The first 6 months of FY 1980 saw NMAC personnel staff helping employees who did not want to transfer to Bethesda find other positions. For transferring employees, the personnel office scheduled various seminars and workshops regarding the move.

The NLM position ceiling was reduced from 503 to 468 in FY 1979, a reduction of 35 positions. In March 1980, DHHS restored 315 positions to the NIH personnel ceiling; 27 of these were allocated to NLM. The NLM authorized ceiling is now 495, the same as the budgeted ceiling; however, recently imposed limitations on hiring are creating serious problems in filling all of these positions. As shown in Table 2, the present onboard strength is now only 428.

In March 1980, NLM initiated a work-study program with Montgomery College. This federally funded program will provide for up to six students who require financial assistance to remain in school; the students will work in various areas of the Library.

Staffing Activities

Charles N. Farmer, Jr., retired as Director of the National Medical Audiovisual Center in February. Farmer was cited by the NLM Board of Regents in January for his dedicated service to NMAC and to the Library. **William G. Cooper,** Ph. D., Associate Director for Planning, has served as interim Acting Director for the Center.

Donald R. Buckner, Ed. D., formerly with the Health Resources Administration, DHHS, was appointed Chief of the Materials Development Branch, NMAC. **Stewart Rowberry,** D.D.S., the former Chief, retired from the Commissioned Corps in March 1980.

Warren F. Seibert, Ph. D., was appointed Chief of the Educational Research and Evaluation Branch, NMAC. He had been Professor of Education and Engineering Education at Purdue University before coming to NMAC. **Richard Lasco,** Ph. D., who previously headed the Branch, transferred to the Center for Disease Control in Atlanta.

Linda W. Kudrick, Assistant Head of the Selection and Acquisitions Section in Library Operations, was selected as Chief of the Materials Utilization Branch, NMAC. **Carl Flint,** the former Chief, retired from Government service in February 1980.

Betsy L. Humphreys, former Assistant Head of the Serial Records Section, was appointed as Deputy Chief of the Technical Services Division in Library Operations. She replaces **Elizabeth L. Myers,** who accepted a position with the University of California.

Bernard G. Silverstein was appointed Chief of the MEDLARS Support Branch in the Office of Computer and Communications Systems. He had been with the Health Care Financing Administration, DHHS. **Joseph Hutchins,** former Chief, resigned from Government service.

Thomas S. Reed, formerly an administrative officer with the National Cancer Institute, NIH, was appointed Chief of the Office of Personnel and Management Analysis. **James J. Hartman,** who had headed that office, accepted a position with the National Technical Information Service, Department of Commerce.

Honors and Awards

NIH Merit Awards for 1980 were presented to **Dorothy T. Hanks,** History of Medicine Division; **Julia F. Sollenberger,** Cataloging Section; **Norman L. Osinski,** Office of Contracts Management; and **Robert B. Mehnert,** Office of Inquiries and Publications Management.

Table 2
Budgeted Personnel Ceilings

Program	*FY 74*	*FY 75*	*FY 76*	*FY 77*	*FY 78*	*FY 79*	*FY 80*	*FY 80**
Office of the Director	11	9	10	12	14	12	15	(17)
Office of Inquiries and Publications Management	5	5	5	5	5	5	5	(5)
Office of Administration	36	34	35	35	38	38	40	(40)
Office of Computer and Communications Systems	51	52	54	52	51	51	52	(51)
Extramural Programs	27	22	24	27	25	25	24	(23)
Lister Hill National Center for Biomedical Communications	20	22	24	24	35	30	46	(34)
Specialized Information Services	17	17	18	17	18	19	22	(19)
National Medical Audiovisual Center	100	101	101	88	88	76	74	(37)
Library Operations	199	196	201	212	221	212	217	(202)
Total	466	458	472	472	495	468	495	(428)

*Actual onboard strength.

Tamas E. Doszkocs, Ph. D., Chief of the Technical Services Division, received the 1979 NLM Regents Award for Scholarship or Technical Achievement for his technical creativity in developing two experimental online bibliographic search tools.

John B. Blake, Ph. D., Chief of the History of Medicine Division, was awarded the William H. Welch Medal by the American Association for the History of Medicine. He was recognized for his valuable scholarly contributions to the history of medicine.

The **National Library of Medicine** received the Edward R. Loveland Memorial Award for the institution's distinguished contribution in the health field from the American College of Physicians. NLM Deputy Director for Research and Education, Harold M. Schoolman, M.D., accepted the award on behalf of the Library.

Equal Employment Opportunity

In FY 1980, the Library established and filled three career-ladder training positions for its employees: Preliminary Cataloger; Computer Aide-Technician; and Technical Information Specialist. These positions represent implementation of Phase I of the Equal Employment Opportunity (EEO) Advisory Committee's recommendations that all major program areas establish competitive mobility opportunities for employees in positions with limited potential for advancement. Later, Phase II will provide similar opportunities in the remaining areas of the Library.

In preparation for implementation of this career development program, the personnel office conducted several workshops on "How To Prepare an SF-171," so that employees could prepare the best applications possible. Approximately 115 employees attended several sessions, one of which was attended by a sign language interpreter for hearing-impaired employees.

In a continuing effort to make the Library Associate Program better known, particularly to minority library students, NLM sent staff member Sam Dove on a recruiting trip to colleges and universities. The trip, together with advertisements in publications directed toward minority readers, resulted in a significant increase in the number of minority applicants for the program this year.

Modernization

The congressional appropriation for construction of the Lister Hill Center included funds to modernize and refurbish the Library building. Architectural and engineering plans have been developed by the firm of McLeod, Ferrara, & Ensign, with the assistance of NLM staff. The contract for the renovation work, projected to require 20 months for completion, will be awarded in 1981.

MEDLARS III

Much planning for MEDLARS III was accomplished in FY 1980. This comprehensive automation program will serve the Library's operational and service requirements for the 1980's. The new system is intended to improve, extend, and integrate internal operations (such as technical processing of books and journals) as well as external network responsibilities. In this regard, MEDLARS III will provide new capabilities to help the Nation's health-science libraries create bibliographic records, retrieve bibliographic and text information, have access to national holdings and location information, and order documents on interlibrary loan.

After the MEDLARS III concept was approved in principle by the NLM Director and Board of Regents, the MEDLARS III Task Force began refining the concept document and distributing it to members of the health-science library community. A series of meetings was arranged to discuss and solicit comments on the proposed MEDLARS III capabilities. The first presentations were made to the Association of Academic Health Sciences Library Directors in November 1979, and to a joint meeting of the Medical Library Association (MLA) Executive Committee and the MLA/NLM Liaison Committee in December.

Review of the documentation for the proposed functional capabilities of MEDLARS III showed the Task Force that the proposed system will have a major impact on computer workload. Thus, a preliminary estimate was prepared so that MEDLARS III requirements could be taken into account in any new computer procurement.

Developing the functional statements themselves was a major undertaking and involved intensive activity, not only by Task Force members but by many NLM staff members assigned to prepare sections of the requirements in their areas of expertise. To accelerate development of the detailed functional specifications and also to ensure consideration of other viewpoints, the group called on outside consultants. A senior adviser assisted in refining the concepts and documentation for two major review meetings held in February, the first with a group of hospital librarians, the second with a group of external expert consultants with strong library systems orientation.

Task Force members visited several sites with systems of potential applicability to MEDLARS III. One such system (in the area of technical processing) is now being used experimentally from a remote terminal at NLM. This test is only one facet of a comprehensive analysis and evaluation of candidate software capabilities before the design of MEDLARS III begins.

Although design and implementation will require a multiyear effort, MEDLARS III will be phased in incrementally, with high priority given to automated technical processing. To the extent that the NLM is already in the process of developing a national serials holdings data base, closing the card catalog, and improving the ELHILL retrieval system, MEDLARS III implementation has already begun.

Regional Medical Library Program

The Regional Medical Library (RML) program is a national network of 11 regional libraries, more than 100 resource libraries, and approximately 3,000 basic units (e.g., hospital libraries) coordinated by the National Library of Medicine. The network provides access to information in support of health services delivery, education, and research. Supported by 10 contracts (NLM functions as the 11th RML), network libraries share their resources through document delivery, bibliographic access to journal and monograph information, and cooperative acquisitions and cataloging. Regional libraries also promote network participation through consultation, training, workshops, and continuing education programs.

Each of the 11 RML's coordinates information delivery services within its own region and cooperates with libraries throughout the network to provide nearly 2 million interlibrary loans annually. These loans facilitate and expedite the provision of critically needed information to the many health professionals who request the service.

During FY 1980, nearly $3 million was awarded to the regional and subcontracting resource libraries to operate RML programs. Approximately 38 percent was used to support document delivery activities; another 14 percent went for other direct services to libraries.

RML Contracts

During FY 1980, NLM issued competitive contract requests in each of the regions under contract. Eight awards were made; contracts for Regions V and VI will be awarded in FY 1981. Seven incumbent institutions received awards; in the Midwest Region (VII), the University of Illinois (Chicago) was named RML, replacing the John Crerar Library.

The new contracts emphasized improvements in network performance, efforts to reduce duplicative processes, greater local self-sufficiency, and continued program evaluation. To achieve greater compatibility of document delivery data, new data collection forms and specific performance indicators were included as part of the contracts. And, in response to a desire to better serve the needs of all segments of the health-science community, many RML advisory committees are being restructured to include more representatives from basic unit institutions.

In cooperation with the Medical Library Association this year, NLM personnel trained catalogers from each region so that they can review the *Anglo-American Cataloging Rules* (AACR2) for other librarians in their regions before January 1981.

RML directors met twice in FY 1980, once at NLM, and again at the University of Texas in Dallas. Among the most significant network issues reviewed at the Texas meeting was NLM's development of a national document delivery plan. Cost-sharing, standardization of charges related to user fees, criteria for resource libraries, and the need for consistency in data collection and reporting were discussed. Other issues raised involved the competitive contract process, the RML evaluation, MEDLARS III, and the Integrated Library System.

Network Evaluation

During this fiscal year, NLM launched a major effort to evaluate the RML network. The purpose of this contract study is to supply the Library with data regarding the success of network libraries in providing services, in attaining optimal levels of performance, and in carrying out NLM policies. The study will also produce information to aid in determining whether regional boundaries should be changed and will examine new concepts and programs that should be considered or tested to meet RML objectives.

Region IV

Early in 1980, Region IV (Mid-Atlantic Region: District of Columbia, Maryland, North Carolina, Virginia, and West Virginia) implemented a Regional Document Delivery Plan to decentralize interlibrary loan service. Ten resource libraries are participating in the program. Backup service to the region and national network is supported by NLM contract funds. NLM is directly serving the Washington area with the assistance of the Uniformed Services University of the Health Sciences, which lends materials to local military medical installations. Other cooperative activities were undertaken this year in the areas of resource sharing, training, and online services. The region began a union list project, the first phase being the development of State union lists. The various State lists will then be linked through SERLINE to produce a union list.

Region IV's educational program continued to focus on training nonprofessional personnel in hospital and other small health-science libraries. With the completion of basic workshops on hospital library practices, reference services, technical services, and audiovisual aids, the RML is now providing selected repeat sessions on these topics.

Course development began this year to provide intermediate-level training for nonprofessionals on topics such as management and technical skills. An introduction to online services was presented in each State to inform hospital librarians of the features of the NLM online services and to stimulate their interest in becoming MEDLINE centers or accessing service through existing centers. The courses will be widely presented throughout the region in 1981.

The NLM Online Services Network had marked growth in Region IV, especially among hospitals and commercial firms (mainly those in the information industry). Many Government agencies, including additional branches of NIH and nonmedical Federal agencies, also entered the online network. At the end of FY 1980, 231 institutions in Region IV participated in the network.

Louise Darling, NLM consultant, analyzed the management policies and organization of the RML Region IV program; her study resulted in several suggestions:

- Additional RML staff for training and consultation;
- Modification of advisory structure to be more comparable to those of other regions;
- Consideration be given to relocating the RML to another institution.

Lobby Exhibits

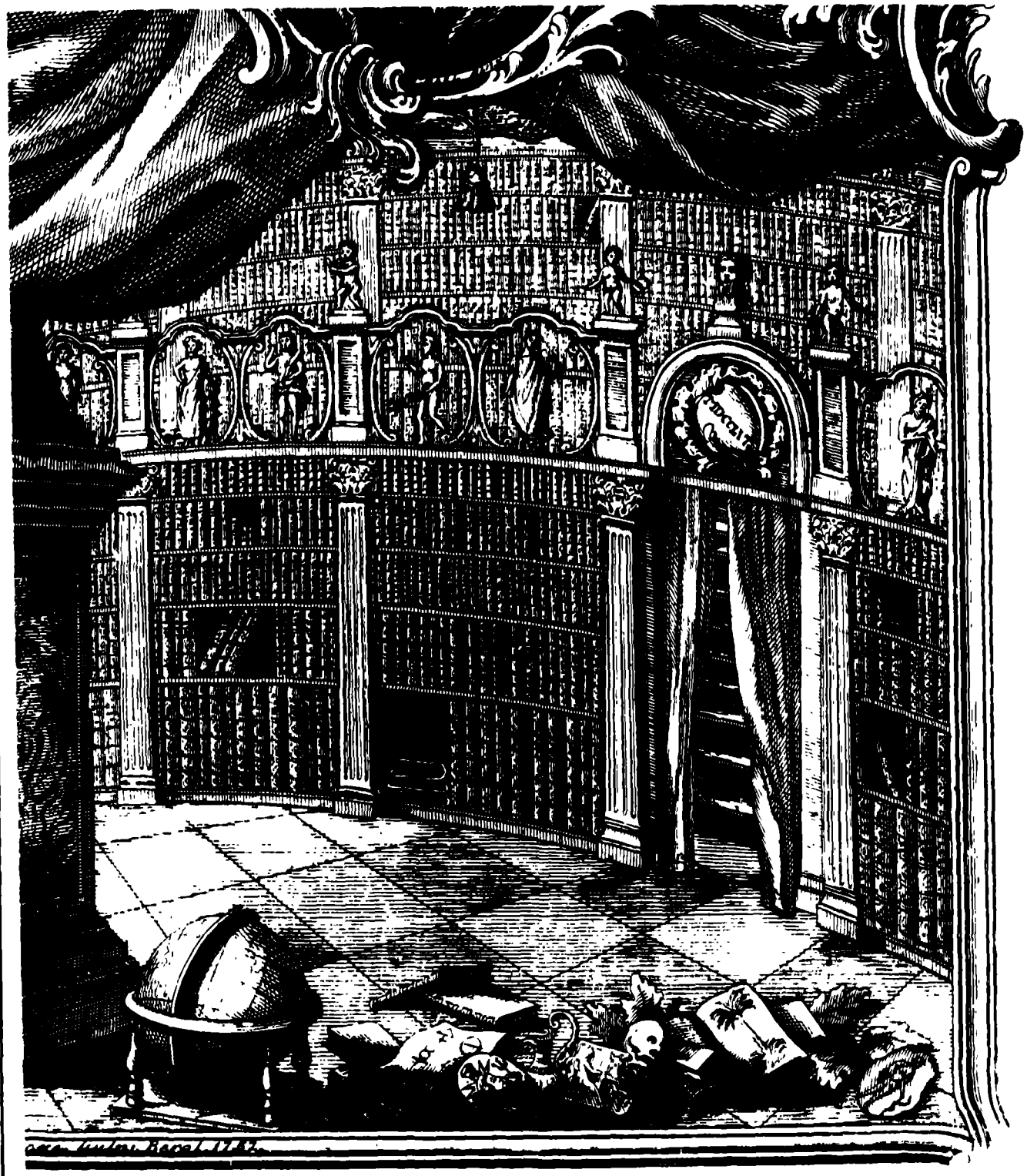
January 1980 saw the opening of a lobby exhibit of some 40 works of military art from the extensive collection of the U.S. Army Center of Military History. The subjects were scenes of military medicine from World War II, Korea, and Vietnam. The Library has a special interest in the subject of military medicine since NLM's collection began in the Library of the Army Surgeon General's Office.

NLM Director Martin M. Cummings, M.D. (center) chats with H. Corwin Hinshaw, M.D., and Mrs. Hinshaw at the May 20, 1980 ceremony opening the Library's exhibit on the 75th anniversary of the American Lung Association. Dr. Hinshaw's research in the 1940's helped usher in the era of modern chemotherapy for tuberculosis.

In April a special exhibit, "An Opportunity Lost," recounted the short history (1909-13) of the Leprosy Investigation Station on the island of Molokai. At the opening, 150 invited guests and NLM staff gathered to listen to presentations by Public Health Service Surgeon General Julius B. Richmond, M.D., Spark M. Matsunaga, U.S. Senator from Hawaii, and Jerrold M. Michael, Dean of the School of Public Health, University of Hawaii.

In cooperation with the American Lung Association, the NLM featured an exhibit in recognition of the association's 75th anniversary meeting in May. The exhibit presented an overview of our understanding of tuberculosis—from antiquity until Robert Koch's discovery of the tubercle bacillus in 1882. The beginnings of community action against tuberculosis were examined against the background of the Progressive movement in the United States, and the story of the successful founding of a single national organization to combat tuberculosis was told through the minutes of the organization.

The final exhibit of FY 1980 was installed in September and will continue through January 1981. "Los Angeles County Hospital—Through the Eyes of the Artist" features 35 paintings and drawings by artist-author May Lesser. The artist has firsthand experience with medical care for the poor at that institution.



The library of J. K. Moehsen, M.D., from his bookplate, 1757.

Library Services and Operations 2

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

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

Several key indicators of level and quality of service improved in FY 1980. Although the demand for interlibrary loans declined slightly (Table 3), there was significant improvement in the quality of services: During the last month of the fiscal year, the fulfillment rate for lending original materials rose to 88 percent, exceeding the rate for photocopy (87 percent). The potential fulfillment rate (the rate that could be achieved except for items that were out on loan or in the bindery) was 97 percent for that month, reflecting a very healthy state of NLM's monograph collection. Turnaround time was also improved: 86 percent of photocopied loans were sent out within 4 days (compared with 83 percent in FY 1979); original loans supplied within 4 days improved even more, from 51 percent in 1979 to 68 percent in 1980.

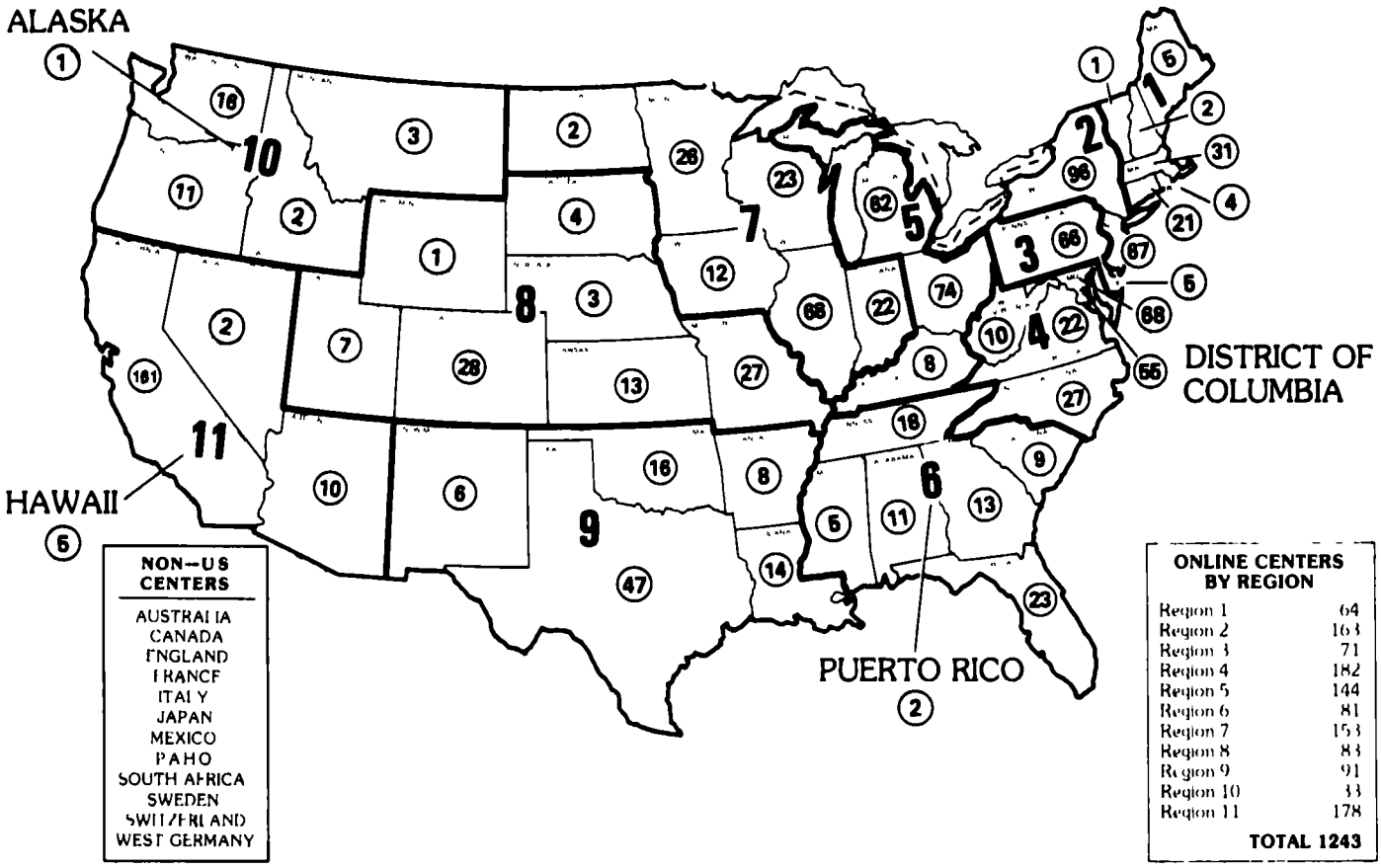
Productivity in cataloging and serial processing also improved significantly. Completed cataloging rose by 23 percent to more than 16,000 pieces (Table 4); serial pieces processed increased by 6.5 percent as shown in Table 5, which displays acquisition processing data. These increases are even more remarkable in view of the fact that both Cataloging and Serial Records were without Section heads for the entire fiscal year. In general, however, restrictions in personnel hiring, combined with heavy staff turnover in some areas (such as interlibrary loan) have strained NLM's capacity to provide services.

Furthermore, there was an unexpected surge in demand for online services at the end of FY 1979. Since the 5-year effort to procure computer hardware was delayed, it became necessary early in the fiscal year to institute a moratorium on new users, including many hospitals and other health care institutions. The Library met this problem by expanding capacity at its backup facility at the State University of New York (SUNY) in Albany.

Although online services continued to grow in FY 1980, the workload on the NLM computers actually diminished. The major increase occurred at the SUNY facility. As a result, the Library was able to lift the moratorium during the summer of 1980 and to provide access and full service to all new applicants.

Excellent progress has been made during the first year of a 3-year project to convert the entire shelf list to machine-readable form and to make the entire NLM catalog, back to 1801, accessible online. At the current rate, the project may be completed ahead of schedule. Preparations for closing the card catalog and for implementing the new edition of the *Anglo-American Cataloging Rules* (AACR2) proceeded; these will be implemented on January 2, 1981. The successful recruitment of staff to head the Cataloging and Serial Records sections should help in reaching these milestones.

ONLINE CENTERS IN THE UNITED STATES
September 1980



Bibliographic Services Division

The Bibliographic Services Division is responsible for indexing the literature for *Index Medicus*, for entering the references into the computerized data base, and for coordinating NLM's online network.

Portions of the Bibliographic Services Division moved to the Lister Hill Center building in FY 1980: MEDLARS Management Section and the Office of the Chief relocated permanently, and the Index Section resides there temporarily until its quarters in the main Library building are renovated. The move to the Center was relatively smooth, and network service was not interrupted.

Indexing

The production of *Index Medicus* continued smoothly in FY 1980, with increased emphasis on improving the quality of indexing. As shown in Table 6, during FY 1980, 266,730 citations were added to the various NLM data bases: 243,873 for *Index Medicus* (243,146 journal article citations and 727 monographic chapter citations), 15,299 for Special List indexes, 1,625 for *Index to Audiovisual Serials in the Health Sciences*, and 5,933 for *Health Literature Index Cumulated Index Medicus*, 1979, contained 226,824 citations, printed on 11,680 pages in 14 volumes.

Part of a project to improve the processing flow in indexing was a contract let for the editing and preliminary keyboarding of 10,000 citations The project is designed to (1) reduce errors in textual data by providing trained editorial staff to identify and review descriptive data in journals, and (2) provide the basis for online indexing by keyboarding the citations before indexers assign subject headings

During FY 1980, Index Section personnel, in cooperation with staff from the Office of Computer and Communications Systems, completed the development of an online file containing information on approximately 20,000 chemicals identified during the indexing of MEDLINE journals but not included in the MeSH controlled vocabulary This file, maintained as part of the online MeSH Vocabulary File, now not only provides access to information on these specific chemicals, but also permits their direct search in MEDLINE by name, synonym, Chemical Abstracts Service Registry Number, or, in the case of enzymes, by Enzyme Commission Number.

During the year, Library Associates in the Index Section performed a pilot study of the effectiveness of the Associative Interactive Dictionary in promoting indexing consistency and predicting relevant headings Initial results are promising, especially those showing the program's ability to reduce randomness in the spread of headings used to index any particular subject

The necessary software modifications, changes in indexing practice, and documentation are underway to add NIH grant numbers to the MEDLINE data base beginning with the 1981 *Index Medicus* year.

MEDLARS Management Section

The MEDLARS Management Section continues to serve the public as contact point in the day-to-day operation of the NLM Online User Network The staff answers telephone and written inquiries about the use and characteristics of the various data bases, maintains billing records, processes applications for access to the network, handles the mailing of offline prints and offsearches, produces manuals and other descriptive materials, and is responsible for all training in the use of the online system (Tables 7 and 8 indicate the increased numbers of online and offline searches, respectively, from FY 1978 to FY 1980)

Use of the online system peaked in October 1979, with a record high of 14,000 connect-hours recorded on the computers at NLM and SUNY The previous record high was 12,200 hours, recorded in August 1979 A moratorium on adding new user institutions was in effect from October 1979 through March 1980 A priority access system, implemented in March 1980, gives preference for access to direct-patient-care institutions To alleviate the strain on the present NLM IBM 370/158 computers, institutions added must access the

SUNY computer as their primary system. A larger computer system (IBM 370/168) is being installed at NLM. The number of domestic and foreign users increased to 1,520 during FY 1980.

In March 1980, a test file of a new data base—POPLINE—was added. It contains citations to population and family planning literature and has been under development for several years. It contains 70,000 records, and was developed as a collaborative effort between the NLM, the Population Information Program of the Johns Hopkins University, and the Center for Population and Family Health at Columbia University.

There are 27 recurring bibliographies currently in production; 4 NIH-sponsored bibliographies were canceled at the end of the 1979 publication year, primarily because of diminishing circulation. It is assumed that the online retrieval services increasingly meet the literature search needs of individual researchers. However, new bibliographies were begun in the fields of podiatry and family medicine, and work is in progress to develop a recurring bibliography for diarrheal diseases.

The 1980 edition of *Online Services Reference Manual* was distributed to all users in January. This revision includes descriptions of the new standardized mnemonics and a new version of the ELHILL software (ELHILL 3.2).

In 1980, a total of 707 people attended 36 initial and advanced classes sponsored by NLM to train searchers in the use of NLM's online data bases. Field classes were held in Minneapolis, Dallas, Atlanta, Salt Lake City, and Detroit. These classes provide training for replacement searchers and additional staff.

Many members of the Medical Library Association visited the Library's exhibit booth at the annual meeting in Washington, D.C. (June 1980). Staff member Barbara Rapp (left) describes two experimental aids for online searching: CITE (Current Information Transfer in English) and AID (Associative Interactive Directionary). Later in the meeting, almost 800 MLA members toured the Library and the Lister Hill Center building.

A study entitled "Evaluation of the Online Search Process" has been conducted by Cuadra Associates and King Research. The major research question concerned differences in search performance based on type of training (formal versus informal), organization type (academic, health care, or research), and searching experience on the NLM system (searches per month). This study is being reviewed by NLM staff.

In November 1979, the size of the offline prints at NLM was reduced from 10 × 11 inches to 6½ × 8½ inches to conserve paper and postage costs. The new size has received wide user acceptance. Offprints from SUNY, which does not have a printer compatible with the smaller paper, continue to be produced on large paper.

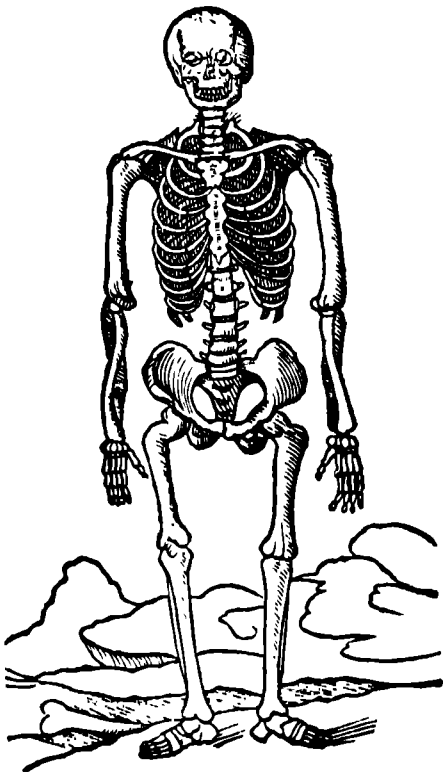
In addition to providing direct access to its online data bases, NLM extends their availability through agreements with two commercial data-base vendors. Bibliographic Retrieval Services (BRS), which has offered MEDLINE and its backfiles since 1977, has recently signed an agreement to acquire CATLINE and the HEALTH PLANNING & ADMINISTRATION data bases. An agreement signed in August 1980 with Lockheed Information Service will provide for MEDLINE, CATLINE, SERLINE, HEALTH PLANNING & ADMINISTRATION, and CANCERLIT. The MEDLARS Management Section continues to work on supplying test tapes of various data bases to Lockheed.

History of Medicine Division

The primary function of the History of Medicine Division is to support research by making available the resources from its outstanding collections. Public service—answering reference questions and filling reader requests, interlibrary loans, and photographic orders—continued to demand much of the staff's time. The Division also prepared for publication the 15th annual volume of the *Bibliography of the History of Medicine*. This volume represents the cumulation of citations indexed for 1975-79.

To help future researchers in the continual quest for new material, the Library added to its historical collections during the past year some 329 books, 51,651 manuscript items, and 479 prints and photographs (Table 9).

Among the more important books acquired was a rare edition of Galen's *De ossibus*, translated by Ferdinando Balami, published in Lyons in 1535. It includes the first printing of two figures of skeletons, which graphically demonstrate the state of anatomical art just prior to the publication of Vesalius' *De humani corporis fabrica*. There is no copy listed in the *National Union Catalog*. The same is true of Hendrik van Deventer's *Manuale operatien*, The Hague, 1701, the first Dutch edition of an important obstetrical work. The first Latin edition, published the same year, is listed in Garrison and Morton's *Medical Bibliography* (number 6253). Perhaps even more scarce, but apparently unrecognized, is a small pamphlet, *Memoires sur l' inoculation du claveau*, dated 1812, by M. Fessart. It reports an interesting experiment on inoculation of sheep pox, thus illustrating the significant relationship between human and veterinary medicine, especially in relation to the history of vaccination.



From a rare 1535 edition of Galen's *De ossibus,* acquired by the Library in 1980.

Additions to the Library's manuscript and oral history collection during the past year included papers of Dr. John Adriani and a large collection of interviews by Robert Porter with former members of the Food and Drug Administration. Other acquisitions supplemented the papers of Dr. William B. Bean previously received and the Milton J. E. Senn collection of papers and oral history interviews on the child development movement. The Library is indebted to these and other donors for their continuing generosity.

As in past years, a number of staff members have also contributed to medical historical studies by presenting lectures and papers at professional meetings at various universities and by providing consultative services to other libraries. Also during the past year, the following staff members were honored:

Peter D. Olch, M.D., was elected president of the American Osler Society and of the Halsted Society;

James J. Cassedy, Ph. D., was elected vice president of the American Association for the History of Medicine; and

John B. Blake, Ph. D., was awarded the William H. Welch Medal of the American Association for the History of Medicine.

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 loan, and is responsible for maintaining and preserving the general collection.

Interlibrary loan requests dropped slightly again this year. The first falloff, in 1978, was by more than 18,000 requests; the decline continued in 1979 with

12,000 fewer requests, and 8,000 fewer this year (Table 3). There has been a noticeable shift in the source of requests, with more coming from Regional Medical Libraries around the country and fewer from the local Mid-Atlantic Region and from abroad. The reasons for the decreases remain unknown, but the most probable causes are the startup of a Mid-Atlantic Region Document Delivery Plan utilizing resource libraries in the several States of the region to provide documents, and the charge for interlibrary loans to some countries whose programs are no longer funded by the Agency for International Development. The increase in requests from Regional Medical Libraries may be related to rising prices and decreasing budgets In a time of reduced personnel resources, the Division was able to maintain fulfillment rates and improve response times.

Requests for material from the general collection for use in the Reading Room increased more than 30,000 this year (Table 3). There was an accompanying rise in the use of coin-operated copying machines in the Reading Room, resulting in some delays for users. Much of this increase in Reading Room activity was traced to firms holding contracts to undertake literature searches and provide copies of articles to support their work. NLM directed that this practice be discontinued, and contractors were provided with information regarding interlibrary loan and commercial sources for the material needed.

In connection with the installation of a book security system, the Reference Services Division undertook the sensitizing of library materials, completing the project during the summer. All new items are being sensitized by the Technical Services Division before being placed in the general collection.

At the end of NLM's second year as a selective depository for publications distributed by the Government Printing Office, a Depository Library Inspector and a representative of the Office of the Superintendent of Documents reviewed the program. The Library received a rating of "excellent" in six of the eight criteria used for measurement, and "very good" in the other two. The Division takes justifiable pride in these ratings as reflections of the quality of service of the documents collection staff. It is an encouraging sign that the hope expressed in last year's annual report—"of making it [NLM's document collection] a model of legislative reference materials relating to the health sciences"—is on the way to realization.

During the year, the Division published the first of a series of annotated guides to the literature, intended for use by Reading Room patrons. Guides are currently available in the fields of psychology and psychiatry, pharmacology and toxicology, geriatrics, nutrition, and vital and health statistics. Guides for other subjects are in preparation. Sources listed in the guides include abstracts and indexes, directories, encyclopedias, textbooks, handbooks, bibliographies, journals, and audiovisual materials.

For years, photocopying for interlibrary loans was on 35-mm mobile cameras. Now it is mostly being performed with new models of mobile office

photocopiers that provide products of better quality than that of copies photographically reproduced. In tests conducted in the stacks, standard office copiers have performed so well that they have all but replaced the former reproduction method. A decision as to the precise make and model of copier (or copiers) awaits further testing. However, the method of reproduction has proved itself by an increase in speed of output, improvement in copy quality, and reduction in cost.

With the planned modernization of the NLM building and the move of several office components to the new Lister Hill Center building, the Division expects to gain increased capacity for the Library's ever-growing general collection of journals and monographs (Table 11). With the possible addition of more compact shelving, another 15 years' storage is possible in the present facility.

Technical Services Division

The Technical Services Division is responsible for selecting and acquiring biomedical literature for the Library's collections and for cataloging new monographs, serials, and audiovisuals.

Selection and Acquisitions

Since the 1977 edition of *Scope and Coverage Manual of the National Library of Medicine,* many new developments in biomedicine have contributed to the need for continuing expansion and clarification of the scope and coverage definitions. The Selection/Acquisitions staff has begun this task by reviewing subjects in categories such as chemistry and psychology, on the periphery of core medicine. Applying scope and coverage criteria consistently is most difficult in these areas. Emphasis will be on developing interpretations, eliminating contradictions, and reassessing depth of coverage for some subject areas.

A Working Group on Acquisition Policy has been formed to analyze the Division's various functions in order to develop a sound acquisition program and to monitor activities in other areas of the Library that are related to technical services. The working group has concentrated on two areas: (1) analysis of acquisition spending for the first 6 months of FY 1980 compared to spending for the same period of FY 1979 and (2) survey of categories of material for which duplicate copies are desirable, particularly in microform.

Serials

The Technical Services Division moved ahead with the project to augment the SERLINE file with actual summary holdings statements for biomedical libraries throughout the United States: In July 1980, a contract was awarded to establish a one-to-one correspondence between like titles in SERLINE and in 22 external files containing automated holdings data. NLM intends to use existing automated data whenever possible, to prevent duplicate work for SERLINE participants.

In a related project, NLM provided the Veterans Administration (VA) central office with machine-readable data from SERLINE to use as the basis for

Lillian Kozuma, a member of the MEDLARS III Task Force, discusses plans for the new system with hospital librarians and NLM staff who met at the Library in February 1980.

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the new edition of the *VA Libraries Union List.* VA library holdings data will be fed back into SERLINE in the future.

The new *List of Serials and Monographs Indexed for Online Users* was published in 1980. It lists, by title abbreviation, all serials in MEDLINE and several other online files, and it also lists, by cataloging main entry, all monographs in MEDLINE. It is designed to help online searchers find complete title information for retrieved citations without having to look in multiple sources.

In the 1980 edition of *List of Journals Indexed in Index Medicus* (LJI), NLM call numbers have been included to assist in document delivery. The subject section of the LJI was modified to include only valid MeSH headings. The separate sections of Special List titles were dropped from the publication, because these titles are incorporated in the new *List of Serials and Monographs Indexed for Online Users.*

The offsite check-in program continued to expand during 1980, with approximately 63 percent of NLM's 22,753 current serial titles being checked in and processed by subscription agents. Seven dealers are participating in the program: Five of these are currently supplying automated check-in data for the titles they handle; the other two are scheduled to begin supplying automated data in 1981.

The Lane Medical Library at Stanford University Medical School, in weeding out its collection of older serials (including many 19th-century items), offered issues withdrawn from its collection to the National Library of Medicine. The entire gift contains many thousands of issues. To date, serials staff members have identified more than 2,000 issues in the Lane gift that are needed for the NLM collection. Many are older foreign materials and unobtainable from other sources. The gift includes some titles that had not been represented in the NLM collection.

Cataloging

Because records for recent materials, the most heavily used by onsite patrons, are already in machine-readable form, NLM has decided to close the modern card catalog before retrospective conversion is complete. In December 1979, a Task Force on Closing the Card Catalog was appointed to accomplish the following: (1) to gather and analyze data on card catalog use and resource requirements for continued maintenance; (2) to examine the implications of MEDLARS III, the Retrospective Data Entry System (RDES), and the adoption of the *Anglo-American Cataloging Rules,* 2d edition (AACR2); and (3) to identify and evaluate interim and long-term alternatives and develop a specific action plan for implementation. Chaired by the

Chief of the Technical Services Division and composed of representatives from the Bibliographic Services, History of Medicine, Reference Services, and Technical Services divisions, the task force submitted its final report in June 1980. The report's key recommendation was that a Computer-Output Microfilm (COM) Catalog be created to serve NLM patrons temporarily as the first source of bibliographic and location information starting in January 1981. This recommendation was accepted and, subsequently, a Working Group on the COM Catalog developed specifications for implementation. Simultaneously, preliminary work commenced on developing a public-access, online catalog as the long-term alternative to the card catalog.

The Division has continued to provide additional access to NLM holdings for certain foreign language and low-priority monographic material through limited cataloging. During the past year, 2,014 limited cataloging records have been added to the CATLINE file, providing network access to this material for the first time.

The project to keyboard into machine-readable form an estimated 300,000 monographic records from NLM's modern shelf list (imprints from 1801 to present) has proceeded on schedule. Nearly 85,000 retrospective catalog records have been entered into NLM's RDES and reviewed for accuracy. Immediate plans include the transfer of these retrospective records to the CATLINE file, where they will be available for searching by other health-science libraries.

The Technical Services Division is now receiving and adding to CATLINE cataloging records for 19th-century materials from the History of Medicine Division (HMD). Both divisions also plan to convert into machine-readable form that portion of 15th-, 16th, and 18th-century cataloging that has not yet appeared in HMD-published catalogs.

The series of meetings on cooperation in technical processing among the Library of Congress (LC), the National Agricultural Library, and the National Library of Medicine continued throughout FY 1980. Plans to begin cooperating on name authority work in 1981 progressed. As a first step in this project, NLM provided access to its internal authority files to the Library of Congress. A preliminary analysis of an appropriate subject division for assigning responsibility in cooperative cataloging was also made. NLM representatives attended AACR2 training sessions arranged by the Library of Congress for its own staff and now regularly participate in meetings to develop LC cataloging interpretations, which NLM will adopt more fully when the AACR2 rules are implemented in January 1981.

Medical Subject Headings

The 1981 MeSH contains 125 new subject headings, representing concepts with no directly corresponding headings in last year's MeSH. An additional 137 new headings replaced existing terms. Also, 53 obsolete or excessively specific terms were deleted without replacement. A great number of cross-references were added to guide the user of the most appropriate heading.

Of greatest importance for users was the development of a MeSH chemical file, listing more than 20,000 drugs and chemicals that have been discussed in a significant manner in the literature cited in MEDLINE since 1970. The chemical file enables the user to retrieve citations concerned with individual drugs and chemicals with a specificity and a certainty never before possible; they can be retrieved through the use of the name of the substance, any of its synonyms, its *Chemical Abstracts* Service Registry Number, or its Enzyme Commission Number. By substantially reducing the need to introduce chemicals as MeSH descriptors, the chemical file helps keep MeSH from becoming swamped with chemical headings to the distress of users with other interests.

The 1981 MeSH headings in the field of psychiatry have been extensively modified to reflect the nomenclatural changes introduced in the *Diagnostic Statistical Manual III* of the American Psychiatric Association, and the *International Classification of Diseases*, 9th revision.

Table 3
Circulation Statistics

Activity	FY 1978	FY 1979	FY 1980
Requests received	425,000	417,613	434,533
For interlibrary loan	261,969	249,820	242,077
For readers	163,031	167,793	192,456
Requests filled	329,119	327,118	341,433
For interlibrary loan	193,804	186,172	179,770
Photocopy	176,158	168,787	163,830
Original	17,646	17,385	15,940
For readers	135,315	140,946	161,663
Requests unfilled	95,881	90,495	93,100
Interlibrary loan	68,165	63,648	62,307
Rejected	28,164	21,072	22,000
Referred	7,445	7,616	8,217
Returned as unavailable	32,556	34,960	32,090
Reader service returned as unavailable	27,716	26,847	30,793

Table 4
Cataloging Statistics

Item	FY 1978	FY 1979	FY 1980
Completed cataloging			
Full	14,186	13,530	14,352
Limited	—	—	2,286
Total	14,186	13,530	16,638
Catalog cards filed	166,300	285,726	214,650
Volumes shelf-listed	14,166	19,641	14,161

Table 5
Acquisitions Statistics

Acquisitions	FY 1978	FY 1979	FY 1980
Serial records			
New titles added	1,272	1,974	1,581
Discontinued titles	830	828	279
Current titles received	23,711	22,172	22,753
Publications processed			
Serial pieces	173,566	174,318	185,657
Other	21,793	26,503	28,657
Total	195,359	200,821	214,314
Obligations for:			
Publications	$1,571,836	$1,655,000	$1,650,000
Rare books	$81,185	$80,000	$51,000

Table 6
Bibliographic Services

Service	FY 1978	FY 1979	FY 1980
Total items indexed*	259,807	254,210	266,730
For *Index Medicus*	232,563	230,427	243,873
Recurring bibliographies	28	28	27
Journals indexed for *Index Medicus*	2,543	2,595	2,661
Monographs indexed	87	55	18
Abstracts entered	94,174	98,501	111,629

*Includes special list articles, audiotapes, and monograph chapters.

Table 7
Online Searches

Data Base	FY 1978	FY 1979	FY 1980
AVLINE	10,425	14,387	17,656
BIOETHICS	1,582	2,403	3,426
CANCERLIT	23,086	36,706	41,795
CANCERPROJ	4,208	5,713	5,002
CATLINE	147,138	184,667	208,639
CHEMLINE	33,009	46,149	59,767
CLINPROT	1,017	1,571	1,558
EPILEPSYLINE	2,327	2,028	2,511
HEALTH	—	23,387	46,971
HISTLINE	183	3,263	3,291
JOURNAL AUTHORITY	511	—	—
MEDLINE	460,209	548,469	682,802
MESH VOCABULARY	2,303	2,870	6,582
NAME AUTHORITY	4,936	5,327	5,406
RTECS	5,983	9,788	12,537
SDILINE	19,581	19,394	18,978
SERLINE	11,914	23,577	37,197
STORED SEARCH	53	60	101
TDB(TOXICOLOGY DATA BANK)	1,572	10,953	9,820
TOXLINE	47,323	64,667	86,333
Total	777,360	1,005,379	1,250,372

Table 8
Offline Searches

Data Base	FY 1978	FY 1979	FY 1980
AVLINE	20	17	29
BIOETHICS	1	6	13
CANCERLIT	1,472	1,394	3,778
CANCERPROJ	356	271	276
CATLINE	101	177	247
CHEMLINE	17	54	43
CLINPROT	11	23	11
EPILEPSYLINE	38	20	28
HEALTH	—	325	547
HISTLINE	0	8	5
JOURNAL AUTHORITY	0	—	—
MEDLINE	28,846	36,997	45,828
MED77	—	—	83,202
MED75	58,625	91,956	106,358
MED72	68,423	76,818	78,593
MED69	49,658	56,867	62,269
MED66	38,028	42,337	44,187
MESH VOCABULARY	0	0	0
NAME AUTHORITY	0	0	44
RTECS	36	82	134
SDILINE	53,856	71,173	108,978
SERLINE	2	8	17
TDB(TOXICOLOGY DATA BANK)	3	74	99
TOXBACK	6,716	7,693	9,547
TOXLINE	7,953	11,976	17,208
Total	314,162	398,276	561,441

Table 9
History of Medicine Activities

Activity	FY 1978	FY 1979	FY 1980
Acquisitions			
Books	489	417	329
Modern manuscripts	15,805	46,006	51,651
Prints and photographs	293	297	479
Processing			
Titles cataloged	2,782	2,789	2,709
Modern manuscripts cataloged	37,527	61,666	46,603
Pictures cataloged	526	320	33
Articles indexed	4,887	4,787	5,266
Pages microfilmed	124,158	118,151	92,938
Public service			
Reference queries	2,160	2,187	2,107
ILL and pay orders filled	2,362	2,107	2,596
Reader requests filled	7,560	3,923	4,551
Pictures supplied	1,840	2,474	2,151

Table 10
Reference Services

Service	FY 1978	FY 1979	FY 1980
Requests by telephone	16,317	13,494	11,102
Requests by mail	753	729	389
Readers assisted	30,763	32,241	31,614
Total	47,833	46,464	43,105
Reading room users registered	33,504	29,758	28,710

Table 11
Growth of Collections

Collection	Previous Total (Sept. 1979)	Added in FY 1980	New Total
Book materials			
Monographs:			
Before 1500	565	0	565
1501-1600	5,547	17	5,564
1601-1700	9,699	56	9,755
1701-1800	23,226	157	23,383
1801-1870	39,397	66	39,463
Americana	2,295	2	2,297
1871-Present	374,619	11,366	385,985
Brief listed—INPROC	20,607	—	20,607
Theses HMD	281,508	9	281,517
Pamphlets	172,021	—	172,021
Bound serial volumes	602,270	27,562	629,832
Volumes withdrawn		(21,877)*	
Total volumes	1,527,673	17,358	1,545,031
Nonbook materials			
Microforms:			
Reels of microfilm	27,114	2,061	29,175
Number of microfiche	62,168	12,486	74,654
Total microforms	89,282**	14,547**	103,829
Audiovisuals	31,449**	4,937**	36,386
Pictures	72,795	479	73,274
Manuscripts	883,919	51,651	935,570

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

**These figures reflect separate counting of each physical piece associated with a title rather than a count of titles only, which has appeared in previous NLM reports. The change has been made to conform to standard library practice for reporting the size of collections.

From Guillaume Le Lièvre, *Ars memorativa*, Paris, 1520.

Computer and Communications Systems 3

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 as well as Specialized Information Systems. Systems analysis and programing support are provided by computer analyst/programers who work closely with subject area specialists to determine their data processing requirements and to convert these requirements into new or improved data processing capabilities.

Equipment

NLM acquired 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 present NLM data processing system and will meet the estimated 20 to 25 percent annual growth of NLM's data processing requirements through 1984. The present NLM system (installed in 1974) will be made available to the NIH Clinical Center for its hospital information system.

The new system will be installed in the computer facility located in the new Lister Hill Center building. The competitive procurement for a new computer system being conducted by NLM and the General Services Administration was canceled when NLM obtained the IBM 370/168. Having acquired that system, the Library found it advantageous to purchase the high-speed laser printer and 16 disk storage drives that had previously been leased. During the next 3 years, there will be a total savings of $480,000 in data processing costs because of the purchase (rather than rental) of this peripheral equipment.

In January 1980, an agreement was reached with the State University of New York to add the TOXLINE, TDB (Toxicology Data Bank), and RTECS (Registry of Toxic Effects of Chemical Substances) to the MEDLINE data base installed at SUNY in 1972. These additions will alleviate the increasing MEDLINE workload at NLM. New MEDLINE users are now provided online access to MEDLINE at SUNY and use NLM only for data bases not available at SUNY. As a result of this agreement, more than 2,900 hours of MEDLINE use were provided at SUNY in September 1980 (as compared with 1,490 hours in September 1979).

This year, considerable emphasis was placed on improving the performance of the 370/158 system so that NLM's data processing requirements could continue to be met until the new system was installed in the fall. This summer, a major new technological feature was added to the IBM 370/158 system—a hardware implementation of the operating system software called the MVS Operating System Enhancement (MVS/SE). Installation of this feature increased the NLM system's capacity by approximately 12 percent. Continued tuning of the operating system and installing new releases of the IBM operating system also improved systems capacity.

At the end of the fiscal year, the computer facility in the new building began to receive the new IBM 370/168 computers.

Bibliographic Retrieval

A number of enhancements were made to the ELHILL retrieval system this year. In December 1979, a third copy of ELHILL was added to the system to handle the increasing use of the MEDLINE service. In March 1980, the first stage of a 2-year cooperative programing effort with the British Library was concluded with the successful implementation of ELHILL 3.2 at NLM. This new version of ELHILL provided the SAVESEARCH, SAVE, DISPLAY, and PROFILE commands, which give the user the ability to modify the password, mailing address, and length and width of the terminal page. It also allows for the immediate storage and use of user search profiles. In July, the final design, coding, and testing of the second stage of this effort were completed. The results of offline prints and OFFSEARCHES can now be sorted in mixed ascending and descending sequence, according to user specification, or in several prestored sequences. These modifications were tested jointly with NLM and British Library personnel in Great Britain. Acceptance testing and implementation are expected to be completed at NLM by early spring of 1981.

Another major capability added to MEDLARS allows the MEDLINE searcher to retrieve citations by *Chemical Abstracts* Service Number, chemical name, or synonym. Implemented in mid-1980, this enhancement included the development of a chemical authority file of information on more than 20,000 chemical substances that have appeared in the indexing literature. This project took 18 months and required substantial software development and modifications, including creation, validation, and maintenance of the chemical authority subfile; significant modification of the online citation input program to allow Registry Number/chemical name input on the journal citation with validation and mapping to MeSH terms; and changes to the retrieval file generation subsystem to provide appropriate indexing both of Registry Number and chemical names and of all synonyms for the chemical.

In June 1980, a contract with General Electric initiated a development project to provide a range of additional capabilities for online searching. This project is to install a greatly enhanced, user-oriented set of functions, using ELHILL as a base

Minicomputer Support

During 1980, OCCS provided greater operational support than in the past to the NLM minicomputer projects. The resulting equipment improvements reduced computer failure and provided greater access and system stability to the project areas. The projects currently operational on the minicomputer follow:

- INPROC/DE—A data entry and edit system that supports the ordering of monographic and audiovisual material for NLM.
- Hepatitis Knowledge Base—The Lister Hill Center's operational system, containing a computer-based, condensed representation of published information, which is accessed at nine major medical centers and biomedical libraries for field testing via the TELENET communications network.
- RDES—The Restrospective Data Entry System for the conversion of the NLM shelf list in support of the closing of the card catalog. Currently, this system supports an average of more than 1,400 connect-hours and the input of more than 10,000 citation records per month.

All of these projects operate on the Data General Eclipse S200 under the Meditech Interpretive Information System (MIIS) operating system. The growth in minicomputer applications and users made it necessary to upgrade this computing power. A Data General System 350 minicomputer is being installed in the new Lister Hill Center computer facility to meet this requirement.

Computer Output Microfilm

Another important activity centered on Computer Output Microform (COM) applications, commencing in January 1979 with the quarterly microfiche publication of *Health Sciences Serials*. Other products being developed for internal NLM use will be on 16-mm film. The growth of these applications, responding to the need for easy access to voluminous data, led to the acquisition of COM equipment that also will be installed and made operational in the new computer facility.

This summer OCCS finalized the specifications for the NLM microform card catalog. This COM catalog will contain a full cumulation of CATLINE within a single viewer, indexed by name, title, and subject heading. The viewer that will contain this film is the Stored Search 100 microfiche roll reader. Operational use of the COM catalog is planned for January 1981.

INQUIRE Support

In FY 1980, OCCS also enlarged the capabilities and improved the performance of the INQUIRE system. That system, which is maintained by OCCS, provides data base management and software support to all NLM components.

OCCS developed an innovative information management system to support the White House Conference on Library and Information Services. The system facilitated the complex tasks of monitoring State conference activity, mailing materials, and balancing delegate representation sociodemographically. In addition, a data base of more than 3,000 resolutions from the 57 State/territory conferences was made available to the delegates at the national conference. This data base provided full text, indexed, boolean, and proximity search capabilities; delegates used it to form their resolutions.

Communications

The principal data communications activity during this fiscal year involved the coaxial cable for NLM and the Lister Hill Center building. The purpose of this network, which was initiated during FY 1979, is to provide a highly flexible data communication system to service the local data and video distribution requirements of NLM.

The design of the coaxial cable distribution network, completed during the year, included these activities:

- Requirements analysis
- Definition of network architecture
- Equipment and outlets schedules
- Detailed specifications
- A statement of work for the installation of the cable plant
- A test plan
- A design description document

The installation of the cable distribution network is scheduled for the third quarter of FY 1981. This system will service the intrabuilding data and video distribution requirements of the Lister Hill Center. The interbuilding requirements will be serviced by a similar network to be designed in FY 1981. Cable runs and outlets will be installed during the renovation of the NLM building; cable hardware and distribution cable will be installed after the renovation.

Data communications requirements for the cable plant were detailed. Techniques for computer-to-computer, terminal-to-terminal, and terminal-to-computer were finalized. Computer interface hardware capable of supporting up to 32 concurrent users will be developed by OCCS. Large numbers of concurrent users will be connected to host computer systems through a standard packet network interface. The same protocol will be used to provide a gateway to the national packet (TELENET and TYMNET) networks. OCCS personnel will modify some of the baseline software for its environment; in some cases, new software must be written.

Hardware was procured for a cable network technical control system that will provide monitoring capabilities. A pilot cable system was installed in June 1980 and is being used for training and system testing.

OCCS played an important role in providing a smooth transition during the move of a number of NLM elements to the Lister Hill Center building. Close coordination of communications requirements was done on a daily basis, despite frequent changes in dates.

Several improvements were made in other communications activities: Upgrades in network interfaces; optimization of communications lines; and extensions of network services to other host computer systems.

From Denis Diderot, ed , *Encyclopédie*, Lausanne 1780

Specialized Information Services 4

Henry M. Kissman, Ph. D., Associate Director

Specialized Information Services' major responsibility is the operation of the Toxicology Information Program (TIP). The objectives of this program are (1) to create computer-based toxicology data bases 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.

During the year, major efforts have been expended on the regeneration of TOXLINE and CHEMLINE; direct support to the management of bibliographic and other information services for the National Toxicology Program (NTP); and collaboration with the interagency Chemical Substances Information Network (CSIN) project, with particular emphasis on its Chemical Structure and Nomenclature System (CSNS) and Chemical Information Resources Directory (CIRD) components.

Online Services

Access to TOXLINE, RTECS (Registry of Toxic Effects of Chemical Substances), and TDB (Toxicology Data Bank) was expanded in February 1980 when these data bases became available from the computers at the State University of New York (SUNY) in Albany. Having SUNY share the load for these toxicology-related data bases should result in better service for users of NLM's online network. CHEMLINE has been available at SUNY for several years.

The following sections summarize the current status of the toxicology-related data bases.

TOXLINE

TOXLINE, a bibliographic retrieval service, is composed of an extensive collection of citations and abstracts derived in large part from the published journal literature dealing with human and animal toxicity studies, biological effects of drugs, pesticides, food additives, industrial and household chemicals, radioactive materials, and toxic pollutants. TOXLINE is updated monthly and, including its back files, now encompasses more than 1 million records.

The TOXLINE back files, TOXBACK74 and TOXBACK65, allow the searching of toxicological information extracted from the pre-1977 literature. When accessing these two files, search strategies are developed online and the searches are then processed in a batch mode the same evening. Search results are mailed to users the following workday.

Information contained in the TOXLINE/TOXBACK files is obtained from three major secondary sources and eight special collections of referenced biomedical and chemical information. The component subfiles now include selected MEDLARS references from 1968 (TOXBIB—241,810 records); *Chemical-Biological Activities* (CBAC) from 1965 *(Chemical Abstracts,* Sections 1-5, 8, 59, 60, 62-64—530,218 records); *Abstracts on Health Effects of Environmental Pollutants* (HEEP) from 1971 (BioSciences Information Services—102,832 records); *International Pharmaceutical Abstracts* (IPA) from 1970 (American Society of Hospital Pharmacists—56,284 records); *Pesticide Abstracts* (PESTAB) from 1966 (Environmental Protection Agency—30,062 records);

Three fellows of the World Health Organization from the People's Republic of China spent several months in training at NLM in 1980. Wang Chi-chung (left) and Lei Chun-bing visited NLM's Specialized Information Services to become acquainted with the toxicology-related data bases.

Toxicology/Epidemiology Research Projects (RPROJ) from 1978 (Smithsonian Science Information Exchange—17,681 records); the Hayes File, 1940-66, (HAYES—10,039 records), a precursor to *Pesticide Abstracts;* the Environmental Mutagen Information Center (EMIC) file from 1960 (Oak Ridge National Laboratory—28,036 records); the Environmental Teratology Information Center (ETIC) file from 1950 (Oak Ridge National Laboratory—18,299 records); and the Toxic Materials Information Center (TMIC) file, 1971-75 (Oak Ridge National Laboratory—4,552 records).

At the end of FY 1980, another component was added to the TOXLINE file. This subfile, identified as TD3 (Toxicology Document and Data Depository), has citations to Government reports, along with associated abstracts, key words, and ordering information. The TD3 component in TOXLINE is obtained primarily from the *Government Reports Announcements and Index* (GRAI), a data base of the National Technical Information Service. TD3 information will be added to TOXLINE monthly. Each update corresponds to the pertinent material contained in the GRAI from the preceding month. Coverage in TOXLINE begins with the GRAI issue for October 12, 1979. From time to time, relevant reports not included in GRAI will be added to TD3. Development of the TD3 project has been supported by the Department of Health and Human Services (DHHS) Committee to Coordinate Environmental and Related Programs through its Toxicology Information Subcommittee.

Including use at SUNY as well as at NLM, TOXLINE in FY 1980 was used for almost 13,000 hours of computer connect time. More than 4.5 million citations were requested to be printed offline from TOXLINE/TOXBACK. This total usage represents a 30-percent increase over FY 1979.

TOXLINE was regenerated during the last quarter of FY 1980, with several major structural changes. After removing duplicate citations, the TOXLINE/TOXBACK files were redistributed, by year of primary publication, into three files: The new online TOXLINE (references to articles published from 1977 forward); offline TOXBACK74 (a back file of citations published from 1974 to 1976); and offline TOXBACK65 (before 1974). Data content was also enhanced. Chemical Abstracts Service Registry Numbers were added to many of the older IPA and PESTAB records to facilitate searching for chemical substances-related information.

RTECS

The Registry of Toxic Effects of Chemical Substances—RTECS—file, an online, searchable version of the National Institute of Occupational Safety and Health (NIOSH) publication *Registry of Toxic Effects of Chemical Substances*, now contains acute toxicity data for 40,967 substances. Chronic toxicity data are also included if a carcinogenic, mutagenic, or teratogenic effect was reported in the reference cited. 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. During the year, new detailed mutation data were entered in the toxic effects field, with notations for 17 specific mutagenicity tests and several additional organisms and cell types added to the controlled vocabulary used in this field. NIOSH continues to maintain responsibility for the content of the file.

TDB

The Toxicology Data Bank (TDB) is an online "fact" retrieval service in toxicology, describing chemical substances that may be hazardous and that may have significant human exposure potential. For each substance, TDB contains data on chemical structure and nomenclature, chemical and biological properties, usage, and potential effects on the environment and the workplace. Data are extracted from monographic sources such as textbooks and handbooks and are further evaluated by the Peer Review Committee, a group derived from the NIH Toxicology Study Section. Staff at the Oak Ridge National Laboratory (ORNL) carry out the required data extraction and computer input work for NLM. By the end of FY 1980, the online file contained some 2,000 completed records; another 500 records were in various stages of development. In choosing compounds for inclusion in TDB, high priority is given to those selected for testing by the National Toxicology Program.

CHEMLINE

CHEMLINE is an online data base allowing the user to search for nomenclature and structural information about chemical substances cited in other NLM online files. CHEMLINE was completely regenerated in April 1980; it now contains 460,406 records for chemical substances known by some 920,010 different names. Included in this set are the 45,981 chemicals listed in the Toxic Substances Control Act (TSCA) Chemical Substances Inventory of the Environmental Protection Agency. CHEMLINE records are made up of Chemical Abstracts Service (CAS) Registry Numbers, molecular formulas, standard chemical nomenclature synonyms, ring structure information (where relevant), some Medical Subject Headings (MeSH) terms, and a locator data element to aid in identifying other files (e.g., TOXLINE/TOXBACK, TDB, RTECS) with information about a specific substance. Total online usage during the year was 5,000 hours (up 12 percent from FY 1979). Plans presently call for adapting programs developed by the National Cancer Institute to provide a greatly enhanced substructure search capability for the CHEMLINE file.

LADB

The Laboratory Animal Data Bank (LADB) information system provides baseline biomedical data from experimental control animals of species and strains commonly used in laboratory research and testing. At the end of FY 1980, this data base contained 893,908 observations from 27,313 animals of 66 species or strains. These unpublished data are contributed voluntarily by industry, Government agencies, and various teaching and research institutions. The data base provides biomedical investigators with rapid access to information on normal values in hematology, clinical chemistry, pathology, environment and husbandry, and growth and development. Using LADB, a user can (1) select and examine numeric or textual biological or pathologic values; (2) determine the accompanying environmental, nutritional, and husbandry conditions for the animals selected; (3) statistically analyze the findings; and (4) receive printed reports including distributions and tables.

LADB became available as a service for evaluation in January 1980. It provides an offline service with searches and consultations, and an online service, via common carrier telecommunications, to the user's own terminal. Support services also available include user training, a hotline and trouble desk, as well as user manuals and other documentation. LADB services are provided by Battelle-Columbus Laboratories under contract.

LADB is administered by NLM, sponsored by the DHHS Committee to Coordinate Environmental and Related Programs (CCERP) and funded by the NLM, CCERP, the National Cancer Institute, the National Center for Toxicological Research, the Environmental Protection Agency, and the Interagency Regulatory Liaison Group.

Query Response and Publication Services

The Toxicology Information Program provides a literature search service in toxicology through the Toxicology Information Response Center (TIRC) at the Oak Ridge National Laboratory. During FY 1980, the number of searches completed by TIRC in response to requests rose from 287 to 546. Most of these requests came from other Federal agencies that have interagency agreements for this type of information support with NLM.

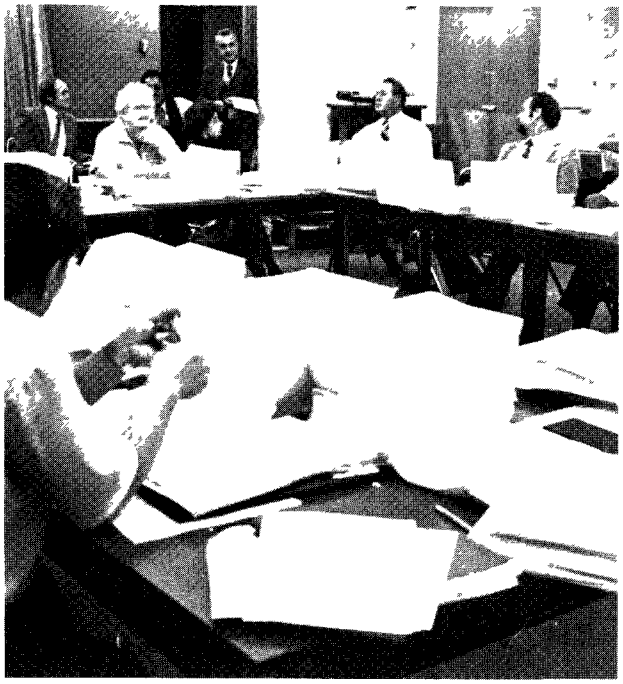
During FY 1980, interagency agreements for TIRC services were maintained with the Food and Drug Administration, the National Center for Toxicological Research, the National Institute of Environmental Health Sciences, the National Institute for Occupational Safety and Health, the Chemical Systems Laboratory of the Department of the Army, and the National Toxicology Program.

One special user of TIRC's literature search services is the interagency Information Response to Chemical Concerns (IRCC) project, sponsored by the DHHS Committee to Coordinate Environmental and Related Programs, together with the Environmental Protection Agency, National Institute of Environmental Health Sciences, National Oceanic and Atmospheric Administration, National Institute for Occupational Safety and Health, and the Center for Disease Control. The primary objective of the IRCC project is to provide the sponsoring organizations with "express" literature searches (48-hour turnaround), on demand. A secondary objective is to prepare comprehensive bibliographies on topics selected by the IRCC project committee as being of general concern to the sponsoring agencies.

Publications

TIRC publishes reviews and annotated bibliographies in toxicology journals and through the National Technical Information Service (NTIS). During 1980, the following bibliography was prepared and published: *Leptophos, An Overview· A Literature Compilation 1964-1979.*

In 1980, NLM negotiated an agreement with the Federation of American Societies for Experimental Biology for printing and promoting TIRC bibliographies. Two publications are now available under this agreement: *Health and Environmental Effects of Acid Rain: An Abstracted Literature Collection 1966-1979,* and *Asbestos in Air: A Bibliography with Abstracts 1964-1980*



TDB review committee

TOX-TIPS (Toxicology Testing-in-Progress)

The Toxicology Information Program produces, for the DHHS Committee to Coordinate Environmental and Related Programs, two publications that describe research in progress. The first of these, *TOX-TIPS,* reports new projects in toxicological testing of chemicals by governmental, industrial, and academic laboratories. Descriptions of epidemiologic studies to determine toxic chemicals and their effects are also included. The National Toxicology Program contributes notices of testing studies. The rapid publication of this information is designed to prevent the unknowing duplication of these expensive studies. TOX-TIPS is published monthly through the NTIS at an annual subscription rate of $35 for domestic mailings, and $70 for foreign mailings (i.e., outside of North America). About 650 subscribers from Federal, State, and private organizations received TOX-TIPS during FY 1980. Voluntary contributions of data to the publication were obtained chiefly from Federal agencies, industrywide testing programs, and individual companies.

TRPD (Toxicology Research Projects Directory)

The second publication for the DHHS committee is the *Toxicology Research Projects Directory* (TRPD). This annual directory contains descriptions of about 12,000 Government-supported research projects in toxicology and related fields. The information is prepared in publication form by the Smithsonian Science Information Exchange from its extensive data base and is published by NTIS at the subscription rate of $65 for mailings in North America and $130 to all other addresses. The reports in TRPD, as well as additional project descriptions from the Epidemiology Research Projects Directory (ERPD), comprise the RPROJ (research projects) subset of TOXLINE. Because the subscription volume of TRPD has not increased over last year's level of 350, publication will cease with the December 1980 issue. Input to TOXLINE will continue.

Collaborative Projects

During the past fiscal year, NLM's Toxicology Information Program (TIP) continued to work on the interagency Chemical Substances Information Network (CSIN) project. CSIN is a national network linking multiple online data bases in various geographically dispersed computers; the date bases involved contain information about chemical substances, their uses, and effects.

Among the CSIN-related projects supported by TIP are development of two online directories—the "Chemical Information Resources Directory," and the "Chemical Structure and Nomenclature System"—and the testing and evaluation of a preprototype CSIN "intelligent" terminal.

The prototype "Chemical Data Bases Directory," constructed in FY 1980 as a forerunner of the proposed "Chemical Information Resources Directory," will be enlarged to a file describing the content, location, and accessibility conditions of about 150 information resources relevant to CSIN's subject scope.

Also in the initial development stages is the interim "Chemical Structure and Nomenclature System," the chemical directory for CSIN. This system will supply online substructure and name search, and structure diagram output capabilities utilizing a file approaching a million compound records.

Located at one of two testing sites for the CSIN preprototype intelligent terminals, the staff of the Toxicology Information Program tested and evaluated each succeeding version of the preprototype, making comments that led to numerous improvements at each stage.

Another important area of collaboration concerns information support services provided by NLM to the National Toxicology Program (NTP). The enabling instrument for these services is an NLM-NTP Interagency Agreement that went into effect in FY 1980. The NTP provided two positions to the Library to support these collaborative activities.

Several accomplishments have resulted from this collaboration. A numbering system for all NTP compounds was devised and implemented to provide a uniform method by which all groups in NTP recognize and refer to the chemicals considered and used in NTP testing programs. A prototype *NTP Chemical Registry Handbook* was assembled to provide NTP scientists and administrators ready access to information about these chemicals.

Information on the toxicological tests and organizations performing these tests, as listed in NTP's *Review of Current DHEW Research Related to Toxicology* (FY 1980), was computerized to produce indexes by CAS Registry Numbers, chemical names, and broad test categories. These indexes will be published by NTP as supplements to the 1980 *Review*. The updating procedures that have been devised will expedite preparation of future editions of this publication.

LITRACK, a management information system, was designed and implemented to permit accurate control of literature searches and document acquisition and to generate reports for NTP. Literature searches for 79 chemicals were carried out in FY 1980 in support of NTP long-term testing, using NLM's Toxicology Information Response Center at the Oak Ridge National Laboratory.

An NTP Information Committee was organized to permit exchange of ideas and to solve problems encountered by those who serve the information needs of the geographically scattered organizational segments of the National Toxicology Program in Research Triangle Park, N.C.; Cincinnati, Ohio; Washington, D.C.; and Little Rock, Ark.

Staff of the Toxicology Information Program developed the parameters of a detailed system and information-processing study to be carried out for the NTP-sponsored Environmental Mutagen and Environmental Teratology Information Centers at the Oak Ridge National Laboratory. The technical direction of these centers is one of TIP's tasks under the Library's agreement with NTP.

Anatomical theatre, Altdorf, ca 1675

AUDIOVISUAL PROGRAMS 5

James W. Woods, Ph. D., Director
National Medical Audiovisual Center

The National Medical Audiovisual Center (NMAC) is the component of the National Library of Medicine with primary responsibility for planning and administering a national program to improve the quality and use of audiovisual learning materials in health professional education and practice.

In March 1980, NMAC moved from Atlanta to the new Lister Hill Center building in Bethesda, Md. The major programs of NMAC—Educational Materials Development, Media Utilization, Training and Consultation, and Educational Research and Evaluation—are either completely operational or expected to be so in the next 6 months.

The physical integration of NMAC facilities, programs, and expertise with those already existing at NLM created a number of new opportunities for improving and increasing services to NLM constituents.

Media Development

The move from Atlanta to Bethesda meant severely curtailing development and production of audiovisual programs and materials during the early part of 1980 so that staff could prepare equipment, supplies, and records either for shipment to Bethesda or for transfer to other agencies.

Some 4 months were required to complete the logistics for the move; it took several more to unpack, set up, and test sophisticated equipment. Approximately 11 percent of the Materials Development Branch staff moved to Bethesda. Shortly after the move, planning began for dedication of the new Center building. During this time, several new programs were started and work on carryover projects was resumed.

Throughout the remainder of the year, work continued on the installation of equipment to bring NMAC's audiovisual materials development capability up to the level it had achieved in Atlanta. By the end of the year, the installations were about 75 percent complete.

Despite the amount of staff time and effort devoted to relocating, many production projects were completed. Twenty-one videotapes were finished, including programs in the "Leaders in American Medicine" and in the "Distinguished Leaders in Nursing" series. Other television recordings included the building dedication ceremonies, the swearing-in of National Cancer Institute Director Dr. Vincent DeVita, and coverage of the fifth anniversary ceremonies of the National Institute on Aging.

Charles G. Roland, M.D., Professor of the History of Medicine at McMaster University, Hamilton, Ontario (second from left) discusses with NLM staff the preparation of a slide/tape presentation on Sir William Osler. With Dr. Roland are Peter D. Olch, M.D., (third from left) of NLM's History of Medicine Division, and Ellen Dollich and John McCarthy of NMAC.

In addition to the videotapes, a 20-minute film highlighting NLM's history was produced in time to be shown to those attending the dedication of the Lister Hill Center building. The film was composed of stock footage detailing the history of NMAC from its conception in the 1940's, and included an introduction by the Director of NLM, a brief history of the Library, and highlights of activities planned for the Lister Hill Center.

Still photography provided 1,605 prints and 1,497 slides, graphic arts handled 2,737 work orders. These and other NMAC statistics are in Table 14.

Materials Distribution and Utilization

NMAC maintains and distributes a large collection of medical motion pictures and videocassettes available on loan to constituents without charge. Selected films, videocassettes, and slide-tape packages produced by NMAC are placed with the sales program of the National Audiovisual Center, General Services Administration.

The loan service was suspended from January through March 1980 because of uncertainties in planning for the transfer from Atlanta. The resolution adopted was to leave the film collection in Atlanta with a contractor; service was resumed in April 1980 for 16-mm films only. The videocassettes were shipped to Bethesda and have not been available on loan, pending plans to begin an expanded videocassette interlibrary loan service in FY 1981.

FY 1980 statistics reflect the program disruption, which came during one of the traditionally busiest loan periods. For the year, 17,500 motion pictures and videocassettes (down 60 percent from last year) were shipped in response to requests for loans. An aggressive acquisitions program to bring the collection up to date and publication of a new catalog (in 1981) are expected to return usage of these materials to the pre-1980 level.

Combined sales of motion picture prints, videocassettes, and slide-tape packages totaled 3,000 units.

In the area of media utilization, each division of NLM has some operational responsibilities in nonprint media, and an NLM AV Materials Handling Group was formed to provide a mechanism for the development and implementation of nonprint media policies at NLM. This group facilitates the involvement of key people throughout NLM/NMAC with interest and expertise in nonprint media activities, and it has been instrumental in identifying major issues and making recommendations concerning the handling of nonprint materials at NLM. The Chief of NMAC's Materials Utilization Branch chairs the group and also functions as the Senior Media Librarian.

Staff members began a complete inventory of the medical films in NMAC's historical film collection in conjunction with setting up the collection in the new quarters. They drafted policies regarding acquisition, preservation, cataloging, indexing, and making the films accessible to health professionals; those policies will be refined in the coming months.

Educational Training and Consultation

The NMAC Educational Training and Consultation Program designs, conducts, and evaluates faculty development workshops and seminars that prepare health professionals to design, utilize, and evaluate instructional materials in a variety of audiovisual formats. Workshops and seminars are initially conducted, evaluated, and revised at NMAC and are then disseminated across the Nation via NMAC's Field Training Centers.

In FY 1980, 485 health professionals participated in 21 workshops conducted by NMAC and the nine Field Training Centers. Workshop titles included "Development and Evaluation of Instructional Materials," "Slide/Art Techniques," "Basic Television Production Techniques," "Learning Spaces," "Basic Photography for Health Professionals," and "Designing Simulation Activities in the Health Sciences."

During FY 1980, two new workshops are planned: "Planning and Presenting Effective Lectures" and "Using Video Technology to Teach Interpersonal Skills to Health Science Faculty." They will be offered during 1981 at Bethesda and at the Field Training Centers.

A recent NMAC-conducted workshop for nurses on the subject of neurological assessment of patients with head injuries.

A contract to establish a validated set of evaluation procedures and instruments for training programs was completed in FY 1980. This contract provided NMAC with a field-tested evaluation model to guide the planning and evaluation of training programs.

During FY 1980, 43 consultations were provided to domestic and foreign institutions. Areas of consultation included orientation to the NMAC training program, teaching and learning methods, utilizing audiovisuals, producing instructional materials, facilities design and hardware selection, audiovisual equipment needs, classroom design, application of audiovisual educational technology, and various aspects of initiating and operating an audiovisual department. In addition, 1,245 publications were disseminated in the United States and abroad. Approximately 1,500 national and international visitors toured the NMAC facilities.

The Office of Training Facilities Coordination (OTFC) was established within the Training and Consultation Branch by the Director of NLM in April 1980. This office is responsible for scheduling training rooms, auditoriums, and classrooms in the Lister Hill Center and the National Library of Medicine. OTFC is also responsible for maintaining all audiovisual equipment and for providing equipment operators.

Educational Research and Evaluation

NMAC conducted a number of educational research and evaluation projects during the year. These included studies to apply instructional methods in conjunction with audiovisual technology to the field of health professional education. One important project completed in FY 1980 was the establishment of a network in Ohio for cooperative planning, improving institutional educational resources, sharing learning materials, and conducting joint educational research. A group of one osteopathic and six allopathic medical schools joined together to establish the Ohio Regional Medical Audiovisual Consortium (ORMAC) and cooperated during a 3-year period in varied educational endeavors. Several products resulted from this consortium.

- 13 audiovisual learning units
- A set of experimental visual abstracts
- A monograph on the "Reconfiguration of Existing Audiovisual Materials"
- Complete documentation of the rationale, background, experience, and results achieved in ORMAC

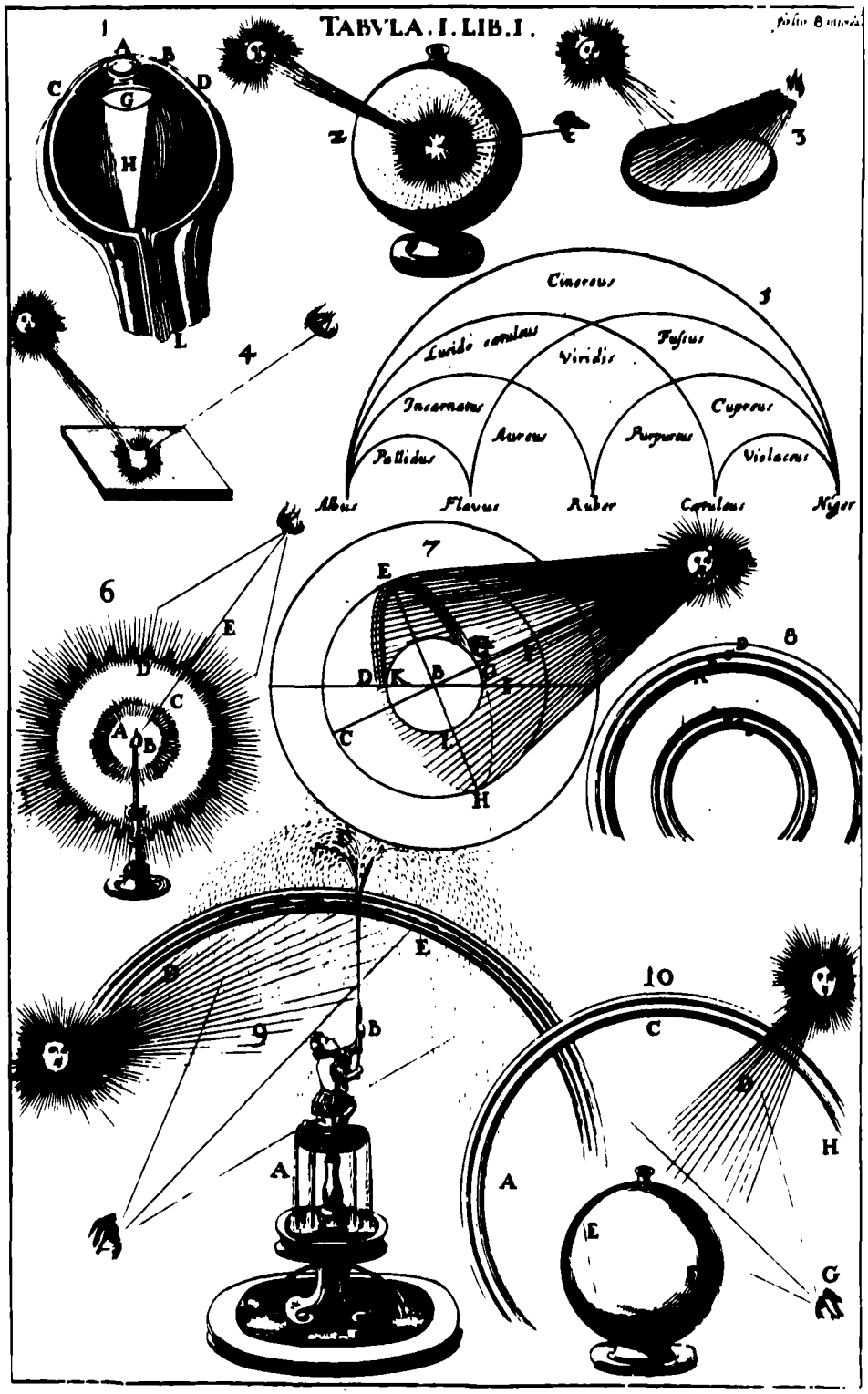
Michael Weisberg, Ph. D. (right) of the National Medical Audiovisual Center demonstrates a videodisc unit to members of a visiting delegation from Nigeria (July 1980).

Other NMAC projects in progress include developing and comparing alternative presentation formats for existing audiovisual instructional materials; a comparative definition, through literature review, of the more common instructional development models in use; and an identification of factors that appear to affect the use of study facilities.

NMAC's tradition of publishing monographs presenting state-of-the-art information about instructional technology continued with the issuance of a monograph entitled "Medical Cinematography." Another, "Computerized Test Item Banking and Test Construction," will be published early in FY 1981.

Table 12. Selected Statistics
NMAC

Audiovisuals requested	15,000
Audiovisuals shipped	17,500
Titles added (film and videotape)	562
Audiotape duplication	950
Titles to the National Audiovisual Center (NAC) for sale	0
Teaching packages sold through NAC	4,116
On-site surveys and consultations	13
NMAC-based consultations	30
Monographs distributed	1,245
NMAC-based workshops (24 partipants)	2
Regional workshops (461 partipants)	20
Audiovisual units completed	24



From Zacharias Traber, *Nervus opticus*, Vienna, 1675.

Lister Hill National Center for Biomedical Communications 6

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

The Lister Hill Center performs research and development to create new, or modify existing, biomedical communication systems and networks. These systems and networks are designed to improve the dissemination and utilization of information for the benefit of health services delivery, health education, and biomedical research. Emphasis at the Center is on experimental programs rather than on operating proved systems. With the facilities provided in the new building, the Center is carrying out more research and development with its own staff and laboratories, although collaboration with the outside biomedical science and technology communities will continue.

Science Review

On October 10-12, 1979, the Lister Hill National Center for Biomedical Communications underwent its second annual review of its research and development programs by the following scientific evaluators.

Edmond L. Applebaum, Library of Congress
Harold P. Belcher, U.S. Postal Service
Richard W. Boss, Information Systems Consultants
William Stanley Brown, Ph. D., Bell Laboratories
Hiram B. Curry, M.D., Medical University of South Carolina
Samuel J. Dwyer, III, Ph. D., University of Kansas Medical Center
Charles E. Molnar, D. Sc., Washington University
Stephen G. Pauker, M.D., Tufts University School of Medicine
Harry E. Pople, Ph. D., University of Pittsburgh

The four programs reviewed were the Knowledge-Base Program, Integrated Library System, Videodisc Mass Digital Storage, and Electronic Document Storage and Retrieval. The reviewers found the research programs to be both significant and appropriate and made specific suggestions concerning program emphasis and direction.

Health Professions Applications Branch

Knowledge-Base Research Program

The Lister Hill Center is continuing to develop an interdisciplinary research program involving the design, implementation, demonstration, testing, and evaluation of knowledge-based systems in specialized areas of biomedicine such as hepatitis and peptic ulcer. The goal of the program is to explore the potential of this approach for the rapid transfer of new medical findings and research information to health professionals, particularly practitioners.

A knowledge-base system contains information derived from the biomedical literature and subsequently reviewed, condensed, synthesized, and reorganized by experts in selected medical

areas. In principle, this information provides a content base to meet the information needs of health professionals. Parallel with developing content is a program of intramural research and development that will devise methods for computer acquisition of text and visual content, their computer representation, and access.

Hepatitis Knowledge Base

The steps in constructing the Hepatitis Knowledge Base were to identify syntheses published by hepatitis experts,[1] for the Lister Hill Center staff to further synthesize and reorganize the content, and for a panel of 10 subject experts to provide consensus review and updating.

The computerized Hepatitis Knowledge Base, containing 2 million characters (corresponding to approximately 400 pages), is organized hierarchically by topic. Accompanying each topic heading is a synthesis statement representing the state of knowledge. Each heading and synthesis is followed by supporting elements derived from published source documents. Included within supporting paragraphs are citations to primary publications used to provide authority for assertions made in the synthesis statements. The system is now accessed from selected sites via a nationwide time-sharing network.

Consensus updating of the Hepatitis Knowledge Base is facilitated by the Electronic Information Exchange System (EIES). This computer conferencing network is the principal medium of communication linking the geographically dispersed experts with each other and with the National Library of Medicine.[2]

Initial field-testing of the Hepatitis Knowledge Base has begun at the nine sites of the collaborating hepatitis experts. Study areas of particular interest are the following: Volume of use (by what numbers of what categories of users for what purpose); performance (quality, reliability, and accuracy) of the system; and effectiveness (user satisfaction and user behavior). Physicians, medical students, librarians, and other health professionals at these locations have received training in the use of the Hepatitis Knowledge Base and are participating in the evaluations.

An abridged form of the Hepatitis Knowledge Base has been published as a supplement to a widely distributed medical journal *(Annals of Internal Medicine)* for review by a general medical audience.[3]

Peptic Ulcer Knowledge Base

A second prototype in the field of gastroenterology is under study for peptic ulcer disease. There are significant developments in diagnosing and treating this common and often serious disorder. The initial text is derived from an existing synthesis.[4] Content development is taking place in collaboration with members of the Center for Ulcer Research and Education (CURE), associated with the University of California at Los Angeles and the Wadsworth Veterans Administration Hospital. A panel of experts is developing and updating this information.

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[1]The major source is J. W. Mosley and J. T. Galambos: "Viral Hepatitis," in *Diseases of the Liver,* 4th ed., 1975; L. Schiff, ed., Philadelphia, Lippincott. Also used: Proceedings of a symposium on viral hepatitis, sponsored by the Committee on Viral Hepatitis of the Assembly of Life Sciences, National Research Council: *American Journal of Medical Sciences* 270, 2-209, July-August 1975. In addition, some 1,200 selected journal articles were used as sources.

[2]Elliott R. Siegel: "Use of Computer Conferencing to Validate and Update NLM's Hepatitis Data Base" in *Electronic Communication Technology and Impacts,* M. M. Henderson and M. J. MacNaughton, eds., Washington, D.C., American Association for the Advancement of Science, 1980.

[3]Lionel M. Bernstein, E. R. Siegel, and C. M. Goldstein: "The Hepatitis Knowledge Base: A Prototype Information Transfer System." *Annals of Internal Medicine* 93 (Pt. 2) 169-181, 1980.

[4]M. H. Sleisenger and J. S. Fordtran, eds.: *Gastrointestinal Diseases,* 2d ed., Philadelphia, W. B. Saunders, 1978.

Human Genetics Knowledge Base

Diseases that have a significant genetic component, and even the risk of these diseases to prospective offspring, result in an enormous burden on the health care system and its users. Dr. V. A. McKusick's *Mendelian Inheritance in Man*[5] is the foundation for an expanded Human Genetics Knowledge Base that covers some 3,000 monogenic traits. Through consensus, a panel of subject-matter experts is expanding and updating its contents using the text-editing system at the Division of Computer Research and Technology, NIH.

The capability of systematically assembling and processing illustrative materials to support the Human Genetics Knowledge Base text is being developed in-house. Plans are being defined using emerging technologies for storing and retrieving both digital and visual information. For example, optical videodisc technology will permit storage of and access to visual information in the form of single illustrations, or in motion supplemented with audio. Retrieving linked textual and visual materials will assist health practitioners by providing more ready access to current knowledge in the important, complex, and rapidly expanding field of human genetics.

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[5]V. A. McKusick: *Mendelian Inheritance in Man: Catalog of Autosomal Dominant, Autosomal Recessive and X-linked Phenotypes*, 5th ed., Baltimore, The Johns Hopkins University Press, 1978.

Knowledge-Base Information Support Program

The Hepatitis Knowledge Base access module supports the storage and retrieval of specified portions of the text. Yet there are many issues that must be resolved. For example, how is such a data base to be updated when the material needing revision is widely scattered throughout the text? Is it possible to assemble an answer *de novo*, from relevant sentences in different paragraphs? Is it possible to use computer systems to assist with the process of update and review with a minimum of human intervention?

The Lister Hill Center is starting a program of basic and applied research to attempt to answer those and similar questions. Relevant research areas include indexing strategies and coding systems for better indexing and representation of medical information, and data structures for storing this information; inquiry systems that use natural-language processing techniques; high-level computer languages to provide a programing environment for developing improved information support systems; computer operating systems to support new knowledge-based systems effectively and efficiently; and distributed processing methods to provide access to medical information in multiple data bases and improved communications networks to ensure reliable and efficient interactions among widely distributed users of knowledge bases and the knowledge base information support system.

At present, the Knowledge-Base Program is supported by four different computers. A single dedicated computer resource, including hardware, software, and personnel, is being acquired to support the research areas and an electronic information exchange system, and to provide a facility for experimenting with alternative methods for representing the medical content of these knowledge bases as they are constructed.

Communications Engineering Branch

Electronic Document Storage and Retrieval

The Lister Hill Center has initiated a program to design, develop, and evaluate an experimental system that will electronically store, retrieve, and display documents acquired by the Library. The long-term goal of the program is to introduce appropriate state-of-the-art technology to help the Library fufill its mission to establish and maintain a national archive for biomedical literature, as well as its corollary mission to maintain an interlibrary loan service. The experimental system is to be developed and evaluated by pursuing three concurrent research projects: Document Capture, Data Transfer and Storage, and Document Display, each corresponding to a key subsystem.

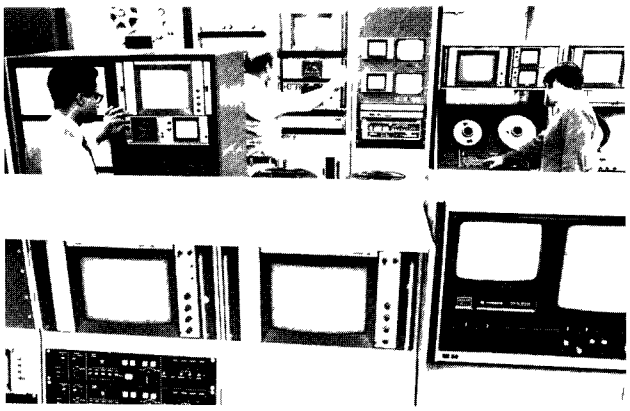
The Document Capture Project will analyze and implement techniques to electronically scan paper documents and film media containing textual and graphic material and to digitize the analog electrical signals generated by the scanning process. The Data Transfer and Storage Project will analyze and implement methods of storing efficiently the resulting stream of bits on magnetic and optical discs. The Document Display Project will develop methods of displaying retrieved documents in both soft-copy (electronic display) and hard-copy (paper) forms.

Because the scanning and digitization processes deliver signals containing considerable redundancy, the data in the magnetic disc buffer will later be compressed, resulting in fewer bits representing essentially the same amount of information. The compressed data will then be stored on a high-density optical disc. It is estimated that more than 500,000 journal pages can be stored on a disc when a compression ratio of 20:1 is used. Expanding the storage with a "jukebox" or disc-pack system containing 1,000 discs will provide an online storage capacity of 3 to 4 million journal issues.

A follow-on project is proposed to investigate the national dissemination of the stored documents. As presently envisioned, the first objective of this project will be a local distribution network in the Washington metropolitan area, while techniques are being investigated to achieve the long-range goal of delivering information nationally. Accomplishing the latter goal will depend in part on the availability of a national telecommunication network of broadband channels, such as the ones proposed for the 1980's by various commercial carriers, and the availability of low-cost display devices.

Video Processing Laboratory

A related Communications Engineering Program is the development of the Video Processing Laboratory, which will have the capability of processing and storing video signals. These signals may come directly from videotapes, or indirectly from photographic images. In addition, the laboratory will be able to create composite videotapes suitable for mastering optical videodiscs.



Lister Hill Center Video Processing Laboratory.

An International Time Display System was developed by the Lister Hill Center and installed in the cafeteria of the new building.

International Time Display System

To reflect the increasing emphasis placed on NLM's international activities, the Communications Engineering Branch developed an International Time Display System, now installed in the cafeteria in the Lister Hill Center building. This system displays local time in 33 major cities throughout the world, and also provides seasonal and calendar information. It consist of a 10-foot wide Mercator projection world map, supported by a base section housing power supplies and a microcomputer that automatically controls an 8-foot long, light-emitting diode (LED) display above the map. Recessed within the map is a Geochron, a moving world map, which provides time zone and calendar information, in addition to sunrise and sunset patterns. A technical report describing the design and development of the system is available from the Communications Engineering Branch, Lister Hill Center.

Computer Technology Branch

One project currently underway at the Center's Computer Technology Branch demonstrates that a small, low-cost microcomputer system can be a cost-effective alternative to the time-shared access of large, full-text data bases and associated computer-generated graphics. The computer language chosen was the University of California at San Diego's (UCSD) version of PASCAL, the most widely available PASCAL on mini- and microcomputers. The Hepatitis Knowledge Base is being used as a model for this study. The present data base delivery system is implemented on the Western Digital PASCAL Microengine, a microcomputer designed around UCSD PASCAL. Although the prototype system is based on a microcomputer adapted for the PASCAL language, the software could be modified for a variety of mini- or microcomputer systems.

A critical component for delivering a large, full-text data base is mass memory. The expense of mass storage devices has impeded the development of stand-alone systems. However, the recent introduction of nonremovable, sealed magnetic disc systems (Winchester technology) has created the possibility of high-capacity, high-performance mass storage at prices comparable to microcomputers themselves. The prototype delivery system, using the original Hepatitis Knowledge Base as a model data base, was completed in August. Additional efforts will evaluate the performance of this implementation, investigate extensions, and integrate the videodisc.

Advanced Terminal System

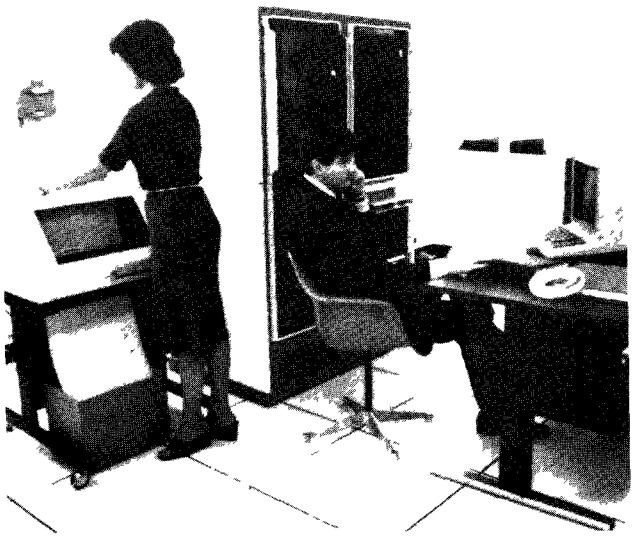
The Lister Hill Center has supported a program to develop an Advanced Terminal System (ATS). Its objectives are to develop a terminal that will be able to service multiple communication protocols in the health sciences, including PLATO and ASCII; to allow the incorporation of computer-generated graphics commensurate with PLATO for all other computer-assisted instruction languages; to provide a sophisticated, stand-alone delivery system for computer-based educational materials; and to allow authoring in online environments as a stand-alone unit using PILOT (Programed Inquiry, Learning, or Teaching).

Field testing of a prototype ATS started in 1979 at Massachusetts General Hospital. As always with prototypes, there were equipment problems, but the testing is proceeding well. The hospital is translating some existing MUMPS teaching programs to operate on the ATS, and is adding computer-generated graphics to their existing minicomputer and MUMPS-based clinical teaching programs.

Several additional ATS units have now been procured. The National Medical Audiovisual Center is supporting the field-testing of these units at the University of Tennessee Health Sciences Center in Memphis, the University of Texas at Dallas, and Ohio State University in Columbus.

Videodisc Program

The Lister Hill Center's Videodisc Program includes several interrelated activities: The Communications Engineering Branch is developing a Video Processing Laboratory to provide the facilities necessary to create master tapes for videodisc production. The Center's Health Professions Applications Branch and the National Medical Audiovisual Center are concerned with the effective use of this exciting new modality. The Computer Technology Branch's responsibility is to develop an intelligent Videodisc Interface Unit, and to identify and address the problems associated with encoding digital information on the standard, video-formated videodisc.



The Integrated Library System is used at the Pentagon's Army Library

The viewer of television images from videodiscs is relatively tolerant of coding errors; encoded digital information, however, will have to be essentially error-free. Studying the encoding of digital information on a videodisc is primarily a problem of determining the errors introduced during the mastering and replication processes and, subsequently, resolving these problems. The initial emphasis has been on developing, with the cooperation of industry, an experimental facility to determine the error characteristics of present videodisc production.

The near-term goal of this effort is to devise an error-correction coding scheme that can be implemented on an inexpensive microprocessor and incorporated into a single "black box" with the Videodisc Interface Unit. This is a necessary step toward the long-range goal of using videodiscs for the mass publication of large machine-readable data bases, as well as compendiums containing digitally encoded text, randomly accessible color video images, and audiovisual sequences.

Integrated Library System

The Computer Technology Branch is developing an Integrated Library System (ILS) to address the library automation needs of both NLM and other health-science libraries. Conceived in mid-1978, the goal was to develop a system that could be adopted

by health-science libraries at all levels to improve their services, to allow better management of library collections, and to promote more effective resource sharing. However, the ILS is certainly applicable to and can be adopted by any library, not just health-science libraries.

The system has the following design objectives:

- Modular integration of functions and files;
- Operation on a range of hardware affordable even by small libraries;
- Software responsive to varying demands;
- Transportability of programs;
- Multilevel user interfaces;
- System network access; and
- Compatibility with NLM's MEDLARS III system.

The ILS is capable of operating on Digital Equipment Corporation's PDP/11 series (including the LSI 11/23 microcomputer), the IBM Series 1, and the Data General Eclipse series computers under the standard Meditech Interpretive Information System (MIIS) operating system supplied by Meditech, Inc., of Cambridge, Mass. To install ILS, a library must acquire the appropriate hardware configuration and Meditech's standard MIIS operating system.

The basic capabilities provided in the initial phase of ILS (version 1.0) follow.

1. *Master Bibliographic File.* Each library can define which data elements (tags and subfields) of a MARC-compatible bibliographic record it wishes to store locally. The capability to create a master file using data from other bibliographic source tapes such as Library of Congress, OCLC, and Blackwell North America is also provided.
2. *The Circulation System.* The circulation subsystem includes bar-code or manual (CRT terminal-assisted) check-in/checkout capabilities. Patrons and items can both be identified by a wide range of entry points including identification (ID) number, personal name (author or patron), call number, and title. The patron registration function contains parameters used in the Army's library at the Pentagon, where version 1.0 has been installed. A generalized capability for defining patron registration parameters is planned. Although the present version functions with HP 2600 series-compatible and OMRON computer terminals, the terminal control subsystem is table-driven and, hence, extension for use with other terminals should present few difficulties.
3. *Serials Check-In.* The basic serials check-in allows the local creation of bar-code directly from the Master Bibliographic File (MBF), including three lines of human-readable information, as well as the production of routing slips from an inexpensive printer attached to the CRT terminal. Hence, at check-in, the MBF is updated, and the serial issue is immediately available for circulation.

4. *Online Catalog Access* This procedure allows searching of the MBF through the use of a variety of entry points including call number, ISSN, ISBN, author, title, and key. Extended search capabilities as well as a patron interface will be part of a future release.

Enhancements of the ILS that remain to be developed include serials control, acquisitions, cataloging, authority control, and generalized network access module.

The Integrated Library System, version 1.0, can be obtained through the National Technical Information Service as PB80-202658 for a licensing fee of $2,000. Although ILS can be implemented on computer equipment costing as little as $25,000, equipment for a medium-size library can cost $70,000 or more. There are many other costs associated with the installation of library automation capability, including those for the MIIS operating system, facility preparation, software changes and maintenance, supplies, and specially trained personnel.

From *Regimen sanitatis Salerni*, Paris, 1506

Extramural Grants and Contracts 7

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

Fiscal year 1980 marks the 15th anniversary of the passage of the Medical Library Assistance Act (MLAA) and its authorities as administered by the Office of Extramural Programs. After one and one-half decades of operation, it is thus appropriate now to examine and emphasize the fundamental nature and various characteristics of the MLAA programs.

A review of the 4,152 awards (totaling $118,632,000) since 1965 shows a clear pattern of growth and change. Each of the existing six program areas authorized by the MLAA has undergone modifications that affect one or more aspects of the program: Applicant eligibility, the basic purpose of grant activity, program emphasis and priorities, additions to grant activities to satisfy new needs, and deletion of grant activities of questionable cost benefit. Such developments are the result of many factors—advances in health education and research with expanding cross-disciplinary information demands; the growing importance of the computer in the storage, retrieval, transfer, utilization, and representation of medical knowledge; advancing technologies in the library and information fields; changing attitudes concerning library functions, accompanied by a changing role for librarians. These external influences and the resultant grant program changes occur over time; hence, the value of a 15-year assessment of NLM's assistance programs.

As the primary national service organization for health information, NLM is by definition a follower of national trends in the health arena; on the other hand, in its nontraditional library role, it is also one of the leaders in developing information technologies and methods to support and facilitate these trends. The Extramural Program, with its various assistance authorities and broad mandate, has been and will continue to be NLM's liaison with that part of the non-Federal community which seeks to improve health care by disseminating knowledge.

In brief, periodic reports, general data (including the methods of financial assistance) are frequently interpreted as ends in themselves. Number of awards, annual fiscal expenditures and future commitments, numbers of consortia established, quantity of interlibrary loans and types of resources acquired tend to become the apparent *raison d'etre* of the granting agency. The objectives, accomplishments, and progress toward goal accomplishment are obscured. The fact that the MLAA has withstood the test of 15 years of operation and four legislative extensions signifies meaningful progress toward alleviating deficiencies identified in the initial legislation. To ensure a continuation of MLAA credibility, however, it is important to stress the end results of MLAA programs as well as the means used to achieve such results. NLM and the grantee community share responsibility for this task. A continuing analysis and evaluation of program direction and frequent contributions to the literature about research findings, project results, and benefits to the health community provide necessary credibility to the assistance programs.

A characteristic of many NLM assistance awards that is infrequently recognized relates to the overall national impact provided by limited Federal funds in the MLAA program areas. It is the nature of many awards that an unknown but significant direct-dollar contribution is made by other funding sources and by grantees and other institutions that stand to benefit from NLM-supported activity. Such contributions are made not only during the grant periods but, in many cases, are continued long after Federal support is terminated.

Overall 1980 MLAA appropriations provided support for 86 new grants, 70 awards for the continuation of projects initiated in previous years, and 8 Regional Medical Library contract awards. The total extramural expenditure was $9,925,000 (Table 13).

Extramural Programs Division offices were relocated in FY 1980 to the new Lister Hill Center building. Even more significant than the amenities of the efficient and functional physical environment is the proximity of Extramural Programs to the NLM intramural offices and work areas, and the resulting improved communication that provides an opportunity for cross-fertilization of ideas and exchange of information.

More specific details concerning the respective programs appear in the following sections. The foreign component of the publications program, also administered by the Office of Extramural Programs utilizing Special Foreign Currency Funds (Public Law 480), is discussed later in this report under "International Activities."

Research Support Mechanisms

NLM's authorities for research are wide-ranging. They make possible a variety of activities that contribute to new discoveries, development of research findings for medical application, and demonstrations of new techniques under actual operating conditions. The areas of inquiry and development include librarianship, information science, computer science, and other disciplines concerned with general problems of information management in a health context. In 1978, a task force confirmed the importance of computer science research for better utilization of knowledge in the practice of health care. Research grants include several support mechanisms, which make it possible to fit the appropriate kind of grant to an investigator's needs and circumstances. The mechanisms follow.

Research Grants

These awards, independently initiated by individual investigators, offer support for research studies, developmental efforts, and demonstration projects. The studies may investigate basic research problems, attempt to develop theoretical findings into practical applications, or demonstrate the value of new technologies in operational situations.

New Investigator Research Grants

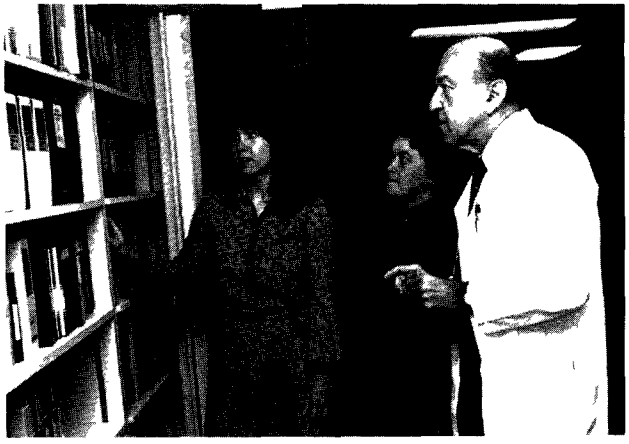
These awards are intended to help younger scientists advance to maturity as independent investigators. Eligibility is limited to those who have received a doctorate within 5 years, but have not yet served as principal investigators on a research grant or contract. The support ceiling is $107,500 over a 3-year period.

Research Career Development Awards

These grants make it possible for institutions to enhance the career development of young scientists who have 3 or more years of relevant postdoctoral experience. The grants enable young scientists to devote essentially all of their time to research in biomedical communications. The period of support may continue for 5 years; the awards provide for up to $30,000 per year in salary support.

Examples of new projects in several different areas, approved by the Board of Regents and subsequently funded, include the following:

Phil R. Manning, M.D.
University of Southern California
"Self-Directed Continuing Education for Physicians"
A multidisciplinary project team will design, develop, implement, and evaluate a system to facilitate self-directed, continuing education for the practitioner. The system will employ such strategies as contract learning, educational networking, and educational brokering by which physicians are linked with learning materials through the intermediary of a librarian.



The M.C. Stith Learning Center at the Wilson Memorial Hospital (Johnson City, NY) was established with support from an NLM resource project grant. Dr. Eugene Wyso, Gloria Gerber (left), and Dr. Shirley Edsall review the audiovisual collection in the new learning center.

William D. Penniman, Ph. D.
OCLC, Inc.
"Modeling and Evaluation of On-Line User Behavior"
This project will model and evaluate the behavior of online users in information retrieval systems, in this case MEDLINE. The study will assess effective and ineffective search patterns and will contribute to a better understanding of the complex encounters between systems and system users.

Computers-in-Medicine

This program, a subset of NLM's grant-supported research efforts, was begun in FY 1979 to implement recommendations of an evaluation of NLM's research grant activities. The Computers-in-Medicine program gives a special focus on computer sciences research in knowledge representation, data base management, and clinical decisionmaking. For FY 1980, the Congress designated $1.3 million in special funding for the program. Following an announcement, receipt of proposals, and review of applications, it was possible to fund 10 new research projects, of which 3 were New Investigator Research Grants. Following are several examples of these projects.

Harry E. Pople, Ph. D.
University of Pittsburgh
"Clinical Decision Systems Research"
This project involves continued work in the production of a computer-based diagnostic system for internal medicine. Improvements will lead to a richer data structure and more complex paths of reasoning and will be of value to medical diagnosis and to applied artificial intelligence.

Grover M. Hutchins, M.D.
The Johns Hopkins University
"Formal Analysis of a Patient Data Index by Computer"
The project involves an investigation of autopsy records, by cause-and-effect analysis, using symbolic logic to determine what autopsy data need to be collected; to develop computer programs for data analysis; and to expand the application of formal logic in medical decisionmaking.

Over a 2-year period, the National Library of Medicine has devoted slightly more than $4 million to initiate new research in its Computers-in-Medicine program, made possible by the specially allocated funds. NLM intends to maintain the program and to initiate more new projects consistent with available fiscal resources.

Accomplishments

Many NLM principal investigators and project team members are gaining recognition for their work and are assuming positions of professional leadership, as illustrated by the following projects.

A program project at the Massachusetts Institute of Technology, directed by Prof. Peter Szolovits, addresses several fundamental issues in clinical decisionmaking from the perspective of artificial intelligence. One of the major collaborators, Dr. Stephen Pauker of Tufts University, led Tufts to organize a Division of Clinical Decision Making in the Department of Medicine. Partly as a result of NLM support, Tufts is now one of the few medical schools to have an identified organization for workers in the health computer sciences. Pauker's use of the microprocessor for medical decision analyses has attracted a great deal of attention.

In his request for funding of the final year of a research project on patterns of scientific communication, Prof. Belver Griffith of Drexel University offered a bibliography of more than a dozen publications, one of which is a collection of papers published by the American Society of Information Science. The work of Griffith and his colleagues shows that analysis of scientific paper citations, as revealed in a bibliographic data base, can provide insights about science as a social undertaking. His results are useful to information managers as well as to students of scientific communication. To some extent, they are predictive of future directions of scientific interest.

Dr. Howard Bleich, Beth Israel Hospital, Boston, is successfully developing a most effective supplementation of MEDLINE. The approximately 500,000 citations from 3,000 journals covered by MEDLINE go back 2½ years. Bleich's system has 36,000 citations from 257 journals, all located at Beth Israel and going back 8½ years. The net contribution of Bleich's system "Paper Chase" is to provide a means of searching for citations known to be held locally, particularly where more exhaustive searches of MEDLINE are not required. During the first year of development, 1,313 users conducted 10,469 searches and displayed 484,979 citations.

Resource Project Grants

The Resource Project Grant provides assistance to established health-science libraries or groups of libraries to develop new services or expand existing ones. Several grants have helped individual libraries establish or expand audiovisual services; these include Cherry Hospital (Goldsboro, N.C.), Connecticut Valley Hospital (Middletown, Conn.), and the Southern California School of Optometry (Fullerton, Calif.). A grant was awarded to develop, implement, and evaluate a comprehensive drug information center to serve central Iowa through the joint efforts of Drake University's College of Pharmacy and Mercy Hospital, both in Des Moines.

Of the 26 grants awarded in FY 1980, 8 represented cooperative projects for the purpose of sharing resources and extending services among several libraries. For example, Creighton University School of Medicine received such a grant to make audiovisual software programs available to institutions in the seven-State area of the Midcontinental Regional Medical Library Program. Through support from the Resource Project Grant Program, statewide library networks are also under development in Oregon and in Idaho.

Of particular note are the several consortia located in rural areas. A project grant to Jefferson Hospital in Pine Bluff, Ark., establishes it as headquarters for the Southeast Arkansas Medical Information Center (SEAMIC), to provide audiovisual resources for the information needs of staff in 10 hospitals. The hospitals have from 29 to 315 beds and serve an area of 7,500 square miles in southeastern Arkansas. The Alabama Hospital Association in Montgomery is receiving NLM support to develop a health-science library network across 16 rural counties in central Alabama. In Aroostook County, the largest and northernmost county in Maine, a circuit-rider librarian is being funded to serve 10 small hospitals with a total of 311 beds. Through projects such as these, NLM promotes the development of library systems that will deliver resources to present and potential users efficiently, effectively, and economically.

Accomplishments

Two examples provide ample evidence of the types and importance of resources developed.

On July 31, 1980, grant support terminated for the Consortium for Health Information, which consisted of 24 members in the suburban southeastern counties of Pennsylvania. The project is now supported locally. A 3-year project grant had made it possible to recruit a full-time coordinator, who successfully implemented a variety of activities for coordinated information services. Union lists facilitated sharing; new MEDLINE terminals were installed for the consortium; and efficient loan and delivery arrangements expedited access to print and nonprint materials. A health education consortium covering the same area has offered to merge with the Consortium for Health Information. The members agreed to meet a budget of slightly more than $50,000 and worked out an equitable apportionment of costs.

NLM continued support in 1980 of a highly significant national resource in the field of bioethics developed by Georgetown University. A grant to Dr. Leroy Walters at Georgetown's Kennedy Institute of Ethics continued support for the "Bibliography of Bioethics" and provided funds for an extensive thesaurus covering this field. Previously, the data gathered by the grant-developed bioethics information retrieval system had been made available online, through BIOETHICSLINE, to all MEDLINE users. Current grant support also enhances the probability of fiscal self-sufficiency for continued production of this vital bibliography. The numerous Federal and local advisory bodies established to address issues of bioethics, the recent court decisions involving bioethical concepts, and the frequency with which health-science academic institutions are implementing formal course work on the subject, attest to the significance and importance of providing ready access to bioethics data through such a comprehensive information retrieval system.

Resource Improvement Grants

The Medical Library Resource Improvement Grant is designed to help individual institutions and consortia of libraries develop basic collections of health-science books and journals. The award to single institutions is for 1 year in an amount up to $4,000, matched by a contribution of up to $1,000 from the institution. For consortia, 2-year funding is available. The first-year grant may be used for the salary of a coordinator to plan the consortium, recruit members, and conduct the collection needs assessment for the individual members as well as for the consortium as a whole. Second-year funds for books and journals are available up to $4,000 to each consortium member contributing matching funds up to $1,000. In addition to the collection development funds, the grant in the second year may be used for a coordinator's salary; this person assists consortium members in setting up the collections.

In FY 1980, a total of 47 Improvement Grants were awarded. Thirty institutions received individual awards for a total amount of $115,487, and 17 grants were made to consortia representing a membership of 176 institutions. Six awards were for first-year planning activities and 11 for second-year collection development.

Some of the consortium awards made in FY 1980 follow.

In Lake Charles, La., St. Patrick Hospital will serve as headquarters for a library consortium of 12 hospitals with from 21 to 246 beds. The Central Coast Health Sciences Library Consortium, in a four-county area along the California coast, has a membership that includes hospitals, colleges and universities, and a public library system. The four newest hospital members of the Consortium of Health Science Libraries of Central Georgia have been awarded funds to establish basic biomedical collections of books and journals so that they can become full-fledged consortium participants. Thus, funds from the Medical Library Assistance Act are being used to build up library resources at the community level to meet the day-to-day information needs of physicians and other medical personnel. In addition, by means of the consortium award, health-science libraries are being encouraged to share their resources and services in an efficacious manner.

Training Grants

The National Library of Medicine's Training Grants Program in Health Science and Computer Technology began in 1972. One of the objectives of the program has been to promote the more effective integration of computer technology into all phases of clinical medicine—teaching, practice, and research.

In FY 1980, $1,637,947 was expended in support of this program. More than one-half of the training funds covered direct trainee expenses (stipends, tuition) with the rest reimbursing the grantee institutions for some of the added expenses generated as a result of the training grant. The sites for the training are the University of California, San Francisco; Duke University (Durham, N.C.); the University of Alabama (Birmingham); Ohio State University (Columbus); the University of Minnesota (Minneapolis); Case Western Reserve University (Cleveland); the University of Missouri-Columbia; and the University of Illinois (Urbana). In addition to the programs at these institutions, training programs were initiated at the University of Virginia (Charlottesville) and at the New England Medical Center Hospital in Boston, Mass. During FY 1980, grants for 76 trainee positions were awarded in the training programs. Thirty-seven were for predoctoral and 39 for postdoctoral students.

In addition to the training grants, NLM has a contract with the Council on Library Resources to support management interns at selected major health-science libraries. The objective of the intern program is to provide an experience that will quality librarians for director-level positions. In this fiscal year, three interns, Eleanor Goodchild, Leonoor Ingraham, and June Bandemer, completed their internships.

Special Scientific Project Grants

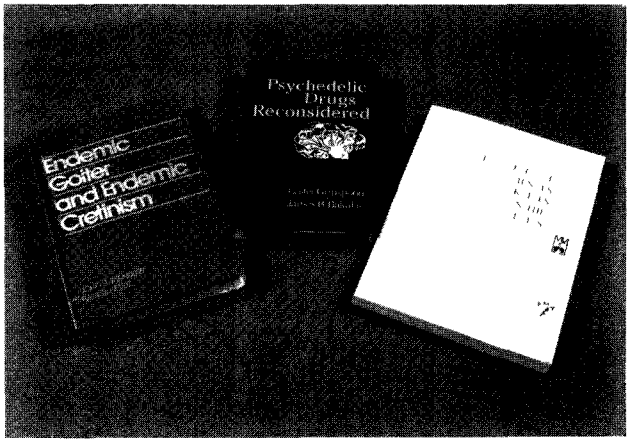
Special Scientific Project Grants support the preparation and writing of authoritative treatises on major health topics. Such treatises help persons from many disciplines by offering a fully documented authoritative interpretation of a large, often diffuse, literature. Works of this kind make heavy demands on scholarship. They call for the ability and the time to retrieve, organize, and integrate enormous amounts of material. They require cogent exposition and the perspective of mature scientific experience. Grant support helps eminently qualified scholars, scientists, and practitioners find the time and the necessary supporting resources to complete these studies in a relatively brief period.

Ten Special Scientific Projects are currently active. One of the projects was published this summer: Robert F. Rushmer, M.D., *National Priorities for Health: Past, Present, and Projected,* New York, John Wiley & Sons, 1980. Another awardee, William C. Stratmann, Ph. D., of the University of Rochester, has completed a manuscript on evaluating hospital-based ambulatory care. It is expected to be published in the spring of 1981.

Biomedical Scientific Publication Grants

Publication Grants facilitate the dissemination and sharing of scientific information important to medical progress and public health. Domestic and international resources are utilized in this effort. International support is 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 later in this report, under "International Activities."

The domestic Publication Grant Program provides selective support for nonprofit biomedical publications, including critical reviews and monographs in health fields; publications in library and information science and in biomedical communication; temporary support for periodical publications; studies in the history of medicine; translations of current foreign biomedical monographs; publication of conference proceedings; and secondary literature tools in the health sciences (such as bibliographies, catalogs, and atlases).



Three recent publications supported under NLM's Publications Grant Program.

During FY 1980, 35 Publication Grants were awarded, totaling $786,889. Of these, 20 were new awards, including a critical review of steroid-protein interactions, a history of the health care of Blacks in the United States (1865-95), and a new journal of the brain and behavioral sciences. Some priority is given to the award of small grants for projects that are underway and scheduled for early publication. This priority is reflected in the average amount of a Publication Grant in FY 1980, which was slightly over $22,000, including both direct and indirect costs. About 25 percent of the total funding supported analytic critical reviews and monographs in the health sciences.

Among the studies published in FY 1980 that had received earlier support in the Publication Grant Program was L. Grinspoon and J. B. Bakalar's *Psychedelic Drugs Reconsidered* (New York, Basic Books, 1980). The study provides a comprehensive survey of all psychedelic substances, including their use in preindustrial cultures and modern American society. Another monograph published with NLM support for manuscript preparation was L. S. Taylor's *Organization for Radiation Protection* (Washington, D.C., U.S. Department of Energy, 1979), a mammoth historical report of the organized development of radiation protection standards nationally and internationally.

The Library's continuing interest in the ethics of biomedical research and medical practice is also evidenced in a 3-year pilot grant to assist a new periodical, *IRB, A Review of Human Subjects Research.* Published by the Institute of Society, Ethics and the Life Sciences at the Hastings Center (Hastings-on-Hudson, New York), this journal has developed as a forum for communicating information and ideas to all those concerned with research involving human subjects—primarily to members of institutional review boards (IRB's), but also to researchers, grants administrators, legislators, Government officials, and others. It is the only periodical exclusively devoted to this increasingly important subject.

The Library's continuing interest in medical librarianship was reflected in the publication of Prof. Alan M. Rees and Dr. Susan Y. Crawford's *Directory of Health Sciences Libraries in the United States, 1979* (Cleveland, Case Western Reserve University, 1980). This directory embodies the results of a comprehensive survey of data on staffing, services, and holdings of health-related libraries in hospitals, medical schools, Government agencies, allied health profession training programs, and group practice clinics. (For a complete listing of books, periodicals, and journal articles received in FY 1980 resulting from NLM publication grants, see Appendix 2.)

Table 13
Extramural Grant and Contract Programs
(in thousands of dollars)

Category	FY 1978		FY 1979		FY 1980	
Research	(13)	$1,111	(22)	$1,658	(32)	$2,794
Resource Projects	(39)	1,848	(44)	1,735	(26)	1,003
Resource Improvement	(13)	165	(34)	284	(47)	593
Training*	(11)	1,459	(10)	1,472	(10)	1,638
Special Scientific Projects	(7)	248	(7)	215	(6)	143
Regional Medical Libraries*	(9)	3,020	(9)	2,848	(8)	2,967
Publications*	(47)	1,071	(35)	750	(35)	787
Total	(139)	$8,922	(161)	$8,962	(164)	$9,925

NOTE: Figures in parentheses refer to number of projects.
*Includes contract funding.

From Kuwatsu, *Kana yomi jushikei*, Osaka, 1805.

International Activities 8

Mary E. Corning, Assistant Director for International Programs

The International Programs of the National Library of Medicine are a natural extension of NLM's domestic responsibilities: These activities are cooperative in nature and have relevancy to both the developed and developing world. This past year has seen a continuation of the international MEDLARS agreements, with the addition of a new partner, Switzerland, in June; the assessment of the 1-year NLM experimental program with the World Health Organization for the provision of services to developing countries; continuation of the NLM exchange program; the beginning of an increased cooperation with the People's Republic of China; the production of critical reviews under the Special Foreign Currency Program; and specialized training for colleagues from abroad.

International MEDLARS Agreements

The current NLM partners are Australia, Canada, France, Italy, Japan, Mexico, South Africa, Sweden, Switzerland, United Kingdom, West Germany, and the Pan American Health Organization (Brazil). A meeting of the International MEDLARS Policy Advisory Group was held in May 1980, with 21 representatives from the collaborating countries. This group provides a forum for the exchange of views on the policies, experiences, and plans of each center.

Major topics discussed were NLM's development of MEDLARS III, future trends in international information activities, the potential role of MEDLARS centers vis-a-vis the needs of the developing countries, document delivery, the impact of technology, evaluation studies, and the development of new data bases.

Table 14
NLM MEDLARS Partners

Tapes	Tapes and Software	Online Access
Germany*	Australia*	Canada
Japan	Sweden*	France
	PAHO**	Italy
	United Kingdom	Mexico
		South Africa
		Switzerland

*Supplemental online access.
**Pan American Health Organization.

This was the fifth meeting of the policy group; the last one was in 1977. Table 14 shows the selection of the centers for the mode of access to the NLM computer. Each center has increased its activities, both in terms of data bases and usage.

Most of the centers provide documents, if not directly from their own resources, then from other existing resources individually or in a consortium arrangement although Germany and Sweden have not assumed the provision of documents as a primary responsibility. France has been providing a microfiche service for a smaller number of journals. One of the challenges still facing all of the centers is the potential cooperation in the intellectual building of data bases.

Work is underway for the development of data bases in Sweden (teratology) and in Germany (poisonous substances, drug information, and toxicology).

New developments have occurred in some of the countries—the establishment of a Delegation for Scientific and Technical Information in Sweden, the Mission Interministerielle de l'Information Scientifique et Technique (MIDIST) in France, and the Federal Information and Documentation Program in Germany.

U.S. Delegation on Biomedical Information meets with staff of the Shanghai Second Medical College during the delegation's July 1980 visit to the People's Republic of China. Facing the camera, left to right: Professor Chen Ching-chih, Miss Mary E. Corning, Dr. S. Richardson Hill, Jr., Dr. Kelly M. West, and Mr. James F. Williams, Jr.

Participants in the May policy group meeting included Sir Harry Hookway and Susan Hills, United Kingdom; H. Thimm and Dr. R. Fritz, West Germany; Dr. J. Zeraffa and Dr. P. Dostatni, France; Dr. Bengt Pernow, Prof. Sune Bergstrom, Dr. Goran Falkenberg and Dr. G. Svartz-Malmberg, Sweden; Shoichi Oi, Japan; Dr. Jose Ferreira, Pan American Health Organization; Dr. A. J. Brink, South Africa; Colin Freeman, Australia; Evelyne Buchdid-Marck, Mexico; George Ember and Eve Marie Lacroix, Canada; and Dr. H. Wirz and Dr. Z. Urbanek of Switzerland.

United States/People's Republic of China Cooperation

A U.S. Delegation on Biomedical Information visited the People's Republic of China, July 9-26, 1980. The delegation consisted of Mary E. Corning, NLM; S. Richardson Hill, Jr., M.D., University of Alabama; Kelly M. West, M.D.,* University of Oklahoma; James F. Williams, Jr., Wayne State University, Detroit; and Prof. Ching-chih Chen, Simmons College, Boston.

The purpose of the visit was (1) to observe how medical information is used within the health care

*Dr. West, a former member and chairman of NLM's Board of Regents, suffered a cerebral accident while in China and died July 29 in Hong Kong. The NLM and the medical library community have lost a good friend.

system of China at the university, medical school, urban, and rural hospital levels; (2) to learn of research and communication techniques and projects relating to information transfer in China; (3) to discuss any potential areas for cooperation; (4) to conclude a *quid pro quo* arrangement with the Chinese Academy of Medical Sciences for Chinese specialists to come to the Library to work on NLM's Chinese collection, in return for which NLM will provide the specialized training in modern medical library management.

The group visited a number of institutions in Beijing, Tianjin, Shanghai, and Canton. An implementation plan was developed to execute the Chinese Academy of Medical Sciences-National Library of Medicine arrangement. An increase in the volume of literature exchanged will also result from the discussions. Additional Chinese journals were identified, particularly those containing English-language abstracts and tables of contents in English.

Collaboration with the World Health Organization

The National Library of Medicine has continued its collaboration with the World Health Organization's (WHO) Special Program for Research and Training in Tropical Diseases in order to publish a *Quarterly Bibliography of Major Tropical Diseases*. These diseases, selected by WHO for special emphasis, are filariasis, leishmaniasis, leprosy, malaria, schistosomiasis, and trypanosomiasis. The NLM prepares this quarterly bibliography through its MEDLINE system; WHO distributes the publication to scientists and institutions in tropical countries. The bibliography is now in its second year of publication and is undergoing evaluation. WHO currently distributes 4,500 copies.

The Memorandum of Understanding between NLM and WHO was completed 1 year ago. Under this arrangement, NLM provides MEDLARS computer searches and interlibrary loans (photocopies of journal articles) for 84 developing countries in the WHO regions of Africa, Southeast Asia, the Eastern Mediterranean, and the Western Pacific. For these services, WHO has supported the equivalent of one and one-half people in residence at NLM to provide 1,400 MEDLINE searches and 2,500 interlibrary loans. The experience has demonstrated that major unfulfilled needs continue to exist within developing countries. The NLM-WHO level of activity is modest compared to the services required. Based on this experience, NLM and WHO will continue the arrangement for another year.

Collaboration with the Pan American Health Organization

NLM continues to provide technical expertise and service support to the Pan American Health Organization's (PAHO) Regional Library of Medicine, BIREME, in Sao Paulo, Brazil. PAHO has undertaken a series of meetings to evaluate the role of BIREME and its future operations. NLM staff participating in these sessions include Mary E. Corning, Joseph Leiter, Ph. D., and Clifford A. Bachrach, M.D. As a member of the Scientific Advisory Committee for BIREME, Miss Corning attended the 12th meeting of this group in Sao Paulo in May 1980. This committee provides policy guidance to the PAHO Director. The committee has been examining BIREME's activities and resources (including interlibrary loans, bibliographic searches and publications), the agency's budget, and the relationship of resources to need.

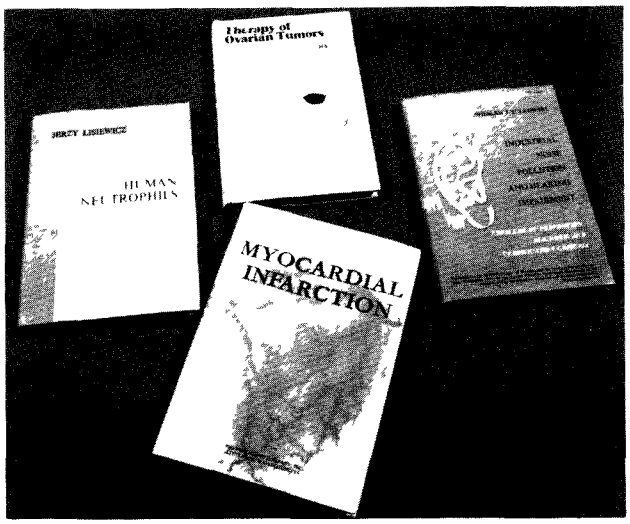
Special Foreign Currency Program

The Library's Special Foreign Currency Program, authorized by Public Law 83-480, as amended, utilizes appropriations of U.S.-owned, local foreign currencies to make awards for scientific writing projects in seven cooperating countries—Poland, Yugoslavia, Israel, Egypt, Tunisia, India, and Pakistan. The program is also currently funded through collaborative, bilateral agreements in Israel and Poland.

Among the projects in the cooperating countries are the preparation of critical reviews and monographs analyzing biomedical research and practice; translations of foreign monographs in the health-sciences; studies in the history or medicine; the publication of major international symposia and conference proceedings; and the preparation and publication of authoritative bibliographies, guides, and other literature tools in the biomedical sciences. The program enables the Library to draw on foreign scientific personnel and resources in obtaining and disseminating information important to U.S. health educators, practitioners, and researchers.

The projects are multiyear; during FY 1980, there were 95 active projects, totaling an equivalent of $1,350,028 in foreign currencies. Almost 50 percent of the program is currently carried out in Poland and Egypt, and about 15 percent in Yugoslavia. New critical reviews and monographs in health fields constitute almost 55 percent of the projects; history of medicine projects represent another 25 percent.

Examples of new projects activated in FY 1980 include a critical review on the application of new ultrastructural techniques in medicine and pathology, the publication in Egypt of a bibliography of leishmania and leishmanial diseases, and a translation of a Russian study of the transplantation of muscles in animals.



Four recent publications supported under the NLM Special Foreign Currency Program (P.L. 480).

Among the books published in FY 1980 under this program was *Industrial Noise Pollution and Hearing Impairment* (Warsaw, Polish Medical Publishers, 1980) by Dr. W. J. Sulkowski, Chief of the Audiological Laboratory, Institute of Occupational Medicine in Lodz, Poland. Another significant study, translated from Russian in Pakistan and printed in Yugoslavia under the NLM program, is the multiauthored *Myocardial Infarction; The Approach to Prevention, Diagnosis, and Treatment in the Soviet Union* (distributed by Littleton, Mass., PSG Publishing Company, 1979). This book represents the result of cooperative efforts between U.S. and U.S.S.R. health institutions, including the NLM, the National Heart, Lung, and Blood Institute and its counterpart, the Myasnikov Institute of Cardiology, Academy of Medical Sciences, U.S.S.R. (For a complete list of books and journal articles resulting from the NLM P.L. 480 Program received in FY 1980, see Appendix 3.)

Visitors and Specialized Training

Approximately 1,000 international visitors come to NLM annually. During 1980, these individuals represented 45 countries. Among their various interests were medical research and education, health care information, library science, construction of new library buildings, and biomedical and health information programs.

Formal delegations were received from Nigeria, the People's Republic of China, West Germany, Japan, Libya, and France. There were five delegations from the PRC, with the following topics and leaders: Health delegation, Qian Zinzhong, Minister of Public Health; University Library delegation, Shi Guohing; Study Mission on Medical Information and Library Management, Prof. Shen Qizhen; Scientific and Technical Information, Wang Wei; Modern Organization and Management of Scientific Research, Dr. Chen Hai-feng.

NLM also received three WHO fellows from the People's Republic of China for a period of 3 months' training: Chun-bing Lei, Institute of Medical Information Sciences, Beijing; Li-yen Peng, Institute of Medical Information, Beijing; and Chi-chung Wang, Institute of Basic Medical Sciences, Beijing.

Specialized programs were also arranged for Irene Lago of Uruguay; Mrinal K. Ray of India; Shirley King of the British Library, United Kingdom; Patricia Shoyinka of Nigeria; and Dr. Gustavo Roman of Colombia.

Appendix 1: Staff Bibliography

The following works were published by National Library of Medicine staff in FY 1980.

Anderson, S.E , and Dick, R S *A User's Guide to Maintaining the Master Bibliographic File of the Integrated Library System (ILS)* Springfield, Va , National Technical Information Service, 1980, 55pp.

Barry, J.W.: Periodical prices *Bulletin of the Medical Library Association* 68(3): 303, 1980.

Bernstein, L.M., Siegel, E.R., and Goldstein, C.M : The Hepatitis Knowledge Base: A prototype information transfer system. *Annals of Internal Medicine* 93: 169-181, 1980

Blake, J.B.: Addenda to Keynes: Bibliography of Berkeley. *Papers of the Bibliographical Society of America* 73: 337-340, 1979

_____: Anatomy. In Numbers, R.L. (Ed.): *The Education of American* Physicians: Historical Essays. Berkeley, University of California Press, 1980, pp. 29-47

_____: Billings and before: Nineteenth century medical bibliography. In Blake, J.B. (Ed.): *Centenary of Index Medicus, 1879-1979.* NIH Publ. No. 80-2068, 1980, pp. 31-52.

_____ : *Centenary of Index Medicus, 1879-1979* NIH Publ No. 80-2068, 1980, 115pp.

_____:Les "Elements de pharmacie" de Baume: encore une edition inconnue. *Revue d'Histoire de la Pharmacie* 26, 175-176, September 1979.

Brand, J.L.: Neurology and psychiatry In Numbers, R L (Ed). *The Education of American Physicians* Berkeley, University of California Press, 1980, pp. 226-249

Cassedy, J.H.: An American clerical crisis ministers' sore throat 1830-1860 (The Fielding H. Garrison Lecture) *Bulletin of History of Medicine* 53: 23-38, 1979

Chapman, G.I., Ford, W.H., and Standing, R A. *Advanced Terminal System Master Control Processor Logic Manual* Springfield, Va., National Technical Information Service, 1980, 211pp.

Chapman, G.I , Ford, W H., and Standing, R A *Advanced Terminal System User's Guide* Springfield, Va , National Technical Information Service, 1980, 143pp.

Cooper, W.G.: The National Medical Audiovisual Center in Bethesda. *Journal of Biocommunication* 7(2). 2-3, 1980

Corning, M.E : Access to medical literature In *Medinfo 80, Proceedings of The Third World Conference on Medical Informatics, Tokyo, Japan, September 29-October 4, 1980, Part 2* New York, North-Holland Publishing Co , 1980, pp 1375-1379.

_____: International biomedical communications the role of the United States National Library of Medicine *Health Communications and Informatics* 6 212-242, 1980

_____: International cooperation for library and health information services. In *Health Information for a Developing World. Proceedings of Fourth International Congress on Medical Librarianship, Belgrade, Yugoslavia, 2-5 September 1980, Vol 3,* 1980, pp. 121-128

_____: The United States National Library of Medicine's international relationships *Medical Informatics* 5(1) 3-20, 1980.

_____: *A Review of the United States Role in International Biomedical Research and Communications International Health and Foreign Policy* NIH Publ No. 80-1638, 1980, 436pp

Craig, D.F. and Strain, P M.: Analysis of collection development at the National Library of Medicine *Bulletin of the Medical Library Association* 68(2): 197-206, 1980

Craig, P.N : Guidelines for drug and analog design In Wolff, M.E (Ed): *Burger's Medicinal Chemistry, Fourth Edition* New York, John Wiley & Sons, Inc , 1979, pp 331-348

Cummings, M M Index Medicus, 1879-1979 *Military Medicine* 144(12) 829, 1979

Doszkocs, T.E , Rapp, B A., and Schoolman, H M Automated information retrieval in science and technology *Science* 208 25-30, 4 April 1980

Epstein, M N : Introduction to computer-assisted clinical decisionmaking, data bases In *Proceedings of the Third Annual Symposium on Computer Application in Medicine* New York, Institute of Electrical and Electronics Engineers, 1979, pp 74-76

Gluckstein, F P ; Doszkocs, T E and Hoag, W G The Laboratory Animal Data Bank (LADB) In *Proceedings of International Symposium on Animal Health and Disease Data Banks, December 4-6, 1978, Washington, D C* U S Department of Agriculture, Misc. Publ. No 1381, 1979, pp 147-154

Held, T. H and Goldstein, C.M PILOT-minicomputer and microprocessor based CAI language for the health sciences In *Proceedings of the Conference on Micro Computers in Education and Training* Warrenton, Va , Society for Applied Learning Technology, 1979, pp 115-116

Himwich, W A Book Review Metzler, H L The Chemistry of Human Behavior *American Journal of Mental Deficiency* 84: 427-428, 1980.

King, S G and Dick, R S *A Guide to Using the Bibliographic Features of the Integrated Library System (ILS)* Springfield, Va , National Technical Information Service, 1980, 22pp

Kissman, H M.: Information retrieval in toxicology In George, R., Okun, R , and Cho, A K (Eds) *Annual Review of Pharmacology and Toxicology, Vol 20* Palo Alto, Ca , Annual Review, Inc , 1980 pp 285-305

Mehnert, R.B.: National Library of Medicine. In Simora, F (Ed): *The Bowker Annual of Library and Book Trade Information* New York, R.R. Bowker Co , 1980, pp 105-109

Merritt, A D , Siegel I R , Goldstein, C M., and Bernstein, I M Online information for physicians: a perspective from the Lister Hill National Center for Biomedical Communications In *Proceedings of the Third Annual Symposium on Computer Application in Medicine* New York, Institute of Electrical and Electronics Engineers, 1979, pp 752-756

Murray, G G., Staley P., and Thoma, G R Motion-adaptive TV data compression. In *Proceedings of the Society of Photo-Optical Instrumentation Engineers, San Diego, Ca , July 28-Aug 1, 1980* Bellingham, Wa., Society of Photo-Optical Instrumentation Engineers, 1980

Olch P.D Evarts Ambrose Graham In *Dictionary of American Biography,* Supplement 6, 1956-1960 New York, Charles Scribner's Sons, 1980, pp 245-247

_____: Robert Elman In *Dictionary of American Biography,* Supplement 6, 1956-1960 New York, Charles Scribner's Sons, 1980, pp 189-190

Pearson, E.F., and Miles W Disinfection of mail in the United States. *Bulletin of the History of Medicine* 54 111-124, 1980

Raum, D M., Spence, A , Balavitch, D , Tideman, S , Merritt, A D , et al: Genetic control of the eighth component of complement *Journal of Clinical Investigation* 64 858-65 1979

Siegel, E.R.: *User of computer conferencing to validate and update NLM's Hepatitis Knowledge Base.* In Henderson, M.M., and MacNaughton, M.J. (Eds.): *Electronic Communication Technology and Impacts* Washington, D.C., American Association for the Advancement of Science, 1980, pp. 87-95.

————: Validating and updating NLM's Hepatitis Knowledge Base: the role of computer conferencing. In *Information Choices and Policies. Proceedings of the ASIS Annual Meeting, Vol. 16.* White Plains, N.Y., Knowledge Industry Publications, 1979, pp. 124-130.

Smith, K.A., and Bernstein, L.M.. Lister Hill Center. In Wedgeworth, (Ed): *The ALA Yearbook*, Vol. 5. Chicago, American Library Association, 1980, pp 94-97.

————: National Library of Medicine In Wedgeworth, R (Ed.): *The ALA Yearbook, Vol. 5* Chicago, American Library Association, 1980, pp. 217-218.

Soave, A., Emmons, R.W., and Ghumman, J. Suspected adenovirus or respiratory syncytial virus illness in a colony of chimpanzees. *Laboratory Primate Newsletter* 18· 2-3, 1979

Sollenberger, J.F., and Sinn S.K.: The National Library of Medicine's retrospective conversion of the shelflist. In *Retrospective Conversion Systems and Procedures Exchange Center (SPEC)· Kit 65* Washington, D C , Association of Research Libraries, 1980, pp 70-75

Sparks, S.M., Vitalo, P., Cohen, B.F., and Kahn, G.· Teaching of interpersonal skills to nurse practitioner students. *Journal of Continuing Education in Nursing* 11 (3)· 5-16, 1980

Spencer, C.C.: Random time sampling with self-observation for library cost studies: unit costs of reference questions *Bulletin of the Medical Library Association* 68 (1) 53-57, 1980

Sumpter, R.E.: A model lesson format and its uses. *Quarterly Journal of the Referee Instructor* 1 (1)· 2-7, 1980.

Suthasinekul, S.: *Adaptive Delta Modulation for Telephone Biotelemetry of ECG* Springfield, Va , National Technical Information Service, 1980, 52pp

————: Microfilm vs. optical disc as storage medium for document retrieval and dissemination In *Communicating Information Proceedings of the ASIS Annual Meeting, Vol 17* White Plains, N.Y , Knowledge Industry Publications, 1980, pp 100-102.

Suthasinekul, S., and Thoma, G.R ADM-TDM for the transmission of 3 ECGs over a standard telephone line In *Proceedings of the 32nd Annual Conference on Engineering in Medicine*, 1979, p. 246

Thoma, G.R.: *Factors affecting cost in a satellite-aided* biomedical communications network In *Proceedings of the Association for the Advancement of Medical Instrumentation* Arlington, Va., Association for the Advancement of Medical Instrumentation, 1980.

————. *Biomedical Communications Experiments Using the Communications Technology Satellite Technical Evaluation* Springfield, Va., National Technical Information Service, 1979, 98pp.

————: Compression techniques for document storage and transmission. In *Proceedings of the ASIS Annual Meeting, Vol 17* White Plains, N.Y., Knowledge Industry Publications, 1980, pp. 97-99.

————: Performance evaluation of a satellite-linked experimental network. *IEEE Transaction on Aerospace and Electronic Systems* 16 (6): 771-782, 1980.

————, and Prophet, D.M : Echo suppression in biomedical communications via satellite. In *Proceedings of the 31st Annual Conference on Engineering in Medicine and Biology* Chevy Chase, Md., Alliance for Engineering in Medicine and Biology, 1979, p. 283.

————, and Prophet, D.M.: *Evaluation of Echo Suppression in Video Teleconferencing via the Communications Technology Satellite* Springfield, Va., National Technical Information Service, 1979, 20pp.

Ullmer, E.J., and Haney, J.B.: *Educational Communications and Technology an Introduction* Dubuque, Iowa, William C Brown Co , 1980, 252pp.

Waserman, M.J · Sir James Y Simpson and London's "conservative and so curiously prejudiced" Dr Ramsbotham *British Medical Journal* 280: 158-161, 1980.

Weise, F.O.: *Health Statistics A Guide to Information Sources* Detroit, Gale Research Co., 1980, 137pp

West, R.T , and Malone, M J.: Communicating the results of NLM grant-supported library projects *Bulletin of the Medical Library Association* 68 (1): 33-39, 1980

Wooster, H.:: Information for poison centers. *Veterinary and Human Toxicology* 21: 468-470, 1979

————: The users last *Bulletin of the American Society for Information Sciences* 5: 19-21, August 1979.

Yep, S., and Suthasinekul, S.: *Digital Transmission Experiment Over CTS Audio Channels.* Springfield, Va., National Technical Information Service, 1980, 67pp.

Yu, P.L., Karn, R.C., Merritt, A.D., Azen, E.A , Conneally, P.M · Linkage relationships and multipoint mapping of the human parotid salivary proteins (Pr, Pa, Db). *Human Genetics* 32· 555-563, 1980.

Appendix 2: Grant-Supported Publications

Alexander, John T.: *Bubonic Plague in Early Modern Russia* Baltimore, Maryland: The Johns Hopkins University Press, 1980, 385 pp.

Baumel, Julian J.: *et al.*, (eds.) *Nomina Anatomica Avium* London: Academic Press, 1979, 637 pp.

Benzinger, T.H.: The Physiological Basis for Thermal Comfort. In: *Indoor Climate. Effects on Human Comfort, Performance, and Health in Residential, Commercial, and Light-Industry Buildings*, edited by P. O. Fanger and O Valbjorn (Proceedings of the First International Indoor Climate Symposium in Copenhagen, August 30-September 1, 1978). Copenhagen. Danish Building Research Institute, 1979, pp. 441-474

Blanco, Richard L.: *Physician of the American Revolution Jonathan Potts* N. Y.: Garland STPM Press, 1979, 276 pp.

Burlingame, A.L., Baillie, T.A., Derrick, P J., and Chizhov, O.S. Mass Spectrometry, *Anal. Chem Fundamental Reviews*, Vol. 52, 1980, pp. 214R-258R.

Burnham, John C.: The Influence of Psychoanalysis Upon American Culture, In: *American Psychoanalysis Origins and Development*, edited by Jacques M. Quen and Eric T Carlson New York: Brunner/Mazel, Inc., 1978, pp. 52-72

_____: From Avant-Garde to Specialism: Psychoanalysis in America, *Journal of the History of the Behavioral Sciences*, Vol 15, 1979, pp. 128-134.

Debus, Allen G.: *Robert Fludd and His Philosophicall Key* N Y Science History Publications, 1979. 156 pp

Early Diagnosis of Decompression Sickness (The Twelfth Undersea Medical Society Workshop.) Bethesda, Maryland Undersea Medical Society, Inc , 1979, 309 pp (Report No 7-30-77)

Forbes, Thomas R.: Apprentices in Trouble: Some Problems in the Training of Surgeons and Apothecaries in Seventeenth Century London, *The Yale Journal of Biology and Medicine, Inc.*, Vol. 52, 1979, pp. 227-237.

_____. By What Disease or Casualty: The Changing Face of Death in London, In: *Health, Medicine and Mortality*, edited by Charles Webster. Cambridge: Cambridge University Press, 1979, pp. 117-129.

Frieden, Nancy M.: Child Care. Medical Reform in a Traditionalist Culture, In: *The Family in Imperial Russia New Lines of Historical Research*, edited by David L. Ransel. Urbana: University of Illinois Press, 1978, pp 236-259.

Grinspoon, Lester and Bakalar, James B.: *Psychedelic Drugs Reconsidered* N. Y.: Basic Books, Inc., 1979, 343 pp.

Grob, Gerald N.: Doing Good and Getting Worse The Dilemma of Social Policy, *Michigan Law Review*, Vol. 77, No 3, January-March 1979, pp. 761-783.

_____: Reflections on the History of Social Policy in America. *Reviews in American History*, September 1979, pp 293-306.

_____: Rediscovering Asylums. The Unhistorical History of the Mental Hospital. In: *The Therapeutic Revolution Essays in the Social History of American Medicine*, edited by Morris J Vogel and Charles E. Rosenberg. Philadelphia: University of Pennsylvania Press, 1979, pp. 135-158

O'Neill, Ynez Viole. *Speech and Speech Disorders in Western Thought Before 1600* Westport, Connecticut. Greenwood Press, 1980, 246 pp.

Patterson, David K.: Health in Urban Ghana The Case of Accra 1900-1940. *Social Science and Medicine*, Volume 13B, 1979, pp 251-268.

Rees, Alan M. and Crawford, Susan. (comp and ed). *Directory of Health Sciences Libraries in the United States, 1979* Cleveland, Ohio: The Cleveland Health Sciences Library of Case Western Reserve University, 1980, 355 pp.

Shilling, Charles W and Werts, Margaret F . *Physical Methods of Bubble Detection in Blood and Tissues An Annotated Bibliography with Preliminary Analysis* Bethesda, Maryland Undersea Medical Society, Inc , 1979, 85 pp.

Stanbury, John B., and Hetzel, Basil S : *Endemic Goiter and Endemic Cretinism* N Y John Wiley & Sons, Inc. 1980, 606 pp.

Taylor, Lauriston S.: *Organization for Radiation Protection* Washington, D.C.. U.S. Department of Energy, 1979, 2082 pp (Distributed through the National Technical Information Service).

Zguta, Russell: Early Russian Medicine Potential Sources and Directions of Research *Journal of the History of Medicine and Allied Sciences*, Volume XXXV, Number 2, April 1980, pp 203-214

Temporary support for periodical publication

IRB-A Review of Human Subjects Research Hastings-on-Hudson, N.Y.: The Hastings Center, Institute of Society, Ethics and the Life Sciences Volume 1, Number 1, March 1979 - (ten issues per year)

Appendix 3: P.L. 480 Supported Publications

Chazov, Evgenii I (ed) *Myocardial Infarction The Approach to Prevention, Diagnosis, and Treatment in the Soviet Union* English Language Edition Edited by James E Muller Littleton, Massachusetts PSG Publishing Company, Inc , 1979 314 pp

Ishaq, Hunayn Ibn *Questions on Medicine for Scholars* Translated into English, with a preface and historical note by Paul Ghalioungui, M D , from a critical edition by Galal M Moussa, Ph D , of the Ninth Century Arabic text, "Al Masa' il fi al-Tibb lil Muta'allimin " Cairo A R E Al-Ahram Center for Scientific Translations, 1980 163 pp

Juretic, Miro *Herpetic Infections of Man* Hanover, New Hampshire University Press of New England, 1980 202 pp Printed by NOLIT Publishing House Belgrade, Yugoslavia

Lisiewicz, Jerzy *Human Neutrophils* Bowie, Maryland The Charles Press, Inc , 1980, 304 pp

Maretic, Zvonimir and Lebez Drago *Araneism* Pula Yugoslavia Nolit Publishing House 1979 255 pp Distributed by the National Technical Information Service

Naor, David Suppressor Cells Permitters and Promoters of Malignancy? *Advances in Cancer Research*, Vol 29 pp 45-125

Nechaeva, I D *Therapy of Ovarian Tumors* Translated from Russian Edited by Myroslaw M Hreshchyshyn, M D New Delhi, India Amerind Publishing Company, 1979 186 pp Distributed by the National Technical Information Service

Polliack, Aaron (ed) Application of New Ultrastructural Techniques in Medicine and Pathology *Israel Journal of Medical Sciences*, Vol 15 No 8 August 1979, pp 627-723

Selzer, Golda (ed) Geographic Pathology of the Gastrointestinal Tract, *Israel Journal of Medical Sciences*, Vol 15, No 4, April 1979

Stein, Yechezkiel and Stein, Olga Interaction Between Serum Lipoproteins and Cellular Components of the Arterial Wall In *The Biochemistry of Atherosclerosis* edited by Angelo M Scanu N Y Marcel Dekker, Inc , 1979 pp 313-344

Sulkowski, Wieslaw J *Industrial Noise Pollution and Hearing Impairment* Warsaw, Poland (PZWL) Polish Medical Publishers, 1980, 243 pp Distributed by the National Technical Information Service

Appendix 4: NMAC Audiovisual Materials Produced

Motion Pictures

Forty Years of NMAC An Historical Review

Videotapes

Lister Hill Center Dedication

Installation of National Cancer Institute Director, by HHS Secretary Harris
National Institute on Aging 5th Anniversary Program
Handling of Tools of Your Trade Laboratory Division, Centers for Disease Control
Can You Spot the Mistakes?
The Combined Niacin-Nitrate Reduction Test for M-TB
The Ph-7-68 Degree Catalase Test for M-TB
The Single Beam Spectrophotometer
Blood Gas Analysis Tonometry
Technique for Making a Slide Culture
Flame Photometry
Differentiation of Enteric Pathogens by TSI and LIA
Introduction to Clinical Gas Chromatography
Inoculation and Interpretation of A P I 20E
Reflectance Spectrophotometry
Wide-Band Pass Filter Photometry
General Purpose Narrow Band Pass Filter Photometer
Oxidase Test
Catalase Test
Operation of Laminar Flow Biological Safety Cabinet
Inoculation and Interpretation of Enterobacteria

Slide/Tape Sets

Physiology of Vision
Projectable Media Pros & Cons

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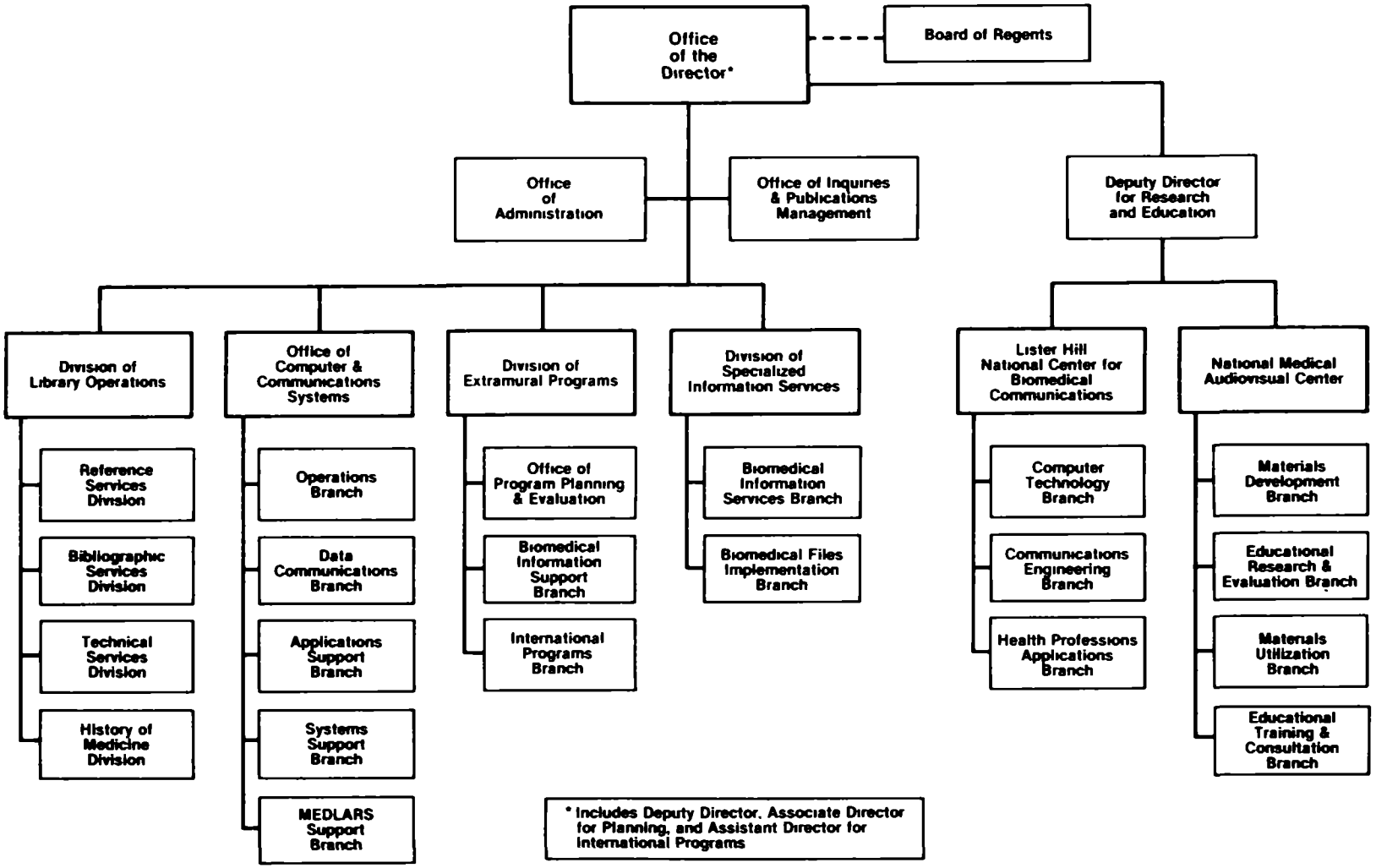

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