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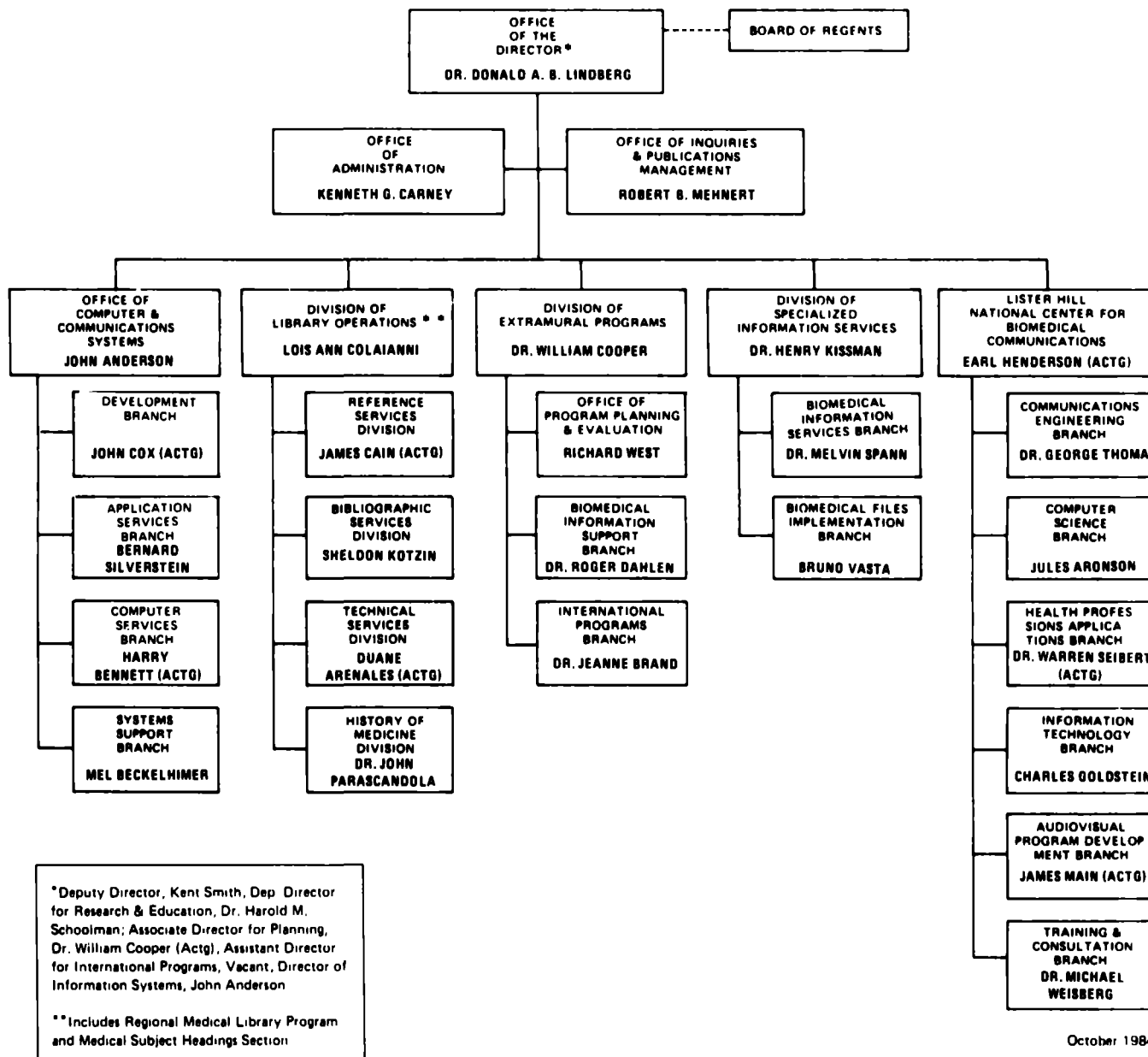
NATIONAL LIBRARY of MEDICINE

PROGRAMS and SERVICES

Fiscal Year 1984

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NATIONAL LIBRARY OF MEDICINE



October 1984

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Cover: The names of the approximately 600 employees who worked at the National Library of Medicine during fiscal year 1984.

**NATIONAL LIBRARY OF MEDICINE
PROGRAMS AND SERVICES**

Fiscal Year 1984

October 1, 1983 – September 30, 1984

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

National Library of Medicine
Bethesda, Maryland
January 1985

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Preface

In my short time at the National Library of Medicine I have been impressed by the wisdom of the choices in program emphasis made by my predecessors. These decisions and the consistency with which the institution has pursued its chosen course have resulted in outstanding accomplishments. NLM's MEDLARS bibliographic database system, and the collections and procedures supporting it, provide the backbone worldwide for access to the biomedical scientific literature. A variety of NLM bibliographic products save enormous effort and cost in libraries that utilize work already done here.

On the research side, NLM's commitment to support the investigation of computer-based programs to benefit information management and decision-making in American health care institutions was clearly farsighted and correct. Now these programs are bearing fruit in advancing our understanding of human cognition, medical decision making, and practical interfaces to automated systems.

It is clear, of course, that this is a time of change. The successes of the past are a source of pride but not a program for the next 20 years. NLM's greatest strength remains its excellent and devoted staff and the wise and faithful guidance of its advisors—the Board of Regents, the Board of Scientific Counselors, and the Biomedical Library Review Committee. During the coming year we shall be drawing upon these strengths to formulate plans for NLM that will carry its invaluable work into the next century.

My most sincere thanks to all on the NLM staff and to the Library's many friends and advisors for so much help and goodwill in the past, and for the help we will need in the future.

Donald A.B. Lindberg, M.D.
Director

POLICY AND DIRECTION

Kenneth G. Carney
Executive Officer

Board of Regents

Perhaps the most important issue considered by the Regents in FY 1984 (as it has been in recent years) was that of pricing NLM computer-based products and services. A draft position paper was considered at the October 1983 meeting and gave rise to lively debate. Before it could be amended and reconsidered in January, however, the Department of Health and Human Services issued a report on the subject. The study approved the present method for establishing and reviewing pricing policies and levels and it found that the current method of basing charges on the actual cost of providing access is reasonable. The study also concluded that the present policy of differential pricing by type of database and time of day is reasonable, but that the possibility should be explored of expanding that policy to include charging different prices to different types of users (commercial and noncommercial, for example). The Regents were asked to study the question of differential pricing for different categories of online users and to report within 120 days to the Assistant Secretary for Health.

The Regents, at the January 1984 meeting, discussed the Department's report and assigned to the Board's Pricing Subcommittee the task of drafting a response. The Subcommittee convened an open meeting on March 26 at which representatives of various interests in the private sector presented their views on the issue of differential pricing. As a result of its own deliberations and of the opinions and testimony expressed at the open meeting, the Board of Regents, in May, approved a report that concurred with the findings of the Department's study. While the Board rejected the notion of differential pricing by type of domestic MEDLARS user, it recommended a modest increase in the cost of foreign access. This is based on the premise that since foreign users do not support the generation

of MEDLARS databases through taxes, it is reasonable to impose on them a higher rate to reflect this fact. In its report, the Board expressed concern that the American public have rapid and easy access to biomedical information, regardless of the source. In keeping with that philosophy, the NLM was encouraged to work cooperatively with database producers in the private sector to create linkages between databases, reduce production costs, and to otherwise facilitate access to all relevant health information.

Other subjects warranting the Regents' attention this year (in addition to their responsibility for reviewing grant actions) were the new subset policy (see page 12), the Library's coverage of the medical behavioral sciences (page 6), MEDLARS III progress (page 21), and Integrated Academic Information Management Systems (page 37).

The terms of appointment expired for Dr. Gwendolyn S. Cruzat, Dr. William D. Mayer, and Dr. Charles E. Molnar. Dr. L. Thompson Bowles was elected Chairman at the May meeting. A list of Regents is in Appendix 3.

Modernization of the Building

The renovation project for the National Library of Medicine was completed in the spring of 1984. The project, which began in the summer of 1981, involved major modifications to the Library building to accommodate the many rapid changes in Library activities that have taken place since the original construction of the building more than twenty years ago. The phasing of the project has been successful, allowing Library functions to proceed with a minimum of interruption to services.

Besides making the work environment and public areas more attractive, the renovation has resulted in an effective fire and safety system for the protection of

staff and the priceless collection and has increased the available stack space by approximately 20 percent.

Financial Resources

In FY 1984, the NLM had a total budget authority of \$50,220,000, including a supplemental transfer to offset payraise costs. Table 1 displays the FY 1984 budget authority plus reimbursements from other agencies, and the allocation of these resources by program activity. The Department of Health and Human Services (DHHS) will begin FY 1985 operating under a continuing resolution.

Personnel

Martin M. Cummings, M.D., retired on January 3, 1984 as Director, National Library of Medicine. His distinguished career in the Federal Government covered a period of 40 years, the last 20 of which were as head of the Library.

On October 11, 1984, Donald A.B. Lindberg, M.D. was sworn in as the nineteenth director of the National Library of Medicine (NLM). Dr. Lindberg, a pathologist and information scientist, was director of the Information Science Group and Professor of Pathology at the University of Missouri School of Medicine in Columbia. He is a pioneer in the use of computers in medicine, having founded at the University of Missouri in 1963 one of the nation's first medical computer centers. His most recent research has been in applying artificial intelligence techniques to the development of expert medical consulting systems. Dr. Lindberg is familiar with the programs of NLM through his

advisory roles on the Library's Board of Scientific Counselors and Biomedical Library Review Committee.

William G. Cooper, Ph.D., was appointed Associate Director for Extramural Programs in March 1984. Dr. Cooper has held the position of Acting Associate Director for EMP since 1982. He previously held the position of Associate Director for Planning and is presently acting in that capacity.

Lois Ann Colaianni was appointed Associate Director for Library Operations in May 1984. Mrs. Colaianni has been at NLM since January 1981, when she was named Deputy Associate Director for Library Operations. She became Acting Associate Director in 1982.

James C. Cain was appointed Deputy Chief of the Library's Reference Services Division in July 1984. He had previously served as Head of the Division's Circulation and Control Section.

Albert M. Berkowitz, Chief of the Reference Services Division, retired in August 1984. Mr. Berkowitz came to the NLM in 1966 as Head of the Division's Loan and Stack Section (now Circulation and Control). He became Deputy Chief of the Division in 1969, and Chief in 1971.

Calvin H. Plimpton, M.D., was appointed NLM Special Assistant for International Programs in October 1983. Dr. Plimpton is a former President of Amherst College (1960-1971) and SUNY Downstate Medical Center (1971-1979). He succeeded Dr. Mary Corning who retired in August 1983.

Richard B. Friedman, M.D., resigned from his position of Director, Lister Hill National Center for Bio-

Table 1
Financial Resources and Allocations FY 1984
(in thousands of dollars)

| | |
|---|----------|
| Budget authority: | |
| Appropriation, NLM | \$49,613 |
| Payraise supplemental transfer | 607 |
| Subtotal..... | 50,220 |
| Plus: Reimbursements | 2,543 |
| Total..... | \$52,763 |
| Budget allocation: | |
| Medical Library Assistance | \$7,573 |
| Intramural Programs and Services | 39,265 |
| Library Operations | (26,478) |
| Lister Hill National Center for Biomedical Communications | (8,200) |
| Toxicology Information | (4,587) |
| Direct Operations | 1,775 |
| Program Management | 4,150 |
| Total | \$52,763 |

medical Communications in July 1984. Dr. Friedman held this position from March 1983. He has returned to the University of Wisconsin as Vice Chairman of the Department of Medicine. B. Earl Henderson is currently Acting Director, LHNCBC.

B. Earl Henderson was appointed Deputy Director, Lister Hill National Center for Biomedical Communications in October 1983. Mr. Henderson has been with the Lister Hill Center since 1972 where he has served as Chief of the Communications Engineering Branch since 1974.

George R. Thoma, Ph.D., was appointed Chief of the Communications Engineering Branch, Lister Hill National Center for Biomedical Communications in January 1984. Dr. Thoma has been a member of the Lister Hill Center staff since 1974.

Betsy L. Humphreys was appointed Deputy Associate Director of Library Operations in August 1984. Since 1973 she has held a number of increasingly responsible positions in NLM's Technical Services Division, becoming Chief of that Division in 1980.

Becky Lyon-Hartmann was appointed Coordinator for NLM's Regional Medical Library Program in January 1984. Ms. Lyon-Hartmann previously was employed by the Veterans Administration, where she was Assistant for Network Development in the Central Office Library Division.

The Library was saddened by the death, on August 21, of Stella Schehl, Principal Cataloger of the Technical Services Division. Mrs. Schehl had worked for the Library for almost 40 years.

Awards. Kent A. Smith received the Assistant Secretary for Health Award for Exceptional Achievement.

Melvin L. Spann, Ph.D., received the NIH Director's Award.

NIH Merit Awards were presented to Dennis E. Black of the Office of Administration, and to Stella F. Schehl, Carolyn B. Tilley, and Judith A. Duff, all of the Division of Library Operations.

Kent A. Smith, Deputy Director, Harold M. Schoolman, M.D., Deputy Director for Research and Education, and Kenneth G. Carney, Executive Officer received the NLM Director's Award.

Martin M. Cummings, M.D., received the NLM Regents Special Award for Leadership and Accomplishment. He also was the recipient of the NIH EEO Special Achievement Award.

Dennis E. Black received a Certificate of Recognition from the William A. Jump Memorial Foundation for his noteworthy service in public administration.

Roger L. Gilkeson of the Office of Inquiries and Publications Management received the PHS Special Recognition Award.

Equal Employment Opportunity

Executive Order 11478 directs the Department of Health and Human Services and its constituent agencies to establish and maintain a continuing affirmative action (AA) program of equal employment opportunity (EEO) as an integral part of every aspect of personnel policy and practice in the employment, development, advancement, and treatment of employees.

The EEO calendar for 1984 included training for managers, supervisors and employees to ensure an awareness of equal employment opportunity and affirmative action. A series of films and a talk by the new Director of NIH's Division of Equal Opportunity on

Table 2
Staff, FY 1984 Full-Time Equivalent (FTEs)

| Program | FY 1984 | |
|--|---------------------|------------|
| | Full-Time Permanent | Other |
| Office of the Director | 12 | 10 |
| Office of Inquiries and Publications Management..... | 5 | 1 |
| Office of Administration..... | 46 | 10 |
| Office of Computer and Communications Systems..... | 59 | 5 |
| Extramural Programs..... | 20 | 2 |
| Lister Hill National Center for Biomedical Communications..... | 76 | 15 |
| Specialized Information Services..... | 29 | 5 |
| Library Operations..... | 222 | 29 |
| Total..... | 469 | 77 |
| Total FTE Usage..... | | 546 |

"EEO Directions at NIH," were the highlights of the year. The film series gave rise to several lively discussion periods and afforded the opportunity for questions and answers.

Lobby Exhibits

Three exhibits, prepared for the enjoyment and education of staff and library patrons, were mounted in the Library's main lobby during the year.

The first, on display through January 1984, was a selection of work by one of America's foremost medical illustrators, Frank Armitage. Mr. Armitage, who worked with Walt Disney in the 1950s on a number of his animated motion pictures, has more recently become known as a versatile medical illustrator whose work goes beyond literal representation. The NLM exhibit featured six large paintings depicting the retina in progressive stages of modern abstraction, two works showing the artist's conception of the neuron jungles of the brain, and a number of sketches and paintings related to surgery and the blood and nerve cells in the hand.

Another well known American medical illustrator's art was featured in the next exhibit, "The Medical Art of Frank H. Netter, M.D." Dr. Netter's work related to the artist's long association with the CIBA Pharmaceutical Company, and items exhibited included more than 50 watercolors illustrating human anatomy, embryology, physiology, and pathology in six body systems: respiratory, excretory, circulatory, nervous, endocrine, and digestive. Also included were 20 paintings and three sketches related to the artificial heart.

The third exhibit, on display from May to October, was titled "Medical Incunabula and the Diffusion of Scientific Knowledge." Prepared by the Library's History of Medicine Division, the exhibit featured more than 50 works published between 1467 and 1500 from the NLM collection, and included an illustrated booklet on the history of medical incunabula.

A special exhibit (January-April 1984) in the lower lobby of the Lister Hill Center depicted "medicine men" of the world. The exhibit was lent to NLM by Midwest Medical of Afton, Minnesota, and featured a series of color lithographs of witch doctors, shamans, acupuncturists, and medieval practitioners by artist John Doyle.

LIBRARY SERVICES AND OPERATIONS

Lois Ann Colaianni

Associate Director, Library Operations

Library Operations supports the basic mission of the National Library of Medicine through acquisition and preservation of the world's biomedical literature; organization of this literature by cataloging, indexing, and bibliographical listing; dissemination of the resulting authoritative bibliographic data in publications, online, and in other machine-readable formats; lending or copying needed documents from the NLM collection; provision of reference and research assistance to health professionals; and coordination of a national network of health sciences libraries to improve biomedical information services throughout the United States.

In this report, specific FY 1984 activities of the Library Operations component are organized and described under functional headings rather than by organizational unit as has been the practice in past annual reports. Viewing FY 1984 as a whole, at least four major themes are discernable in the myriad of Library Operations' activities: (1) expansion of direct services to health professionals; (2) increased involvement in national bibliographic cooperation; (3) progress in the development of MEDLARS III and the transitional capabilities that lead toward it; and (4) efforts to improve access to NLM's rich resources in the history of medicine.

Personnel and Training

Library Operations' most important resource is its dedicated and highly trained staff of over 250 librarians, technical information specialists, subject matter experts, health sciences professionals, library technicians, and administrative support personnel. The staff is organized into four operating divisions: Bibliographic Services, Reference Services, Technical Services, and History of Medicine; plus the Medical Subject Headings Section; the Regional Medical Library Program

Office, and a small administrative unit in the office of the Associate Director.

Library Operations endeavors to improve its employees' skills and potential through on-the-job and formal classroom training. In addition to staff training and development activities, Library Operations directs the NLM Associate Program, which provides one year of post-graduate training for library school graduates with high potential in the health sciences library/information field. Six Associates, selected from 55 applicants, participated in the FY 1983/84 program. The first five months of the program consists of a formal curriculum which introduces the Associates to NLM's programs and services and is organized into nine broad functional modules. The remainder of the program is devoted to individual projects. Each Associate works on two or three projects under the guidance of staff project leaders. Associates also have the opportunity for field experiences in other health sciences libraries and information organizations.

Planning and Management

In FY 1984, Library Operations continued the strategic planning begun in FY 1983 by outlining the specific tasks required to accomplish the plan's four major objectives for FY 1984-1988 and developing operational plans for the first two years' tasks. Measurable progress has been made toward achieving the four objectives:

- to improve internal technical and bibliographic processing;
- to develop and implement programs that make it easier to identify, locate, obtain, and use biomedical information and literature;
- to develop and implement a program for the preservation of the biomedical literature; and

- to ascertain the information needs and information-seeking behavior of health science professionals and the history of medicine community, as a step toward improving Library Operations' products and services.

Achievements related to these objectives are highlighted throughout this report. The year also saw substantial progress toward automating personnel, budget, and other administrative data in order to support management decisions within Library Operations.

The renovation of the Library building was completed during FY 1984. All Library Operations staff are now working in their permanent renovated quarters after a series of temporary relocations. Staff cooperation assured that basic library services did not suffer during the inevitable upheaval.

Collection Development

The History of Medicine Division (HMD) and the Selection and Acquisition Section and the Serial Records Section of the Technical Services Division (TSD) share responsibility for development of the NLM collection. HMD is responsible for building the pre-

1871 collection, the manuscript collection, and the prints and photographs collection. TSD selects, acquires, and processes all other post-1870 materials, which form the large majority of all acquisitions.

Selection. During FY 1984, work continued on a revision of the *Scope and Coverage Manual of the National Library of Medicine*, which provides guidance to staff in selecting material for the collection. Over 50 NLM staff members, several consultants, and Dr. Faye Abdellah, Deputy Surgeon General, who is the NLM Board of Regents liaison to the effort, have been involved in various aspects of this project. Several major subject areas in the current 1977 manual were examined in depth and reworked to be responsive to recent changes in biomedical research and to provide clearer guidance to selectors. In addition, the format of the manual has been redesigned to make it easier to use. The new edition of the manual will be available for public distribution in FY 1985.

In parallel with the revision of NLM's scope and coverage manual, staff from NLM and the National Agricultural Library (NAL) have been reviewing their policies for collecting materials in veterinary science in an

Table 3
Growth of Collections

| <i>Collection</i> | <i>Previous Total (Sept. 1983)</i> | <i>Added in FY 1984</i> | <i>New Total</i> |
|----------------------------|--|-----------------------------|------------------|
| <i>Book Materials</i> | | | |
| <i>Monographs:</i> | | | |
| Before 1500 | 567 | 1 | 568 |
| 1501-1600 | 5,632 | 26 | 5,658 |
| 1601-1700 | 9,881 | 37 | 9,918 |
| 1701-1800 | 23,791 | 149 | 23,940 |
| 1801-1870 | 39,543 | 43 | 39,586 |
| Americana | 2,321 | 6 | 2,327 |
| 1871-Present | 447,603 | 9,776 | 457,379 |
| Theses HMD | 281,585 | 8 | 281,593 |
| Pamphlets | 172,021 | | 172,021 |
| Bound serial volumes | 713,565 | 32,433 | 745,998 |
| Volumes withdrawn | (26,904) | (544) | (27,448) |
| Total volumes | 1,669,605 | 41,935 | 1,711,540 |
| <i>Nonbook Materials</i> | | | |
| <i>Microforms:</i> | | | |
| Reels of microfilm | 33,710 | 912 | 34,622 |
| Number of microfiche | 122,150 | 16,428 | 138,578 |
| Total microforms | 155,860 | 17,340 | 173,200 |
| Audiovisuals | 40,630 | 1,192 | 41,822 |
| Pictures | 74,665 | 459 | 75,124 |
| Manuscripts | 1,207,259 | 33,024 | 1,240,283 |

effort to rationalize and clarify them. A joint statement on this issue will be distributed in late 1984, and information about NAL's guidelines for selecting veterinary science materials will be incorporated in the new edition of NLM's scope and coverage manual.

During the year, researchers at Drexel University, working under contract to the Library, completed a study of NLM's indexing coverage and monograph collection in the field of medical behavioral sciences. The study has stimulated discussion of basic issues related not only to collection development and indexing coverage, but also to the scope of other services. A presentation and discussion of these issues took place at the May 1984 Board of Regents meeting. As a follow-up, a small survey was designed by NLM staff to elicit opinions on the appropriate scope of five NLM activities: (1) collection development; (2) cataloging; (3) indexing; (4) interlibrary loan and onsite use; and (5) preservation. Responses from NLM staff, the Regional Medical Library Directors, and a few medical librarians identified by the Medical Library Association's MLA/NLM Liaison Committee will be compared to identify areas of substantial agreement and disagreement.

Acquisitions. During FY 1984, 41,935 volumes were added to the NLM collection and more than 153,000 books, serial issues, and audiovisual programs were received and processed. Among the more unusual and notable additions to the historical collections were: a collection of Russian documents dated 1830-31 relating to the cholera epidemic of those years and containing official letters, orders, and regulations of the Ministry of Internal Affairs; the case reports, diaries, and notes of Drs. George and William Darrach, well-known Philadelphia physicians of the 19th century; a medical student's notes from the lectures of Eli Ives, one of the founders of the Yale Medical School; the papers of Moses Shelesnyak, a prominent American physiologist; and Jean Fernel's *De naturali parte medicinae libri*

septem, Paris, 1542. Fernel was one of the most famous physicians in sixteenth century France and a popular professor at the University of Paris. His book is the earliest work devoted to physiology and the first to use that term.

FY 1984 saw two significant changes in the fiscal control of NLM's 2.3 million dollar literature budget. It was the first full year of use of the National Institutes of Health (NIH) automated delegated procurement system for processing literature invoices which allows NIH to track payments more easily and ensure compliance with the provisions of the federal Prompt Payment Act. Also, machine processing of automated serials invoices from NLM's major subscription agents was fully implemented during the past year. This releases staff from tedious line-by-line review of large serials invoices and allows them to concentrate on improving NLM's program for claiming lapsed subscriptions and missing issues.

The online serials check-in system implemented last year improved in reliability during FY 1984 and was linked with the new online indexing system which became fully operational in January 1984. Data for issues to be indexed are passed from the check-in system to the indexing system to form the basis for the "source" information in MEDLINE citations. The improved control and productivity provided by the online check-in system has reduced the need for offsite check-in services by subscription agents.

Additional improvements in serials processing were realized with the development of new formatted video display screens for the addition and maintenance of bibliographic, subscription, missing issue, and indexing authority data. The screens permit greater input validation which decreases review time and improves the quality of data in the Master Serials System.

While these changes were made to current operational systems, preparations for the implementation of

Table 4
Acquisition Statistics

| <i>Acquisitions</i> | <i>FY 1982</i> | <i>FY 1983</i> | <i>FY 1984</i> |
|--------------------------------------|----------------|----------------|----------------|
| Current serial titles received | 23,694 | 23,470 | 22,294 |
| Publications processed | | | |
| Serial pieces | 146,708 | 127,927 | 126,167 |
| Other | 22,342 | 25,479 | 27,456 |
| Total | 169,050 | 153,406 | 153,623 |
| Obligations (\$) for | | | |
| Publications | 2,618,993 | *1,861,489 | 2,390,426 |
| Included for Rare Books | 54,602 | 57,610 | 88,088 |

*Revised figure

MEDLARS III for collection development activities intensified. All records in the monograph in-process file are being reviewed and upgraded or deleted as appropriate in preparation for merging these records into the MEDLARS III master bibliographic file. As monograph selection and acquisition will be one of two initial applications to be brought under MEDLARS III, considerable effort was devoted to the review of design specifications for these activities and the development of plans for the necessary file conversions scheduled for late FY 1985.

Collection Preservation and Maintenance

Collection preservation and maintenance are primarily the responsibility of the Circulation and Control and Audiovisual Resources Sections of the Reference Services Division (RSD), and of the History of Medicine Division (HMD), although the processing activities of other Library Operations' components also have an impact on preservation. RSD deals with the post-1870 materials which include the bulk of the collection and also the majority of the acidic paper that poses the most serious preservation problems. HMD manages the older materials and special collections, such as rare books, prints and photographs, and manuscripts.

Preservation of the collection is one of the four major objectives in Library Operations' strategic plan. An NLM Preservation Planning Team has been formed to assess the state of the collection, examine current preservation activities, and prepare a plan for the preservation of the NLM collection. Research in electronic document storage and retrieval currently underway in the Lister Hill National Center for Biomedical Communications has significant preservation implications, and staff from Center are collaborating with Library Operations' staff to assist in the development of an optimum strategy for preservation of the NLM collection. The preservation planning process is modeled on a self-study procedure developed by the Association for Research Libraries (ARL). NLM is working with ARL to set up the process and identify consultants to assist the Team. The group's recommendations are expected in the spring of 1985.

In the meantime, regular preservation and maintenance activities continued and several special projects related to preservation and management of the collection were completed. During FY 1984, 24,294 volumes were bound for the NLM collection and 296 items were preserved on microfilm. The bindings for 2,460 rare books were oiled and 1,100 pages were mended; 209 rare book volumes were restored or rebound.

Additional compact shelving was purchased according to the Library's plan for providing space for collection growth through the year 2004. The historical

film collection was moved into a new film vault. Work was begun on transferring historical films to 3/4" videocassette format and moving NLM's prints and photographs collection to acid-free folders.

Dust and dirt deposited on library materials during the renovation were removed under a special contract to clean the entire collection. A survey of the older serials to identify gaps and to determine the condition of the paper in the volumes was begun during the summer. Data collection in the survey will be used in the development of the preservation plan. The NLM Disaster Recovery Plan was revised, updated, and redistributed to staff early in the fiscal year.

In an effort to assist preservation activities in the biomedical library community as a whole, NLM made arrangements to have the 1984 *Cumulated Index Medicus* and all future cumulations printed on acid-free paper.

Bibliographic Control

Responsibility for bibliographic control of the biomedical literature and for the maintenance of the thesaurus and classification scheme used by NLM and other institutions to provide subject access to the biomedical literature is shared among the Medical Subject Headings (MeSH) Section, Technical Services Division (TSD), History of Medicine Division (HMD), and the Bibliographic Services Division (BSD). The MeSH Section maintains and updates the MeSH vocabulary; the Cataloging Section, TSD, maintains the NLM classification scheme and provides authoritative cataloging for the modern biomedical literature; the Index Section, BSD, indexes articles in selected serials in all fields of biomedicine; and HMD indexes articles and books dealing with the history of medicine and catalogs pre-1871 materials. The Serial Records Section, TSD, also produces a variety of tools which aid in the identification and use of the biomedical serial literature.

In addition to its regular bibliographic control responsibilities, in FY 1984 Library Operations directed a Task Force to Identify Elements in Manuscripts in Electronic Form Useful for Bibliographic Control and Access as a part of the Electronic Manuscript Project sponsored by the Association of American Publishers and the Council on Library Resources. The Task Force, which had broad representation from the library and information service community, submitted its report and recommendations on March 30 as part of the larger effort to develop a standard method of tagging elements in electronic manuscripts. The goal of the Electronic Manuscript Project is to facilitate use of the original author's keystrokes in final publications and in the production of information services that provide access to the published literature.

Thesaurus and Classification. In order to keep the MeSH thesaurus current with developments in medicine and trends in terminology, 159 headings were added to the vocabulary in FY 1984. Of these, 119 were entirely new and 40 replaced deleted headings. An additional 81 headings were deleted also; most of these represented rarely mentioned chemicals and were transferred from the regular MeSH to the chemical subfile. This subfile grew by 3,427 records through the addition of chemical entities newly encountered in the literature being indexed. A new edition of the printed version of the chemical subfile was published in November 1983.

During the past year, preliminary work began on a project to develop a machine readable "table" to relate MeSH terms heavily used in cataloging to their Library of Congress Subject Headings (LCSH) equivalents, and vice versa. When available, such a table can be used to provide assistance to users searching catalog files containing some records with LCSH and some records with MeSH terms. It can also help librarians to use cataloging copy which lacks the subject headings normally used in their libraries. In order to identify problem areas and policy issues to be resolved, all LCSH terms beginning with the letter A were reviewed and an attempt was made to map all those with biomedical significance to equivalent MeSH terms. Based on the information gathered during the effort, a plan is being developed to complete the intellectual mapping in FY 1985. Staff members also are considering the need to store LCSH equivalents to MeSH terms, including main heading/subheading combinations, in developing the final functional requirements for the MEDLARS III subject authority file.

Beginning with 1984 cataloging, NLM changed its policy for assigning classification numbers to newly cataloged nursing materials. The new policy states:

Classify works pertaining to clinical medicine written for nurses in the class number for the subject. Use the form subheading "nurses' instructions" to modify MeSH terms assigned to these works.

This policy supersedes the previous practice of classifying materials on clinical medicine written for a nursing

audience in the WY (Nursing) schedule of the *National Library of Medicine Classification*, 4th edition, revised 1981. The WY classification is now reserved for works which are actually about nursing. The new policy allows clinical materials written for nurses to be classified according to the same general principle as materials written for other audiences. The form subheading "nurses' instructions" replaces "nursing texts" in order to encompass audiovisual programs specifically addressed to nurses.

Work is proceeding on plans to convert the automated classification file to its MEDLARS III format and to link it to the MeSH file. Eventually, when this is accomplished, it will be significantly easier to publish updated editions of the *NLM Classification*.

Cataloging. During FY 1984, NLM cataloged 17,859 books, serials, audiovisual programs, and Cataloging in Publication galleys. A total of 11,592 items received full cataloging; 6,267 items received limited cataloging. The Library continued to obtain cataloging assistance for foreign language materials under contract and through an interagency agreement with the Library of Congress (LC). A new contract action was initiated to obtain assistance in reviewing and upgrading Cataloging in Publication (CIP) records to full status when the published books are received. In all, 2,857 items in Spanish, French, Dutch, Norwegian, Swedish, and Russian were cataloged by outside sources during the year.

The contract to review frequently used records in NLM's name authority file for compliance to the *Anglo-American Cataloging Rules* second edition (AACR2), upgrade these records as necessary, and maintain associated bibliographic records in CATLINE and AVLINE proceeded smoothly. With contract work nearly completed, 37,715 names have been reviewed; 17,534 names have been upgraded; and an estimated 71,000 CATLINE and AVLINE records maintained. As a result, there is a single form of name access point for most names represented in the NLM catalog files. This assists users in searching for and retrieving works by particular authors or corporate bodies.

Table 5
Cataloging Statistics

| Item | FY 1982 | FY 1983 | FY 1984 |
|----------------------|---------|---------|---------|
| Completed cataloging | | | |
| Full | 10,800 | 11,322 | 11,243 |
| Limited | 16,190 | 7,126 | 6,267 |
| Total | 26,990 | 18,448 | 17,510 |

Significant progress was made toward the goal of achieving compatibility in descriptive cataloging produced by the three national libraries. This will reduce the effort required by health sciences libraries to merge NLM records with records produced by other cataloging sources. Since 1972, NLM has been cooperating with the Library of Congress (LC) to provide MeSH headings and NLM classification data for inclusion in the Cataloging in Publication copy for biomedical books. Until very recently, however, NLM and LC have each produced descriptive cataloging independently for these items. In March 1984, NLM and LC began a pilot project in which NLM provided LC with descriptive cataloging for a portion of the biomedical books receiving CIP treatment. Due to the success of this test, NLM will provide LC with descriptive cataloging, MeSH headings, and NLM class numbers for all biomedical CIPs beginning in October 1984. LC will use NLM descriptive records and add LC subject headings and classification numbers for publication in the CIP records.

In conjunction with the CIP pilot project, NLM also expanded its contributions to the national Name Authority Cooperation (NACO) file, which is maintained at LC. NLM had been contributing all name headings associated with its serial cataloging and some pre-1871 books since July 1981. Beginning with calendar year 1985, all names associated with full cataloging records will be reconciled with the NACO file and added to that file as appropriate. To reduce the duplicate keying now required by these cooperative efforts, NLM is investigating how to implement the Linked Systems Protocol (currently being tested by LC, the Research Libraries Information Network, and the Washington Library Network) in the MEDLARS III system.

The online cataloging system implemented in FY 1983 continued to function well. This system represents a transition to the MEDLARS III cataloging environment which will permit catalogers to upgrade machine readable bibliographic records created during selection and acquisitions activities, thereby eliminating the redundant data creation necessitated by the current software. In preparing for the new system, a contract was awarded to ensure that correct links exist between serial records in CATLINE (NLM's online database of cataloging records for print materials) and the bibliographic module of the Master Serials System, so that the two files can be merged in the construction of the MEDLARS III bibliographic file. Cataloging will be one of the first applications to be switched to the MEDLARS III system, and staff have been heavily involved in refining functional requirements, reviewing design documents, and planning for conversion and implementation.

Indexing. The consultants who advise NLM on the selection of literature for *Index Medicus* reviewed and rated 247 candidate journals for inclusion in *Index Medicus*. Of these, 61 were accepted for indexing. The consultants also reviewed currently indexed journals in cardiology, anesthesiology, endocrinology, metabolism, nutrition, anatomy, cytology, embryology, histochemistry, psychology, sociology, orthopedics, and rheumatology. Fifty-two of these journals were dropped either because they had ceased publication or were considered to have limited value for *Index Medicus* users. The newly added journals publish more articles than those that were deleted, so the growth in the size of the *Index* is greater than would be expected by the net growth in journal titles alone. At the end of the year there were 2,695 titles being indexed for *Index Medicus* and a total of 3,688 titles represented in MEDLINE, the Health Planning and Administration files, and POPLINE.

During FY 1984, 306,263 citations for indexed articles were added to various NLM databases. Of those, 278,905 citations were published in *Index Medicus*. Abstracts were added to the MEDLINE file for 172,153 articles or 62% of the citations added to that database. Beginning in January 1984, abstracts exceeding 250 words have been truncated when added to the file. This limit is expanded to 400 words for abstracts from articles of 10 or more pages or from articles in the core journals identified by the National Cancer Institute for inclusion in the CANCEREXPRESS database. Approximately 3% of the abstracts require truncation in this fashion. Of the articles indexed for *Index Medicus* in FY 1984, 26% were indexed by NLM staff; 40% directly by foreign MEDLARS centers or through arrangements made by them with U.S. commercial firms; and 34% by NLM contractors.

Since January 1984, no more than ten authors' names have been included in a MEDLINE citation or listed under the name of the first author in the Author Section of *Index Medicus* and other printed bibliographies. Only the second through the tenth authors are cross-referenced to the first author, instead of the previous unlimited number. This limitation was imposed because of the increasing number of articles with many authors listed. The largest number of authors encountered to date is 162.

A new subject heading, Retraction of Publication, was introduced in 1984. This is used whenever a journal publishes a retraction of an earlier article. The citation of the retraction contains a reference to the original article, and the original citation is amended to call attention to the retraction.

Progress continues to be made in reducing the time between receipt of journals at NLM and the appearance of citations to them in *Index Medicus*. In the

Table 6
Bibliographic Services

| Services | FY 1982 | FY 1983 | FY 1984 |
|---|---------|---------|------------|
| Total citations published* | 282,950 | 310,445 | 306,263 |
| For <i>Index Medicus</i> | 259,874 | 284,856 | ** 278,905 |
| Recurring bibliographies..... | 25 | 24 | 24 |
| Journals indexed for <i>Index Medicus</i> | 2,697 | 2,709 | 2,695 |
| Abstracts entered..... | 124,511 | 149,851 | 172,153 |

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

**Includes 502 nonprint citations.

past year the Index Section continued to process 90% of the high priority journals, which account for over 30% of all citations in *Index Medicus*, within 30 days of receipt by NLM. Work will continue in the coming year to reduce processing time to 60 days for all other journals that are indexed. The workflow within the Index Section became more fully automated in January 1984 when NLM in-house indexers began using a new online indexing and management system. Developed with support from the Office of Computer and Communications Systems (OCCS), the new system results in further improvements in the currency and accuracy of *Index Medicus* and MEDLINE. It supports tracking of *Index Medicus* and Special List Journals through the indexing process, input typing of descriptive information, subject indexing, corrections and validations, and generation of management statistics on the indexing workload. Work will continue this year to extend online indexing to contract indexers; its extension to MEDLARS Centers overseas will be examined later.

Network Services

All organizational components in Library Operations cooperate to provide services to health professionals and health science libraries throughout the United States. BSD, HMD, RSD, TSD, and the MeSH Section are involved in the distribution of NLM's bibliographic data in publications, on machine-readable tapes, and through NLM's online services network. BSD manages NLM's online services network, including training. HMD provides reference and research assistance and document delivery services to those needing information from the modern collections. The Regional Medical Library (RML) office manages the contracts with the seven Regional Medical Libraries and provides national coordination for the RML program. TSD supports document delivery throughout the network by maintaining SERHOLD, the national bibliographic serial holdings database. NLM filled 20,596 requests for reference assistance from remote users in FY 1984, al-

though the majority of demand for network services occurred in the other areas mentioned below.

Publications. In FY 1984, Library Operations published over 50 issues of serial publications, including *Index Medicus*, the *National Library of Medicine Current Catalog*, the *National Library of Medicine Audiovisuals Catalog*, the *Bibliography of the History of Medicine*, the various volumes of *Medical Subject Headings*, and several specialized recurring bibliographies. *Index Medicus*, NLM's major index to biomedical articles was distributed to more than 5,500 subscribers. Forty new published Literature Searches were produced on specific topics of current interest including Acquired Immunodeficiency Syndrome (AIDS), Alzheimer's disease, and premenstrual syndrome. More than 85,000 copies of these bibliographies were distributed by the library.

A new edition of the irregularly published *Index of NLM Serial Titles* was prepared for distribution in the fall of 1984; the last edition was published in 1981. The first issue of *Health Sciences Audiovisuals*, a quarterly microfiche cumulation of all records in AVLINE, was published by the Government Printing Office. FY 1984 was also the first year in which indexed citations to audiovisual serials appeared as a separate section in the *NLM Audiovisuals Catalog*. Previously these citations had been published by the Medical Library Association in the *Index of Audiovisual Serials in the Health Sciences*, which publication ceased at the end of 1983. There are plans to publish all CATLINE records in microfiche in FY 1985.

An experimental videodisc of 1,000 pictures from NLM's collection of some 75,000 prints and photographs depicting medical subjects was produced by HMD in collaboration with the Lister Hill Center. The 1,000 images were cataloged according to the *Anglo-American Cataloging Rules, Second edition* and *Graphics Materials: Rules for Describing Original Items and Historical Collections* and printed to accompany the videodisc. The pilot videodisc and accompa-

nying catalog will be distributed to selected sites for evaluation and comment.

Machine-Readable Databases. NLM makes its own authoritative bibliographic records available in a variety of machine-readable databases and also cooperates with other organizations to create and/or provide access to other biomedical information. By the end of the year 27 databases were available on NLM's online services network. NLM regularly distributes tapes of various NLM databases containing journal citations or the Medical Subject Headings to 22 U.S. and foreign institutions. Six organizations receive NLM's cataloging records in USMARC format.

In FY 1984, NLM introduced an important new service for domestic users—the availability of subsets of the MEDLINE database. In the past, because of the size of the NLM databases, tape distribution has been limited to organizations having major computer resources. With the development of sophisticated and relatively low cost mini- and microcomputers, individual users and organizations with smaller computers can now set up local retrieval capabilities for files of substantial size. To serve these users, NLM now offers subsets of the MEDLINE database. Eventually, the Library will offer "predetermined subsets," produced according to parameters set by NLM based upon the Library's experience or advice of professional groups. Two options are presently available; "individualized subsets," specified by the subset requester and available on annual subscription with monthly or quarterly updates; and "custom subsets," specified by the subset requester and provided on a one-time basis with no updates. Subsets are currently distributed on magnetic tape only; some subsets will be available on diskette in the future. A policy statement covering the production, distribution, and use of subsets and a current price list was published in August 1984.

NLM also significantly expanded the availability of its cataloging records in FY 1984. An additional 33,846 catalog records converted under the Retrospective Conversion Contract completed during FY 1983 were added to the CATLINE file, bringing the total number of CATLINE records to 562,034. During the year, NLM's limited cataloging records and its pre-1965 cataloging records became available in USMARC format for the first time. All CATLINE records are now available in USMARC format. Progress was also made toward the goal of distributing records for audiovisual materials in USMARC. Programs for converting these records are now being tested; distribution is planned for 1985.

Online Services. During FY 1984, the average monthly connect hour usage of the MEDLARS system was 19,122 hours, 11% higher than the average in FY

1983. Usage for the entire year was 229,463 connect hours. There are now 2,461 domestic institutions that are online users of NLM's MEDLARS system. More than half of the domestic users are involved in direct patient care (Figure 1). Many additional users access NLM's databases through other U.S. database vendors and those foreign MEDLARS centers which mount copies of certain NLM files.

A new method for determining charges for online use of MEDLARS services was implemented on October 1984. Online charges are now calculated by an algorithm which includes connect time, computer work units, search statements, carriage returns, citations, and characters transmitted to the user's terminal. Under the previous method, only connect time was considered. Communications charges are embedded in the charge for connect time. The new algorithm does not penalize users with slower terminals, but charges according to the amount of computer resources actually used to fulfill each user's search requests.

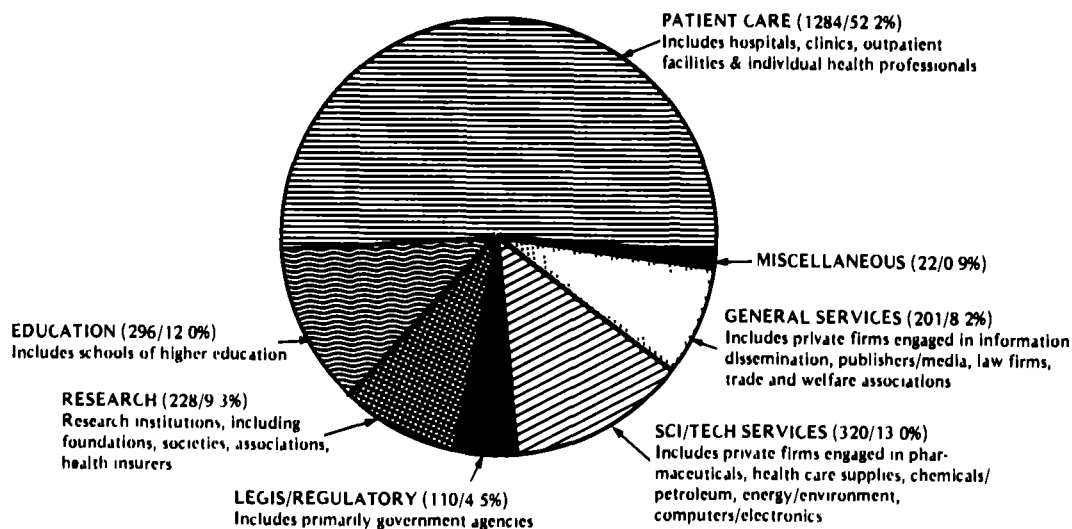
After the introduction of the new online pricing algorithm, the Library added a new database, INFORM. While connected to INFORM, users may request online information, e.g., the NEWS or Online EXPLAINS, which are descriptions of databases and system capabilities, with no charge being levied for characters. This was done to encourage online users to remain current with system developments.

NLM also introduced the INTROMED file in FY 1984. INTROMED is a training database containing approximately 20,000 citations extracted randomly from the MEDLINE database (1982 and 1983 publication years). There are no charges for citations or characters printed from INTROMED, which makes it approximately 50% less expensive than the MEDLINE databases. Searchers who have recently attended a training class in searching the NLM system may wish to practice in INTROMED. Although it is useful as a training tool, it should not be used for daily searching because it contains only a small fraction of the citations in the full MEDLINE.

FY 1984 brought the addition of a new user-friendly version of the PDQ (Physicians' Data Query) file. This menu-driven file, developed by the National Cancer Institute (NCI) in cooperation with NLM, is designed to permit health professionals to access information on the diagnosis and treatment of cancer, active clinical protocols, and a directory of physicians and organizations with a special interest in the care and treatment of cancer patients.

Enhancement of the bibliographic CANCERLIT file with nonjournal citations also took place in late FY 1984. NCI is now adding meeting abstracts and monographic material to the regular monthly updates, which, for over a year, had consisted entirely of cancer-relat-

Figure 1



*Domestic Online Users by Type
September 1984
Total=2461*

ed citations derived from MEDLINE. In addition, work has begun on restructuring the CANCERLIT file. The new file will feature several new data elements, including MeSH headings and CAS Registry Numbers, and is expected to be available in February 1985.

A total of 982 people received training in searching NLM databases in the 48 online classes held in FY 1984. NLM staff conducted 20 classes at NLM and 7 in other locations throughout the United States. UCLA and the University of Nebraska, two Regional Medical Libraries which provide training in online searching of the MEDLARS databases under contract to NLM, sponsored 21 classes in various locations.

NLM developed a new 6-hour online training course and associated training materials for health professionals who wish to search the MEDLARS system directly. The first session was held at NLM on March 14. Additional courses were given by NLM and UCLA, sometimes in conjunction with meetings of health professional associations. NLM also developed a special class to train health sciences librarians to provide MEDLARS training to health professionals. The first class was held for 140 librarians on September 20.

Document Delivery. NLM instituted a charge for filled interlibrary loan requests effective in October 1984. Billing and collection of fees are handled through the National Technical Information Service. Requests for loans dropped almost 33% to 142,464 for the year, presumably because of the new charge. NLM filled 87% of the requests received. Throughput for handling requests remained very good, with 91% of filled requests processed within 4 days of receipt.

Interlibrary loan service for audiovisual materials was expanded in April 1984, when all videocassettes in the NLM collection became available for loan. A total of 1,131 requests for audiovisual programs was received during the year.

In order to provide more rapid service to requestors, NLM began to use the United Parcel Service for sending original items out on loan in March 1984. The new shipping method cuts two to ten days off delivery time, depending on the location of the requestor.

Significant progress was made in providing automated support to document delivery activities. SERHOLD currently contains over 600,000 automated holdings statements for 1,233 biomedical libraries. The Regional Medical Libraries coordinate the gathering of

**Table 7
Online Searches**

| Database | FY 1982 | FY 1983 | FY 1984 |
|-------------------------------|------------------|------------------|------------------|
| AVLINE | 18,376 | 19,050 | 11,339 |
| BIOETHICS | 3,409 | 4,047 | 4,580 |
| CANCERLIT | 42,365 | 45,739 | 48,664 |
| CANCERPROJ | 3,270 | 3,099 | 1,797 |
| CATLINE | 224,559 | 250,729 | 156,914 |
| CHEMLINE | 46,375 | 40,880 | 32,614 |
| CLINPROT | 1,753 | 3,166 | 2,405 |
| DIRECTORY | | 420 | 840 |
| DIRLINE | | 1,389 | 2,446 |
| EPILEPSYLINE | 1,607 | 326 | |
| EXPRESS | | 1,087 | 1,761 |
| HEALTH | 70,735 | 81,289 | 90,140 |
| HISTLINE | 3,978 | 4,460 | 4,173 |
| INFORM | | | 47 |
| INTROMED | | | 719 |
| MEDLINE | 784,625 | 951,582 | 1,199,482 |
| MED80 | | | 247,046 |
| MED79 | 118,877 | 28,482 | |
| MED77 | 144,185 | 193,796 | 189,077 |
| MED75 | | 67,478 | 90,644 |
| MED71 | | 46,211 | 62,799 |
| MED66 | | 30,145 | 45,500 |
| MESH VOCABULARY | 19,016 | 20,469 | 12,141 |
| NAME AUTHORITY | 10,618 | 16,528 | 5,322 |
| PDQ | | 7,124 | 4,724 |
| PDQRS | | | 1,949 |
| POPLINE | 16,483 | 18,652 | 19,486 |
| RTECS | 14,741 | 17,578 | 8,512 |
| SDILINE | 17,770 | 18,619 | 25,979 |
| SERLINE | 44,916 | 48,941 | 29,887 |
| STORED SEARCH | 176 | 49 | 89 |
| TDB (TOXICOLOGY DATA BANK) | 14,466 | 19,737 | 7,470 |
| TOXLINE | 68,768 | 67,381 | 75,190 |
| TOXBACK76 | | | 2,889 |
| TOXBACK74 | 8,864 | 11,651 | 11,518 |
| TOXBACK65 | | 411 | 8,246 |
| TOTAL | 1,679,932 | 2,020,515 | 2,406,389 |

**Table 8
Offline Searches**

| Database | FY 1982 | FY 1983 | FY 1984 |
|--------------|---------|---------|---------|
| AVLINE | 33 | 104 | 320 |
| BIOETHICS | 6 | 18 | 65 |
| CANCERLIT | 5,385 | 5,095 | 5,766 |
| CANCERPROJ | 40 | 31 | 10 |
| CATLINE | 145 | 137 | 333 |
| CHEMLINE | 18 | 14 | 20 |
| CLINPROT | 6 | 7 | 5 |
| DIRECTORY | | 1 | 0 |
| DIRLINE | | 1 | 8 |
| EPILEPSYLINE | 7 | 3 | |
| EXPRESS | | 20 | 65 |
| HEALTH | 3,285 | 7,147 | 9,997 |

| Database | FY 1982 | FY 1983 | FY 1984 |
|-------------------------------|----------------|----------------|----------------|
| HISTLINE | 11 | 3 | 9 |
| MEDLINE | 36,666 | 26,771 | 26,628 |
| MED80 | | | 25,803 |
| MED79 | 44,817 | 8,972 | |
| MED77 | 63,267 | 35,906 | 29,610 |
| MED75 | 72,616 | 31,212 | 21,817 |
| MED72 | 56,646 | 8,413 | |
| MED71 | | 15,501 | 15,432 |
| MED69 | 42,094 | 5,966 | |
| MED66 | 30,374 | 14,166 | 10,462 |
| MESH VOCABULARY | 18 | 6 | 8 |
| NAME AUTHORITY | 1 | 0 | 0 |
| PDQ | | | 1 |
| POPLINE | 2,208 | 6,342 | 9,688 |
| RTECS | 296 | 124 | 124 |
| SDILINE | 178,774 | 197,762 | 218,110 |
| SERLINE | 27 | 10 | 15 |
| TDB (TOXICOLOGY DATA BANK) | 238 | 117 | 103 |
| TOXLINE | 21,798 | 18,591 | 17,097 |
| TOXBACK76 | | | 111 |
| TOXBACK74 | 6,204 | 4,410 | 2,263 |
| TOXBACK65 | 6,731 | 4,984 | 1,996 |
| TOTAL | 571,711 | 391,834 | 395,866 |

holdings data for the database and provide it to NLM in machine-readable form. The 1983 update of SERHOLD was completed in early FY 1984. NLM produced a variety of microform and hard copy union lists from the updated file, based on requests received from the Regional Medical Libraries. In early 1984, the data were used to update the location symbols for major biomedical libraries in SERLINE and *Health Sciences Serials*, NLM's quarterly microfiche publication. The 1984 SERHOLD update began in April 1984 and is scheduled for completion in October. Several union lists have already been generated from the 1984 data. The contract to add NLM's serial title control number to records in the CONSER database on OCLC ended in April 1984. The addition of the numbers to the OCLC database will make it possible for machine-readable holdings data from OCLC to be added to SERHOLD, after the programming for processing OCLC tapes is completed.

Although it is used to generate union lists, SERHOLD was built primarily to support automated routing of requests for articles in DOCLINE, NLM's automated document request and referral system. During FY 1984, significant progress was made in developing an improved DOCLINE system suitable for use by all RML network libraries during the transition to MEDLARS III. As components of the system were completed and tested, they were made available for testing

Table 9
Circulation Statistics

| <i>Activity</i> | <i>FY 1982</i> | <i>FY 1983*</i> | <i>FY 1984</i> |
|------------------------------|----------------|-----------------|----------------|
| Requests Received:..... | 411,343 | 395,957 | 358,654 |
| For Interlibrary Loan..... | 226,991 | 216,536 | 147,017 |
| For Readers..... | 184,352 | 179,421 | 211,637 |
| Requests Filled:..... | 332,356 | 332,478 | 299,681 |
| For Interlibrary Loan..... | 175,657 | 169,501 | 109,257 |
| Photocopy..... | 163,078 | 159,583 | 102,723 |
| Original..... | 12,579 | 9,918 | 6,534 |
| For Audiovisual Loan**..... | | 5,087 | 4,183 |
| For Readers..... | 156,699 | 157,890 | 186,241 |
| Requests Unfilled:..... | 78,987 | 63,552 | 54,737 |
| Interlibrary Loan..... | 51,334 | 41,941 | 33,577 |
| Rejected..... | 22,588 | 14,167 | 12,572 |
| Referred..... | 1,652 | 3,718 | 1,975 |
| Returned as Unavailable..... | 27,094 | 24,056 | 19,030 |
| Reader Service | | | |
| Returned as Unavailable..... | 27,653 | 21,611 | 25,160 |

*Revised to include audiovisuals.

**Includes videocassettes loaned by the Audiovisual Resources Section and motion pictures circulated from an off-site contract facility directly to individuals for educational use.

and use by the RMLs, which constitute the current DOCLINE user group.

When available for broader use, DOCLINE will provide the ability to create and edit interlibrary loan requests online in real time, receive and update requests as a potential lender, and obtain real-time status reports as both a lender and a borrower. Several automated time-triggered actions will assure that requests move through the system in a timely manner. It will be possible to transfer bibliographic data from MEDLINE, CATLINE, AVLINE, and the Master Serials System into requests by keying only the appropriate record citation number and to enter shipping and billing addresses by entering only a short library identification number. Serial requests will be routed automatically based on SERHOLD data and a list of preferred loan sources prepared by each DOCLINE participant. The routing system was modelled after that in use in OCTANET, the automated serial request system developed by the Midcontinental Regional Medical Library System and

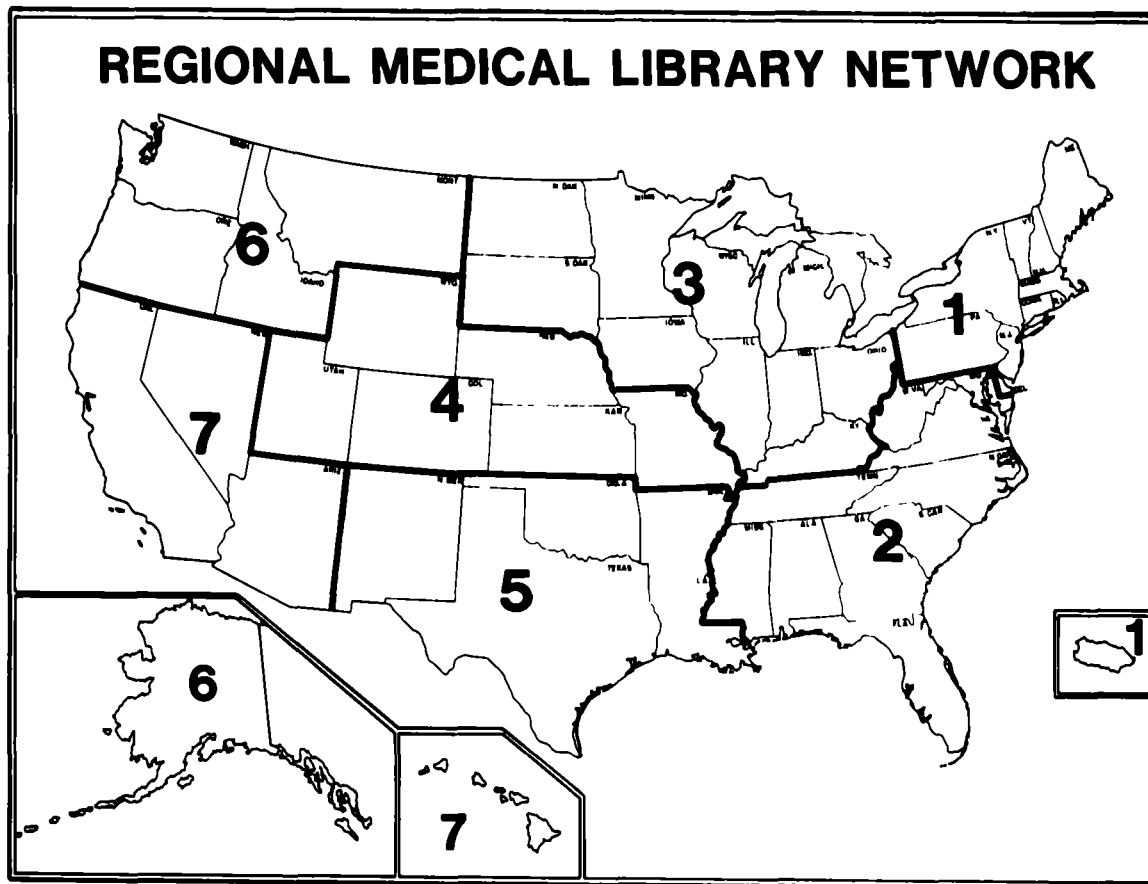
operated on the computer facility at Washington University in St. Louis.

Additional network libraries will begin to use DOCLINE in early 1985. First, the resource libraries will be brought on to the system region by region; they will assist NLM staff in testing and stabilizing the system. In the second phase all network libraries will become participants, again a region at a time. The phase-in period is expected to last 12 to 18 months.

An early test of the ability to link DOCLINE to other automated interlibrary loan systems was completed successfully in January 1984, when procedures were established for automatic transfer of unfilled requests from OCTANET to NLM's system.

In order to provide an improved interim document request capability while DOCLINE availability is gradually extended throughout the network, NLM is now accepting interlibrary loan requests via electronic mail.

Figure 2.



Regional Medical Libraries

- | | |
|--|--|
| <p>1 Greater Northeast Regional Medical Library New York Academy of Medicine 2 East 103rd Street New York, NY 10029 <i>States served:</i> CT DE MA ME NH NJ NY PA RI VT Puerto Rico</p> | <p>4 Midcontinental Regional Medical Library University of Nebraska Medical Center Library 42nd and Dewey Avenue Omaha, NE 68105 <i>States served:</i> CO KS MO NE UT WY</p> |
| <p>2 Southeastern/Atlantic Regional Medical Library University of Maryland Health Sciences Library 111 South Greene Street Baltimore, MD 21201 <i>States served:</i> AL FL GA MD MS NC SC TN VA WV DC</p> | <p>5 South Central Regional Medical Library University of Texas Health Science Center 5323 Harry Hines Blvd. Dallas, TX 75235 <i>States served:</i> AR LA NM OK TX</p> |
| <p>3 Greater Midwest Regional Medical Library University of Illinois Library of the Health Sciences Health Sciences Center Chicago, IL 60680 <i>States served:</i> IA IL IN KY MI MN ND OH SD WI</p> | <p>6 Pacific Northwest Regional Medical Library Health Sciences Library University of Washington Seattle, WA 98195 <i>States served:</i> AK ID MT OR WA</p> |
| <p>7 Pacific Southwest Regional Medical Library UCLA Biomedical Library Center for the Health Sciences Los Angeles, CA 90024 <i>States served:</i> AZ CA HI NV</p> | |

RML Program. The medical institutions currently under contract with NLM to serve as Regional Medical Libraries are listed in Figure 2. The current three-year Regional Medical Library contracts emphasize outreach to health professionals, interlibrary loan of library materials, resource sharing, online services, and training and consultation—all aimed at improving access to biomedical information for the health professional. A basic national goal is to provide health professionals wherever located with at least a minimum acceptable level of information service. Each RML has identified underserved areas within its regional boundaries and is implementing programs to meet the information needs of health professionals in these targeted areas.

The RML contracts continue to emphasize document delivery and resource sharing. Approximately two million journal articles, book and audiovisual loans are provided annually to health professionals through the network, with the RMLs themselves filling about 120,000 requests for library materials. NLM, as backup, satisfies more than 140,000 requests annually. Six RMLs earmarked funds for strengthening regional collection resources to improve resource sharing and each has developed a plan for accomplishing this.

All seven RMLs provide trained online searchers with regional updates that cover changes to the NLM online databases. In addition, RML staff demonstrate the NLM databases for local groups of health professionals. Through the RMLs, the network also provides training and consultation programs that improve service to health professionals by enhancing the skills of information providers. Here the emphasis is on basic training for non-professional library personnel and training in resource sharing activities such as interlibrary loan, consortia formation, and locator tool development. In FY 1984, the RMLs continued to shift training and consultation programs from federal support to a cost recovery basis by imposing fees to cover a minimum of 50% of actual costs.

Onsite Services

The Reference Section, RSD, provides reference and research assistance and obtains materials from the Library's general collections for onsite users. HMD provides these same services for the smaller group of users who come to use the historical and special collections. Library Operations staff also serve as guides for the majority of regularly scheduled public tours given at the Library and provide special briefings to many foreign and domestic visitors.

Reference and Research Services. Approximately 26,000 people came to NLM to use the Library's services in FY 1984, 13% more than in FY 1983. Visitors this year requested that 211,637 items be retrieved

from NLM's closed stacks. This represents an 18% increase over the number of such requests made last year and for the first time surpassed the number of requests for materials in the NLM collection made by off-site users. Onsite users also asked 62,309 reference questions, a 47% increase over last year's total. In all, 3,739 online searches were performed on NLM databases for onsite users.

With the availability of a new Learning Resource Center and appropriate staffing for this facility, the number of onsite users of audiovisuals rose 107%. New, more convenient quarters also led to greater onsite use of NLM's extensive prints and photographs collection.

During FY 1984, CITE/MEDLINE, a prototype user friendly interface to MEDLINE, was made available to onsite users. Onsite users also continued to use CITE/CATLINE, NLM's online catalog for printed materials. Walk-in patrons are now able to search for biomedical books or journal articles using flexible natural language subject queries.

Public Tours. During FY 1984, 165 regular public tours were given to a total of 681 visitors. Of these, 31% were students, interns, or residents; 24% were librarians or people otherwise associated with the information science field; 14% were health professionals; 9% were NLM or NIH staff, 8% were foreign visitors; and 14% fell into other categories. Visitors in groups accounted for 31% of those toured. Another 550 visitors (40 groups) received special programs and tours arranged by the Office of Inquiries and Publications Management (Office of the Director).

Special Historical Programs. NLM has announced a new visiting scholar program in the History of Medicine. Under this program, one recognized scholar will be invited annually to spend from six to twelve months at the Library. Scholars will be expected to engage in research which will utilize the NLM historical collections extensively. They will also be available for staff consultation, for one or more public presentations, and for assessing segments of the collections.

Beginning in FY 1984, HMD also initiated a public lecture/film series on subjects related to the history of medicine with a showing of "Free Show Tonight," a film about the old-time patent medicine shows. A series of seminars for HMD staff given by staff and other scholars who are using the NLM historical collections in their research was also inaugurated.

The responsibilities of some HMD staff include research using NLM's rich historical collections. The results of this research appeared in several publications during the year.

Table 10
Reference Services

| | <i>FY 1982</i> | <i>FY 1983</i> | <i>FY 1984</i> |
|--------------------------------------|----------------|----------------|----------------|
| Reference Section | | | |
| Requests by telephone..... | 12,886 | 15,157 | 20,069 |
| Requests by mail..... | 301 | 386 | 527 |
| Readers assisted..... | 37,297 | 42,318 | 62,309 |
| Total..... | 50,484 | 57,861 | 82,905 |
| Audiovisual Resources Section | | | |
| Requests by telephone..... | | 2,123 | 2,473 |
| Requests by mail..... | | 2,300 | 1,579 |
| Readers assisted..... | | 220 | 383 |
| Total..... | | 4,643 | 4,435 |
| Total reference service..... | 50,484 | 62,504 | 87,340 |
| Reader Room users registered..... | 22,078 | 23,096 | 26,273 |

Table 11
History of Medicine Activities

| | <i>FY 1982</i> | <i>FY 1983</i> | <i>FY 1984</i> |
|-----------------------------------|----------------|----------------|----------------|
| Acquisitions | | | |
| Books..... | 248 | 253 | 271 |
| Modern manuscripts..... | 91,953 | 46,313 | 33,024 |
| Prints and photographs..... | 475 | 346 | 459 |
| Processing | | | |
| Titles cataloged..... | 3,028 | 862 | 349 |
| Modern manuscripts cataloged..... | 53,100 | 51,353 | 36,209 |
| Pictures cataloged..... | 420 | 188 | 1,436 |
| Citations indexed..... | 4,498 | 6,178 | 6,000 |
| Pages microfilmed..... | 103,869 | 103,930 | 80,817 |
| Public Service | | | |
| Reference questions answered..... | 2,421 | 2,378 | 2,659 |
| ILL and pay orders filled..... | 2,515 | 2,575 | 2,118 |
| Reader requests filled..... | 5,903 | 5,236 | 5,061 |
| Pictures supplied..... | 2,427 | 2,209 | 2,627 |

Services to NIH and Other Agencies. The National Institutes of Health (NIH) Library provides library and information services to NIH employees, but NLM staff do provide special support to some NIH programs. RSD prepares Literature Searches for distribution to the participants in many of the NIH Consensus Development Conferences and provides Public Health Service officials with up-to-date information on publications dealing with acquired immunodeficiency syndrome (AIDS), through special monthly supplements to the quarterly Literature Searches on AIDS. The NIH Library also relies on NLM's Learning Resource Center to provide audiovisual services to NIH employees. Library Operations staff also serve on advisory committees to the NIH Library, as advisors to public information

clearinghouses operated by various institutes, and on special committees formed to address high priority health issues.

RSD also responds rapidly to a variety of special information requests from members of Congress, the Supreme Court, the Office of the President, the Secretary of the Department of Health and Human Services, and other federal agencies. Over 1,500 such requests were received and processed in FY 1984; almost all were filled in the same day.

The information services available to assist NLM employees in performing their varied assignments were improved during FY 1984 when the reorganization of RSD led to the assignment of a full-time professional Library employee to head the Staff Library.

OFFICE OF INFORMATION SYSTEMS

John E. Anderson
Director

MEDLARS III

The MEDLARS III contract was awarded on August 31, 1983 to Logicon, Inc. The design and implementation of MEDLARS III is taking place in three phases. The Phase I work includes the tasks: (1) to develop the overall system architecture that will support the total MEDLARS III system; (2) to acquire and install a database management system (DBMS); (3) to implement applications that will support the cataloging and acquisition functions; and (4) to develop a pilot information retrieval language that will be used to test the overall performance of the system. The target date for the implementation of Phase I is fall of 1985.

Several significant changes have occurred in the Phase I contract as a result of the analysis and design that has taken place to date. The first of these was the decision to use the IBM PC/XT personal computer as the basic workstation for internal MEDLARS III users in place of more conventional terminals. The use of the IBM PC/XT provides several advantages to the user in terms of more flexible screen formatting and better response time. The second major change was the selection of the Model 204 DBMS in place of the system that was originally proposed. A number of important elements have been so far completed by the contractor and reviewed by NLM. A Software Development Plan, which is the basic management document controlling the development process, was completed and accepted by NLM during the first three months of the contract. A Requirements Specification, which documents the basic agreement between NLM and Logicon, was completed and accepted by NLM in April 1984. In addition, Logicon has acquired and installed on the NLM computer the Model 204 DBMS, and has acquired and made operational a full complement of hardware, software, and communications devices required to support software development and testing.

The design of the Phase I system is nearing completion. The final design review by NLM will occur in October 1984. The programming of certain modules has been under way for some time and is expected to continue through April 1985. The remaining months of the contract will be devoted to acceptance testing, training, and system implementation. The current contract completion date for Phase I is September 30, 1985.

Phase II of the system calls for the implementation of applications to support the indexing function, serial records processing, and subject authority control. Phase III will include the implementation of the interlibrary loan routing and control function, the information retrieval system, and remaining collection management activities. Phases II and III are expected to be completed during the following two years.

Interim Projects. In order to improve processing in several important areas prior to the implementation of MEDLARS III, NLM has undertaken the development of two interim systems: indexing and interlibrary loan support.

The interim indexing system became operational in December 1983. This system provides complete online input and control of indexing materials from their check-in to their release for inclusion in MEDLINE and *Index Medicus*. Plans are under way to enlarge the scope of the online indexing system to include the work of contract indexers performed off-site.

Development to support an interim interlibrary loan routing and control system has been underway for several years. The first phase of this system provided automated support for billing interlibrary loan users. The billing system was implemented in January 1984. The second phase of the system provides for online input of interlibrary loans to NLM from the Regional Medical Libraries. This phase of the system has been

operational since March 1984. The third phase of the system will provide online input of loan requests and routing of those requests to other libraries based on holdings data. This phase is expected to be operational in early 1985.

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 Services. Computer analysts and programmers work closely with subject area specialists to determine their data processing requirements and to convert these requirements into new or improved data processing capabilities. OCCS provides systems and programming support for the MEDLARS II system and is responsible for certain aspects of the transition to the MEDLARS III system. Support for all of NLM's production data processing is provided by OCCS on an IBM 3033 multiprocessor system and Data General 230 and 350 minicomputer systems.

OCCS also provides support to our foreign MEDLARS partners. OCCS provides copies of the MEDLINE and other databases to six foreign centers and provides copies of the ELHILL retrieval system to three centers. The most recent, France, was converted this year from an online center to a combination online and tape center. OCCS installed the ELHILL retrieval system and databases in Valbonne, France for use by INSERM in August. This system will be made available to searchers in November 1984.

Application Services Branch

The Application Services Branch was organized in September 1983 by merging the workloads and most of the personnel from the MEDLARS Support Branch and the Application Support Branch. Prior to reorganization, the programming staffs tended to specialize in either INQUIRE stand-alone support or MEDLARS II databases, individual workloads and responsibility levels tended to be uneven, and coordination of important projects was occasionally less than perfect. The new branch structure has permitted the Office of Computer and Communications Systems to cross-train professional staff in both the INQUIRE and MEDLARS II tools and techniques, to the point where all databases and systems have both primary and secondary programmer assignments. Internal programmer documentation has been improved and standardized to permit back-up programmers to solve problems that arise. In addition, the assignment of technical team leaders help to insure that projects are kept ontrack and ontime.

Concurrent with the major reworking of assignments and organization, the branch output was main-

tained at a high level. Major MEDLINE databases were maintained and made available to the public on schedule. All the TOXLINE and CHEMLINE files were rebuilt and the locator fields in CHEMLINE were aligned with the new back file assignments in TOXLINE. Responsibility for the Automated Indexing Management Systems (AIMS) was accepted in the branch, and a new subsystem—BIBCHECK—was added to further automate and integrate the work of the several Library Operations sections. A new field was added to the master serials system, sequence (SEQ) element, which had a major rippling effect throughout the associated databases, and has permitted serial holdings to be uniquely identified without losing any prior identifier used by other medical libraries. We improved the processing of the serial holdings data from Regional Medical Libraries and will be able to process their submissions in a fraction of the previous time, provide the source libraries with exception reports, and create the SERHOLD database on a production basis. We have improved the flow of citations from AIMS into HISTLINE so that redundant keying by contractors is avoided and the citations are available for editing online by NLM staff. Finally, programming staff has been assigned to develop the inter-library loan system under the direct supervision of the Development Branch. A similar interchange of personnel had been successful for AIMS development.

Systems Support Branch

During FY 1984 the Systems Support Branch provided all required support for NLM mainframe operating systems and related software, provided training, and resolved user-reported problems and inquiries. Major efforts this year were to take advantage of the capacity of the 3033 system and to provide the necessary support for the MEDLARS III interim systems.

Notable activities of the Systems Support Branch during FY 1984 include:

- Installation and maintenance of systems software packages—MVS/SP—the current version of the IBM operating system that provides support for the recently installed 3380 disk storage units as well as increased system reliability and performance.
- Installation and support of more than 100 software products for programmers, users, systems support staff, and computer operations specialists.
- Installation and support for the Model 204 Data Base Management System which is being used for MEDLARS III development. This system was installed in addition to the INQUIRE/System which has been in use at NLM for a number of years. INQUIRE itself was enhanced with the installation

of its Data Management Supervision in late FY 1983 and became fully operational in FY 1984. At the present time the AIMS online indexing system and the National Cancer Institute's PDQ Cancer Information System have been installed under INQUIRE/DMS.

- Major tuning and continuing development of CICS (Customer Information Control System) and the Series/1 protocol converter. The increased use of computer terminals by NLM professional staff required an improved method of providing computer services. CICS provides control for database/data communications applications and will be one of the critical building blocks for MEDLARS III. The protocol converter provides the ability for ASCII terminals—those used throughout NLM—to use the vast library of 3270 applications and services available on the 3033 system. These systems are an important element in the MEDLARS III interim systems.

Equipment. In 1982, NLM installed its IBM 3033 multiprocessor system to support the present MEDLARS system and services as the new capabilities of MEDLARS III are developed. In 1984, NLM completed its upgrade to new technology IBM 3380 magnetic disk storage. These units are much faster, more reliable, and have greater capacity than any other drive available today. As a result of this upgrade, NLM now has a storage capacity of some 60 billion bytes of storage—the equivalent of more than 18 million pages of information.

In January 1984 a team of OCCS specialists conducted a series of system simulations at the IBM Raleigh, North Carolina facility to project NLM's future computational needs. The simulations were based on projected workload growth and the anticipated impact of MEDLARS III. The results showed that the NLM processor's capacity will be reached in 1985. As a result, initial planning for a new competitive procurement to replace the IBM 3033 multiprocessor system was started this year.

Computer Services

During this fiscal year, the Computer Services Branch maintained an extremely high level of operational readiness. In FY 1984, with the advent of online indexing and the implementation of the National Cancer Institute's PDQ cancer information database, systems reliability and availability became even more critical. Service to both of these new online systems as well as to MEDLINE users has been excellent, with MEDLINE response times remaining in the range of one to two seconds.

On March 30, 1984, NLM awarded contracts to Telenet, Tymnet, and UNINET for data communications services. These data communications network companies will provide continued toll-free access to the NLM systems for users of NLM databases. The NLM policy of equal access for all users, which was first implemented with TYMSHARE (now Tymnet) in 1974 and supplemented later with Telenet, has now been expanded to include UNINET access as well. The new contracts have increased the areas of local area telephone access to NLM databases.

SPECIALIZED INFORMATION SERVICES

Henry M. Kissman, Ph.D.
Associate Director

The Toxicology Information Program (TIP), which is the major responsibility of the Library's Division of Specialized Information Services (SIS), was established in 1967 in response to the 1966 President's Science Advisory Committee report, "Handling of Toxicological Information." The objectives of the Program are to: (1) create automated toxicology data banks, and (2) provide toxicology information and data services. TIP offers three major types of services: it provides online services, responds to queries, and supports other Government agencies in their information needs.

Online Services

TIP develops and maintains the NLM Chemical and Toxicological Files, which are online, interactive information and data retrieval services in toxicology. They include CHEMLINE, TOXLINE, RTECS, and the Toxicology Data Bank. It is also responsible for DIRLINE, an online information resources directory file.

CHEMLINE (Chemical Dictionary Online) is an online chemical dictionary and directory file. It allows users to identify a chemical substance of interest, determine which NLM files contain information for that substance, and aids in the formulation of an appropriate search strategy for these NLM files. As of August 1984, CHEMLINE contained records for 612,812 chemical substances. It is updated bimonthly, and regenerated at least once annually. In FY 1984, the average usage was 279 connect hours per month.

During FY 1984, improvements continued to be made in the CHEMLINE file. In April more than 110,000 substance names from the RTECS, TDB, and MeSH files were added to CHEMLINE. It is now possible to add chemical names, identified by NLM staff, that are of emerging biomedical interest but are not found in current sources. An agreement was signed with United States Pharmacopeia, Inc. (USP) for the

use of their validated drug nomenclature in CHEMLINE.

In order to learn more about the characteristics of CHEMLINE users and their perceptions about the file, a survey was begun of chemical information searchers in cooperation with the NLM Operations Research Group. In FY 1984, a questionnaire was designed and approved by the Office of Management and Budget, and an analysis of the workflow necessary for implementation of the survey was made. The survey and analysis of the results will take place in early FY 1985.

TOXLINE (Toxicology Information Online) is an online bibliographic database covering the toxicological effects of drugs and other chemicals. TOXLINE is updated monthly and, including its backfiles, now encompasses more than 1.4 million records from 1965 to the present. During FY 1984, online usage of TOXLINE and its backfiles was 10,650 hours.

New sources of information for enriching the TOXLINE file were evaluated. A "toxicology" subset of CRISP, the NIH database of research grants awards, will be added to the RPROJ (Research Projects) subfile of TOXLINE in FY 1985, as will the National Technical Information Service's Federal Research in Progress database, FEDRIP. Selected portions of the Hazardous Materials Technical Center Bulletin, the International Labor Organization bibliographic database, and a subset of the National Institute for Occupational Safety and Health Technical Information Center database are expected to be added to TOXLINE during FY 1985.

The TOXLINE files were regenerated in August 1984. The records were redistributed: TOXLINE (1981-present), TOXBACK76 (1976-1980) and TOXBACK65 (pre 1965-1975), and the language data element was modified to facilitate retrieval of non-English records.

RTECS (Registry of Toxic Effects of Chemical Substances) is an online interactive database built and maintained from data provided by the National Institute for Occupational Safety and Health (NIOSH). As of September 1984 it contained records for 68,386 substances. Quarterly updates to the file provided increases both in the number of substances covered and in the scope of information relating to the toxicity of chemical substances.

TDB (Toxicology Data Bank) is an online factual database describing chemical substances that may be hazardous and may have significant human exposure potential. Records in TDB include information on pharmacology and toxicology, manufacturing and use, environmental and occupational exposure, and chemical and physical properties. Data are extracted from tertiary sources such as monographs and handbooks, as well as from the primary literature. Completed records are evaluated by the TDB Peer Review Committee, a group of toxicologists associated with the Toxicology Study Section of the NIH Division of Research Grants. The online file presently contains 4,112 records—of which 4,077 are complete, and 35 are in processing. Online usage remained constant at approximately 200 hours per month in FY 1984.

Considerable progress has been made in enhancing the content and responsiveness of the TDB file. A new record format was adopted, with more extensive coverage in the areas of environmental pollution, safety and handling, exposure standards and recommendations, and other health and environmental effects. More than 3,000 records, many of which were updated and enhanced, have been converted into the new format.

The Remote Data Entry System, developed by NLM's Lister Hill Center, has been adapted for building the TDB file. This minicomputer-based system permits multi-site, online, interactive construction of records through communication links installed between data entry terminals and the host computer facility. Other software modules have been implemented to provide: (1) computer conferencing for the peer-review process, (2) in-process control tracking of record building and review; and (3) electronic mail/message sharing capabilities.

A new search/delivery system, which runs on the same minicomputer used for file building and review, was designed. It provides more user-friendly access to the data and greater flexibility in output options. The enhanced TDB file will be tested in the fall of 1984 and is scheduled to be available to domestic MEDLARS users in the spring of 1985.

DIRLINE (Directory of Information Resources Online), an online interactive directory which refers users to or-

ganizations and other sources of information in specific subject areas, successfully completed its one-year experimental period in August 1984. Currently, records in DIRLINE come from two sources: the Library of Congress's National Referral Center (NRC) database, and the National Health Information Clearinghouse (NHIC) database.

The NRC component contains information about 13,621 resource centers. These centers include public and private organizations, institutions, and groups and individuals with specialized information in particular fields. Each record is updated by the NRC at least every two years.

The NHIC database, provided through an agreement with the Office of Disease Prevention and Health Promotion of the Public Health Service, was added to DIRLINE in June 1984. Initially, the Office provided 428 records, and has agreed to enhance DIRLINE by approximately 1,000 records in FY 1985. NHIC contains references to organizations that provide information about various aspects of health and disease. Each record in NHIC is updated at least once a year. DIRLINE is updated quarterly.

User support for the NLM Chemical and Toxicological Files continued to expand. The manuals and pocket cards, designed to aid users in searching the files, were updated. The printed SAMPLER and audio-visual Files Overview, both of which introduce the new or prospective user to the files, were revised. A slide/script on the organization and management of the TIP was developed to be used in conjunction with the existing TIP slide/script overview describing the Program's products and services. Instructional packages consisting of 35mm slides and lecture guides were developed for each of the files, as well as the basic features of the ELHILL search system. Courses were designed for a three-hour abbreviated end-user training program and a six-hour end-user training program. The abbreviated end-user training course was given for the first time at the American Chemical Society meeting in Philadelphia, PA, on August 16, 1984.

An expanded exhibit program at professional meetings was started to acquaint potential users in the areas of chemistry, toxicology, and environmental health with the NLM Chemical and Toxicological Files. In the future, end-user training will be offered at professional meetings in conjunction with the exhibit program, and at governmental sites in the field.

CITE (Current Information Transfer in English). The CITE Online Public Access Catalog in the NLM Reading Room was enhanced to provide user-friendly access to the MEDLINE medical journal literature database. Walk-in patrons of the National Library of Medicine are now able to search for biomedical books or

journal articles using flexible natural language subject queries. The CITE systems utilizes a "closest match" search strategy, automatically displays suggested medical subject headings, and shows retrieved documents in a ranked sequence.

Query Response Services

Literature search and query response services in toxicology are provided by both TIP and the NLM-sponsored Toxicology Information Response Center (TIRC) at the Oak Ridge National Laboratory in Tennessee.

TIP is currently developing a Query Response service that closely parallels that of the NLM Reference Services Division. A policy instituting charges for services is under discussion. TIP continues to provide specially requested searches on a non-routine basis.

TIRC products and services are provided on a cost-recovery basis. Charges for literature searches at TIRC are \$40 per hour for both domestic and foreign users, with billing being handled by the National Technical Information Service (NTIS). TIRC performed approximately 400 full literature searches in FY 1984. Most of the search requests were from Federal agencies that have interagency agreements with NLM for information support from TIRC.

Information Services to Other Agencies

TIP provides information support to several Federal agencies. Current examples are the Agency for Toxic Substances and Disease Registry, the National Toxicology Program, the Food and Drug Administration, the Department of the Army, and the National Institute for Occupational Safety and Health (NIOSH). Literature searches and related information services for these agencies are provided by TIRC.

Hazardous Substances Information Services. A major effort of TIP during FY 1984 has been in support of the Department's responsibilities under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), also referred to as the "Superfund Act." These activities were initiated in late 1982 and became fully operational in FY 1984. The primary objectives are to: (1) enhance the NLM Chemical and Toxicological Files with additional chemical substance records and data pertinent to chemical waste dumps or accidental spills; and (2) improve information dissemination capabilities for officials dealing with hazardous chemicals—often in emergency or remedial situations.

An interagency agreement with the Agency for Toxic Substances and Disease Registry, signed on June 28, 1983, was extended through FY 1984. The Agency, formed under direction of the CERCLA, is the

lead agency for the Department of Health and Human Services' Superfund activities, and is part of the Centers for Disease Control in Atlanta.

While TOXLINE and CHEMLINE were enhanced to some extent for CERCLA purposes, the major part of the effort in FY 1984 was focused on enhancing the TDB. An effort was made to identify additional data sources to supplement the existing sources, especially in the areas of environmental effects and occupational safety. A workshop was held at NLM in spring 1984 to better identify sources and their utility for TDB purposes.

Since January 1983, NLM has directed the development of a stand-alone, microcomputer-based workstation—housed in a CODATA microcomputer—to permit rapid and convenient access to chemical, toxicological, and hazardous waste information for regional and field personnel at the Centers for Disease Control (CDC). The capabilities planned for this workstation encompass most of the major functions of the Chemical Substances Information Network (CSIN) (see below). Additional capabilities now under development include: (1) post-processing of retrieved data, (2) searching of local data files, (3) communicating with other workstations, and (4) communicating with regional headquarters and field personnel via electronic mail/messaging. The first field workstation is being deployed to CDC for testing and evaluation.

In addition to the activities discussed above, NLM supported the DHHS Hazardous Waste Information Evaluation Subcommittee in selecting chemicals for toxicity testing and incorporation of information into the TDB, and conducted a feasibility study for the development of hazardous chemical profiles.

Interagency Subcommittees. As part of its collaborative work with other Federal agencies, TIP chairs the Toxicology Information Subcommittee of the DHHS Committee to Coordinate Environmental and Related Programs, and the Chemical Substances Information Network Subcommittee of the Interagency Toxic Substances Data Committee. The former group sponsors and monitors the following three projects which are operated by TIP.

TOX-TIPs (Toxicology Testing-in-Progress) is a monthly publication that describes toxicity testing and related epidemiological studies reported voluntarily by governmental, industrial, and academic laboratories. Coverage of literature reports on animal testing alternatives was begun this year as a new feature. Each issue also includes an alerting service entitled, "Methods of Testing Chemicals for Biological Effects." TOX-TIPS is published monthly through NTIS and is available at annual subscription rates of \$45/domestic and \$90/foreign. The number of subscriptions has remained

stable at approximately 625 worldwide. Contributions to the publication were received chiefly from Federal agencies and some industrial testing programs.

Two TOXLINE components, Research Projects, carrying information on ongoing research in toxicology, and the Toxicology Document and Data Depository (TD3), with information about the report literature in toxicology, are also sponsored by the Subcommittee.

As the name indicates, the CSIN Subcommittee monitors the activities of the interagency CSIN (Chemical Substances Information Network) project which

provides integrated access to specified files on MEDLARS, the Chemical Information System, CAS ONLINE, and ORBIT. CSIN facilitates online searching through a minicomputer-based "gateway" system that functions between the user's terminal and the target online files housed in government or commercial online systems. It uses the preprogrammed search capabilities, SCRIPTs, which essentially perform the online search for the user, and TRANSFORMs, which reformat the output of one search for use as input to another search. NLM has supported the CSIN project since its inception.

LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS

Earl Henderson
Acting Director

In FY 1984, the Lister Hill National Center for Biomedical Communications conducted reviews of all its intramural research and development projects. The Director asked senior researchers to develop documentation for new research and development projects and to justify major ongoing activities. This marked the beginning of a review process that included internal peer review at the LHCBC and review by the NLM's Board of Scientific Counselors (the members of the Board are listed in Appendix 4). This effort helped integrate the programs and resources of the National Medical Audiovisual Center with the programs of the Center by identifying research projects which could exploit the personnel and research facilities of the new Lister Hill Center. Potential research areas in computer assisted instruction, medical decision analysis, and human factors in information systems were defined and staff training and project development for them was begun.

Among new activities in FY 1984 were a series of monthly seminars identified as "The Lister Hill Center Seminars" which were held in the LHC auditorium. Both local and external experts in areas of increasing interest to biomedical communications researchers discussed their recent research projects. Some experts and their topics were, Robert Williges, Ph.D., Human Factors Design of Human Computer Dialogues; Arthur Elstein, Ph.D., Physicians' Judgments About Estrogen Replacement Therapy: A Study of Clinical Decision Making; Dennis G. Fryback, Ph.D., Feedback Systems for Improving Clinical Judgment; George R. Thoma, Ph.D., Compression Techniques; Ms. May Cheh, Artificial Intelligence: Problems in Knowledge Representation; Mr. Charles Goldstein, Optical Disk Technology and Library Information; Richard B. Friedman, M.D.,

Computer Simulation of the Patient Physician Encounter.

In addition, Dr. Ben Shneiderman of the University of Maryland Computer Sciences Department presented a seminar to LHCBC and other NLM staff on Designing Interactive Computer Systems. The Center also sponsored presentations on the Health Education Network and the Health Sciences Communication Association, when the officers of those organizations attended conferences at LHC. An increased number of technical seminars and demonstrations were presented by visiting faculty, commercial, and medical researchers.

In October 1983, Mr. Earl Henderson was selected as the Deputy Director of LHCBC. He was formerly the Chief of the Communications Engineering Branch. In 1984, Dr. George Thoma was appointed Chief of the Communications Engineering Branch. The Director of the Center, Dr. Richard B. Friedman, headed an effort to review and advise NLM management on office automation strategies for the Library. The effort culminated in new office automation for the NLM which is now being implemented.

The Director of the Lister Hill Center, Richard B. Friedman, M.D., left his position in July to return to the University of Wisconsin Medical School. Mr. Earl Henderson was appointed Acting Director while a search for a successor is underway.

TIME

A major new project, known as Technological Innovations in Medical Education (TIME), was begun in the first quarter of FY 1984. The project is directed by Dr. William G. Harless and involves staff from several Lister Hill Center branches; thus, it is not reported under the branch headings which follow, but has its own section in this report.

The primary goal of the TIME project is to address the potential application of the new technologies of microprocessor, interactive laser disc, and speech recognition to the education of medical students and medical practitioners. The new technologies offer unprecedented capabilities for interactive and visual presentations of educational material. The TIME project is exploring these capabilities by developing a series of problem-based, patient-related clinical simulations.

The educational methodology being developed by the project for the simulations has been labeled "contextual learning." This method assumes that optimal learning occurs when an interested, motivated student is given the opportunity to observe and participate in a relevant, believable simulated situation.

Each TIME simulation provides an appropriate contextual framework for acquiring medical knowledge and learning clinical decision making. The simulations are carefully designed to engage the user in the life story and health problems of the patient. Furthermore, they provide the user with effective educational material (visual, audio, and textual) within the context of the patient situation.

The first prototype TIME simulation to be developed has been completed. The patient, Frank Hall, is a 43-year-old male who arrives at the emergency room complaining of weakness and abdominal pain following an episode of vomiting blood two days earlier. The Frank Hall simulation requires two videodiscs. Each disc contains a variety of scenes depicting the patient's current experience in the hospital and significant past experiences (through flashbacks) which are related to his present illness. Other scenes depict elements of the physical exam and relevant diagnostic tests.

At the user's verbal request any scene on any disc is immediately available. The user selects scenes in any order desired by speaking into the voice recognition unit. Before using the simulation, the user trains the system to recognize more than fifty control words. About forty of these allow access to scenes concerning the patient's medical condition and social situation. The remaining words (called system control words) enable the user to independently manage the interactive session or obtain help from the system.

The TIME program is designed to preclude the need for either an on-site monitor or written user instructions. At the conclusion of the interactive session, the user receives (evaluative graphic) feedback from the system describing the type, amount and order of information gathered during the simulation.

This prototype simulation has been formally presented to the senior NLM management, Lister Hill Center Staff, International Council of Scientific Unions-Abstracting Board, American Association of Colleges of

Pharmacy, and a variety of NLM visitors from both the public and private sectors.

A supplementary disc for the Frank Hall simulation is nearing completion. This prototype tutorial disc will demonstrate further the possibilities for contextual learning by providing the student with instruction in relevant physical examination techniques and procedures within the context of the medical problem.

A second prototype TIME simulation is currently being developed concerning a geriatric patient in a nursing home situation. It is scheduled for completion during the first quarter of FY 1985.

During FY 1985 additional simulations will be created. The TIME staff will evaluate the simulations and develop research paradigms to explore the relevant issues concerning the technological and educational innovations. In addition, presentations will be made to interested medical and educational agencies, institutions and societies; and manuscripts submitted for publication to medical and educational professional journals.

Communications Engineering

Electronic Document Storage and Retrieval (EDSR).

The EDSR Program is an ongoing effort to design, develop, and evaluate a laboratory facility that will serve as an engineering prototype to electronically store, retrieve, and display documents acquired by the Library. Its long-term goal is to help introduce advanced technology to aid the Library in fulfilling its missions in information processing as well as to serve as a national archive for biomedical literature. The development of the experimental system involves integrating various components such as a document capture subsystem, high density storage media, document display subsystem, and a system controller. The resulting engineering prototype enables both technical and operational evaluation to be done.

Document capture techniques are being explored to scan electronically both loose-leaf and bound documents containing textual and graphic material. Document storage in the prototype system is provided by high-density magnetic disks allowing about a thousand pages of storage, sufficient for preliminary experimentation and documentation. This storage medium will later serve as a buffer storage for an archival storage subsystem to be implemented by optical disk technology. Documents are retrieved and displayed at a resolution of 200 points per inch in both softcopy (electronic display) and hardcopy (paper) forms.

The first phase of the program is complete, namely, a prototype system to scan, store, retrieve, and display the exact images of paper documents. This system is currently being used to demonstrate a poten-

tial library application. First, a document image database was built from the title pages and tables of contents in cited books in a selected medical area. This demonstration begins with performing a search on a standard NLM bibliographic database yielding a list of citations. For the citations of interest the image database may be commanded to rapidly deliver the corresponding exact document images. This is accomplished by linking the bibliographic database on the Library's mainframe computer to the minicomputer that serves as the system controller in the EDSR prototype.

Among the program's next phases will be to develop an archival capacity by means of optical disk technology. Also, the hardcopy output is to be upgraded to allow plain paper output at a higher speed. The present device has the disadvantage of requiring expensive chemically treated paper and its slow speed is a deterrent to effective usage of the EDSR workstation.

The research effort will use the prototype system as a test bed to evaluate and correct problems encountered in capturing images, transferring images to storage media, retrieving and displaying images on output devices, and evaluating factors such as display image quality, system reliability, maintainability, the man-machine interface, and the utility of such a system to the NLM mission in information processing. Other research programs using the prototype system are being initiated. These involve image data compression and omnifont text recognition.

Computer Science

Automated Classification and Retrieval. This new research program will investigate, develop, and evaluate information science, computational linguistics, and artificial intelligence techniques which support the automated classification and retrieval of biomedical literature. The program will include projects in the areas of natural language understanding, knowledge representation, and information retrieval. The goal of these projects is to explore their application to the development of automated systems for identifying, representing, and retrieving relevant concepts and main ideas from printed documents. The Center is pursuing this as an intramural research program, but also seeks opportunities to collaborate with other organizations that are conducting related research.

Two intramural research projects are being developed. The first is defined as a matcher between queries and a knowledge base. The second is defined as a natural language understanding project.

A preliminary study explored the development of semantic grammars and frame structures to represent information in a selected group of English language articles about clinical drug treatment. The relevance of the representations, as well as other representations devel-

oped as part of the new projects, will be evaluated with respect to queries used by library patrons. A set of queries processed against various online retrieval systems during 1983 was provided by the NIH Library (patron names were deleted prior to their release to the NLM) for such use.

Advanced Computer Science Resource (ACSR). The Computer Science Branch, with the help of the Information Technology Branch, procured and installed the ACSR system which consists of two VAX 11/780 systems interconnected by an ethernet local area network. This system, which was installed in January 1984, replaced two computer systems, a DEC 20/60 and a DEC PDP 11/60. One of the new systems is connected to the ARPA/MILNET network. The ethernet, because it uses the TCP/IP protocols, is also part of the ARPA/MILNET network. As a consequence, either system has the capability for exchanging mail or files and for remote terminal connections with many sites throughout the United States. The ACSR runs under the Berkeley version of the UNIX operating system and supports a variety of text editors, program development tools, graphics facilities, and languages and tools applicable to artificial intelligence.

The text editors, EMACS and VI, are full screen text editors and provide the capability of editing programs and documents. EMACS, through its macro language feature (a lisp-like dialect), can be tailored to fit a multitude of applications ranging from document preparation to program development. These editors together with a collection of other programs provide an environment to develop and test programs in the languages C, Fortran 77, Prolog, Interlisp, and Franzlisp.

The graphics facilities include a high resolution laser graphics printer, graphics terminals, and software to display graphics images on these devices.

The artificial intelligence languages and tools include the languages Interlisp, Franzlisp, and Prolog; and the expert system building tools AGE, EMYCIN, and MRS.

Information Technology

Distributed Information System (DIS). The DIS program encompasses several projects related to the effective distribution (as opposed to centralization) of advanced information systems technology. The projects include:

- Interactive Information Management System (IIMS)
- Network Access Information Workstation
- Integration of an Extended MUMPS Language under UNIX
- Information Retrieval Testbed System

The efforts of the Information Technology Branch have been related to the above projects and have benefited from a collaborative program with NLM's Specialized Information Services in which the results have been applied to operational systems. The IIMS project is designed to produce a working model for testing and demonstrating advanced information management and retrieval techniques which can be applied to full-text databases. The project has been built upon concepts and code developed for previous Lister Hill Center projects including a Retrospective Data Entry System originally used for conversion of NLM's card catalog, electronic mail initially developed for the Integrated Library System, and a Distributed Information Delivery System which demonstrated the microprocessor-based delivery of a full-text encyclopedic data base.

The Network Access Information Workstation project is to develop a user-friendly microcomputer workstation that can facilitate access to different online information sources. The workstation provides automatic logon to online databases, automated search sequences (scripts), transformation of retrieved data to standard formats, and transfer of data to a user's personal filing system. The prototype has been based upon a design for the Chemical Substances Information Network which was originally implemented on a DEC VAX 11/780. The workstation has brought the functionality of the VAX implementation to an inexpensive multi-user microcomputer and in the process has provided greater flexibility and ease of use. In collaboration with Specialized Information Services and the Council on Environmental Quality, a version of the workstation that has been tailored for access to hazardous waste information will be field-evaluated by the Centers for Disease Control (CDC) in Atlanta. The workstation will form the hub for a network of portable computers that will be used by CDC personnel who respond on-site to chemical emergencies and who require immediate and accurate information.

The third DIS project is the implementation of an extended MUMPS programming language environment under the UNIX operating system. MUMPS is one of the ANSI-standard languages and has been extensively used in biomedical computing applications. Two of the strong points of the language are its interpretive nature and an embedded database management system, which are two features missing in UNIX. Since a significant amount of software, including the IIMS, has been developed for NLM in a version of MUMPS, the translation to a language that operates under a portable operating system such as UNIX would increase the availability of this software and save the effort of recoding these applications in another language. The Information Technology Branch has begun testing commercial implementations of MUMPS that exist under UNIX with a

view towards defining the functions necessary to provide a translation of NLM software and an optimal MUMPS environment in UNIX.

The last activity within the DIS program, the Information Retrieval Testbed System, evolves from earlier work in the area of natural-language queries and statistical retrieval techniques. As part of that effort, a system called ANNOD (A Navigator of Natural Language Organized Data) was developed as a query system for the Hepatitis Knowledge Base. The objective of the present effort is to create a testbed system that will enable evaluation of the performance of statistically based information retrieval systems. The basic set of component programs, including word stemming, thesaurus building, and ranking of retrieved output, has been developed under the UNIX operating system and will permit systematic testing of different retrieval strategies and dependencies on the types of databases searched. The Toxicology Data Bank file has been stored on an IDM database machine to facilitate the management of and access to a sample full-text database. The project also includes the investigation of bit-mapped display technology for window-based presentation of text.

The National Demonstration Center for Educational Technology. In 1984 a Lister Hill Center program was initiated to establish a National Demonstration Center for Educational Technology (NDC). This Center is to provide an environment for, and demonstrate, state-of-the-art-technologies in health-sciences-oriented computer-based education. The Center will allow health science educators—faculty and researchers—to have access to a spectrum of computer-based educational materials. In addition to demonstrations, the NDC will serve as a laboratory for comparative studies and evaluation of such materials. The NDC facilities will include two demonstration areas and a conference room; the latter to be linked electronically with the former. Detailed plans have been drawn up for the NDC, to be implemented in FY 1985.

Microprocessor Laboratory. In recognition of the development, advances, and widespread utilization of microprocessor technology, the Lister Hill Center designated the space on the ninth floor as a microprocessor-based research and development laboratory. This microprocessor laboratory will provide space for core facilities and research and development—movable partitions allow the laboratory to be divided into as many as eight separate areas. Planned core facilities include a communications section, a software library/archive area and a general purpose access area. The programs targeted for initial occupancy all involve computer-based education. The laboratory space will be reallocated to new programs as old programs are phased

out. Expected programs in artificial intelligence, distributed database systems, and human interfaces will be housed in the laboratory in the future.

Processing of Bibliographic Citations. There is today a large variety of online bibliographic citations serviced by various retrieval systems such as SDC, Lockheed DIALOG, BRS, NLM's MEDLINE, etc. With the advent of micro- and personal computers, coupled with software programs such as ISI's SCIMATE, INSEARCH, etc., an increasing number of users are "downloading" citations in machine-readable form. These downloaded citations are usually incorporated into personal bibliographic files and are often used as references in subsequent publications. Unfortunately, there are no bibliographic citation standards and, hence, citation formats differ between different databases and retrieval systems. Under such circumstances, it is natural to ask if it would be possible to machine process the citations into some common format, and then to provide an easy means of formatting for different purposes.

Utilizing the powerful text analysis and manipulation tools available in the UNIX operation system on the Lister Hill Center's VAX 11/780 minicomputers, programs were developed to process journal and proceedings citations into a common format and to provide a means of creating different reference formats. These programs are presently being documented for publication. It is expected that programs such as these will be part of a growing collection of computer-based tools available to all scholars in the future.

Electronic Mail. The Information Technology Branch developed an electronic mail system in the language MIIS as part of the Integrated Library System (ILS) program (which terminated at the end of 1983). The mail system design introduced many innovations including the retention and categorization of messages to form a personal information database for users. Following completion of the ILS program, the electronic mail system has been used in the Distributed Information System (DIS) program to provide communication between the peer review committee members and the staff of NLM's Specialized Information Services.

Audiovisual Program Development

The Audiovisual Program Development Branch (APDB) applies current and emerging video communication technologies and audiovisual techniques to Lister Hill Center research, development, and demonstration projects and to the educational, research, and information transfer needs of the health sciences community.

In order to carry out its program goals, the Branch began a long-term updating of the Lister Hill Center video and audio production facility. This will allow it to

continue to support the premastering of materials for new videodisc projects, and to include in these prototype materials the visual techniques consistent with current computer based educational objectives. This year the Branch emphasized updating the editing systems, with future plans to upgrade the audio production, video-graphics, and still recording systems.

Projects. Two medical simulations were produced as videotape premasters for optical videodisc/microcomputer programmed demonstrations in the TIME series (described earlier in this chapter). Experienced theater performers were recorded in both studio settings and on remote locations. Music, special effects, narration, and electronically generated graphics were integrated with live action and still frames for mastering onto multiple optical videodiscs.

An experimental videodisc was produced for the History of Medicine Division Prints and Photographs Collection, using more than 1,000 selected visuals from that collection. A number of collaborating health sciences institutions will test the feasibility of using the videodisc and accompanying written materials as a means of selecting prints or photographs for research or educational purposes by medical professionals, authors, publishers, teachers, students, and library patrons.

In another activity, several hundred carefully selected color slides of skin disorders were electronically recorded, to be assembled on videodisc for a "dermatologic diagnosis" project. Responsive to microcomputer programming, the demonstration visual database will be tested in medical education settings to evaluate its utility as a teaching/learning tool and as an aid in diagnostic decision making.

Working with Dr. Frank Allen, Department of Medicine, George Washington University School of Medicine, the Branch's staff used video microscopes to continue to record materials from Dr. Allen's extensive collection of histology slides. When properly indexed and enhanced with electronically generated graphic descriptors and visual aids, a "Microanatomy Data Bank Videodisc" will be developed. The disc will be interfaced with microcomputer programming to create interactive audiovisual learning units.

Two videotapes were produced, in collaboration with the National Institutes of Health and the Food and Drug Administration, as units in a training series for researchers and health sciences administrators on the significance, the historical development, and the federal guidelines and regulations pertaining to the protection of human subjects involved in medical research experiments.

Selected brain sections, plus 4" X 5" and 8" X 10" color transparencies from the Armed Forces Insti-

tute of Pathology's Dr. Yakovlev Brain Section Collection were recorded on both videotape and 35mm motion picture film. This experiment is designed to ascertain (1) if optical videodisc recording provides sufficient resolution for cataloging and analyzing brain sections, and (2) to determine whether photographic copies can be used in the videodisc production process, rather than actual brain sections.

Support Activities. The Branch's Graphics and Still Photography Labs continue to provide visual information materials in support of approved audiovisual development projects and to other elements of the Library. The Branch's graphic artists are helping to test a computer graphics system as a step toward upgrading the presentation graphics support provided to the Library. The Branch also provides projection, audio recording, and other audiovisual support to meetings scheduled in the Lister Hill Center Auditorium and other NLM facilities by the Office of Training Facilities Coordination.

Health Professions Applications

The principal activities of the Health Professions Applications Branch this year were: 1) the continuation and extension of the microscopy-pathology videodisc testing, which now includes 35 test sites in U.S. and Canadian medical schools, technical support to the participating sites, and the evaluation of data from the sites; 2) the continuing development of similar prototype videodisc projects in radiology and in suicide assessment, planned as collaborations with other government and non-government organizations; 3) the development of a prototype videodisc and database in dermatologic diagnosis; 4) the continuing roles in planning and evaluating the Lister Hill Center and Office for Protection from Research Risks (NIH) materials development project; 5) directing two evolving projects in nursing history, one in cooperation with the Public Health Service nursing community and the other with Freedmen's Hospital alumnae; 6) the completion of a

study and analysis of user responses to NLM's audiovisual loan program services; 7) completion of work on NLM's Scope and Coverage Task Force, resulting in recommendations about the collecting of medical behavioral science materials; and 8) the securing of the long-delayed approval by the Office of Management and Budget of the selection-acquisition study, a contract project at the University of Iowa.

The Branch's staff participated in a series of organizational development meetings with consultants from Tricom, Inc., an organizational consulting firm. These efforts resulted in a jointly prepared staff working paper that included a new mission statement for the Branch; a compilation of the staff's credentials, interests, and work experiences; and brief descriptions of about 30 ongoing or suggested staff projects. These efforts contributed to improved cooperation among HPAB staff. As a follow-up to these meetings, staff prepared and submitted several preliminary proposals for review. These included proposed projects on test item banking in health professions education, applications of clinical decision analysis, uses of videodisc technology in health professions education, health professionals' information-seeking behaviors, and a history of medical computer-based education.

Training And Consultation

The Training and Consultation Branch continued its programs in support of the effective use of microcomputer and audiovisual technologies in the health professions. Information resources for health professionals were developed in the areas of microcomputer and videodisc applications in medical education and in selecting microcomputer authoring systems. The Branch staff participated with the Information Technology Branch staff and consultants to establish a National Demonstration Center in Educational Technology.

The Training and Consultation Branch provided more than 400 in-house consultations to health professional teachers, researchers, and administrators.

EXTRAMURAL GRANTS AND CONTRACTS

William G. Cooper, Ph.D.

Associate Director, Extramural Programs

The National Library of Medicine's Extramural Programs, authorized by the Medical Library Assistance Act (MLAA) of 1965 and extensions, provide a variety of assistance opportunities, through grants-in-aid and contracts, to the health science information, biomedical communication, and medical informatics communities. Awards have assisted authors and scholars, researchers and academicians, librarians and media experts, computer scientists and linguists, and information network and systems architects; collectively their global objectives have helped in the preservation of health knowledge and in the expeditious utilization of such knowledge. Funded projects range from information resource improvement for the libraries of rural hospitals to historical writings on significant health topics to the initial stages of developing integrated academic information management systems with vast implications for the basic fabric of how heterogeneous information is accumulated, stored, retrieved and amalgamated in multi-faceted health conglomerates. Regional Medical Library contract activities, also authorized by the MLAA, are described in the chapter, Library Services and Operations.

The authorizing legislative language of the MLAA has remained substantially unchanged since the Public Law was enacted almost twenty years ago; however, the implementation of this flexible law has consistently reflected the juxtaposition of contemporary health science information needs and the rapidly evolving technologies through which these needs can be best addressed.

Ten years ago this report described the Extramural Program interests and provided examples of the year's accomplishments for the \$7.6 million expended under the MLAA authorities. It is noted that the only explicit statement relative to automation technology in the FY 1974 report—indeed the only use of the word "computer"—is in the descriptive sentence, "Several groups

of investigators, with NLM support, have been testing, developing, and demonstrating the use of the computer in automating various library activities. . . ." A decade later, the current report also describes grant program mechanisms and examples of MLAA awards for the \$7.5 million obligated during the year, but closer examination of the context of this support reveals a quite different dynamic. In FY 1984, more than 67% of the grant dollars expended were for activities directly dependent on the availability and the capability of the computer.

MLAA sponsored research, the initially disappointing weak link of the 1965 Law's provisions (according to a 1971 analysis by NLM Director Cummings) has come of age through opportunities afforded by computer technologies; the same, forward-looking *objective* of the 1974 awards for "testing, developing and demonstrating the use of the computer in automating various library activities" has become the *prerequisite* for this generation's new Resource Grant Initiative (see IAIMs); and NLM's new 1984 training awards now focus exclusively on advanced training of promising post-doctoral scientists for research careers in medical informatics (computers-in-medicine). Given the pervasiveness of the computer, it would be unusual if these trends were any less evident in the descriptive data for recent NLM assistance awards. It is said, however, that "the mode by which the inevitable comes to pass is effort" and less directive effort on NLM's part might have cast a somewhat different FY 1984 Extramural Programs report.

MLAA appropriations for fiscal years 1974 and 1984 were almost identical. Even though some of the intervening years provided larger spending levels, the annual average for MLAA funds for the decade was less than \$8.25 million. In addition, since FY 1981 the Extramural Programs have operated on a year to year reauthorization provided by annual appropriation acts

rather than by specific multi-year renewals of the MLAA Public Law. In regard to the recent years' appropriation levels, as well as postponements of the MLAA renewal, it should be noted that in neither instance were actions, or lack of actions, in any way attributable to concerns about the progress, results, or continued need of the MLAA programs. As is often the case with complex, omnibus legislative bills, involving appropriations and statutory authorities for a number of bureaus and institutes, final action on noncontroversial parts of the bills depend on resolution of the whole.

Currently, a 3-year extension of the MLAA authorities is pending joint congressional committee action and the proposed authorization levels, if realized, would provide the initial steps toward an improved extramural assistance operation.

Research Grants

Ever expanding medical knowledge and changing dimensions of health care delivery raise challenging questions about managing health information effectively. Scientific investigations of these questions are sponsored by NLM's research awards. This research attracts workers in many disciplines. The questions studied include the organization of medical knowledge, economic and social issues of information service, analyses of medical bibliography as a mirror of scientific activity, and assessments of the scientific literature in terms of its validity and reliability.

At Mount Sinai School of Medicine in New York City, for example, reports of controlled clinical trials are analyzed to determine how valid the trial procedures are. The published trial reports are also compared against those which have not been published to see whether they reflect different scientific methods. The long-term goal is to derive standards for clinical trial reports which investigators, their sponsors, and scientific journal editors will find helpful.

At Case Western Reserve University in Cleveland, the usage of medical libraries has been surveyed in a study which combines usage statistics with data on information service costs. The study results are complemented by a similar assessment of information economics in general academic libraries, sponsored by the National Science Foundation.

Within recent years, exciting advances in the computer sciences, together with new discoveries in the cognitive, behavioral, and linguistic sciences, suggest innovative possibilities for bringing relevant knowledge directly to bear on clinical activities. In 1978, the National Library of Medicine convened a distinguished task force to consider these developments as a possible research focus. The task force recommendations led to a research program initiative entitled "medical informatics." Over a 5-year period, it has been possible to

support fundamental studies on computerized reasoning via artificial intelligence, on the nature of clinical thought processes in medical decision-making, and on the attributes of medical language. Related studies concern retrieval of information from graphic images and mathematical models of medical problem-solving. Examples of the broad scope of medical informatics projects follow.

At Stanford University, research into computerized representation of medical knowledge has yielded a computer program that represents and assesses treatment planning for cancer patients.

At Latter Day Saints Hospital in Salt Lake City, computer-based logic is being studied for diagnosis and treatment of coronary artery disease. The resulting program will be available to practitioners through a local computerized hospital information system.

Growing interest in medical informatics as a research field is one indication of the program's success, but the challenging issues involved require additional experienced investigators. This program uses different kinds of grants to foster career growth in medical informatics. Besides the usual investigator-initiated research grants, there are New Investigator Research Awards and Research Career Development Awards for promising younger scientists. The program stresses fundamental work on utilization of knowledge, but the research supported must necessarily take place in a health context. Where appropriate, NLM collaborates with other Federal programs, at NIH and elsewhere, to support research projects of mutual interest.

Recent publications resulting from NLM grant support are included in Appendix 2.

Medical Library Resource Grants

The objective of this grant program is to assist health science libraries by increasing their resources and expanding their service capabilities. Medical Library Resource Grants are of two types: The Resource Improvement Grant assists single institutions and consortia in developing basic collections. The Resource Project Grant is directed toward established health science libraries and enables them to undertake new services or expand existing ones. Libraries of various organizations involved in health education, research, and patient care are eligible to apply.

In FY 1984, 16 new Resource Improvement Grants were awarded; seven were to single institutions and nine to consortia serving some 66 members.

Among the nine Resource Project Grants awarded in FY 1984, two were for statewide networks and one for a local network. Computer-based information systems will be installed in the medical libraries of the Medical University of South Carolina and the Universi-

ty of South Carolina. In subsequent years the system will be extended to the libraries of the Area Health Education Centers and to other library consortia throughout the state of South Carolina. In the State of Washington, a coordinator will assist in developing health sciences libraries and in creating a statewide network. Such a network will strengthen resources and services in existing libraries and will provide new access points to health information for currently unserved health professionals. A grant to the library of Cornell University Medical College in New York City will support the installation of a computer-based library information system. In the second year, the system will be extended to three affiliated hospital libraries.

Two grants have been made to permit health science libraries to provide audiovisual services. At Maimonides Medical Center in Brooklyn, Resource Project Grant funds will establish a learning resource center within the library. In northern Maine, a regionally shared audiovisual collection will be established to accommodate the continuing education and inservice training needs in seven small hospitals in Aroostook County.

Two institutions will be introducing new services to patrons which go beyond the traditional library roles. A Resource Project Grant awarded to the University of Maryland in Baltimore will assist in providing faculty with direct access to reference, online searches, photocopy, and interlibrary loan services via an electronic mail link with the Health Sciences Library. At the Dahlgren Memorial Library of Georgetown University Medical Center, a Library Computer Information Service will be established to provide a learning laboratory environment where students, faculty, and staff may obtain guidance in the use of microcomputers and in database development.

Two Resource Project Grants will assist in the preservation and organization of special collections. Ross A. McFarland is considered one of the founding fathers of the study of human factors in aviation. His personal collection in aerospace medicine and human factors engineering, held at Wright State University, Dayton, Ohio, will be made available to the scholarly community. W. Horsley Gantt was the only American to have studied with Pavlov for an extended period. He then pioneered Pavlovian theory and methodology in the United States. The objective of this grant is to preserve and organize his papers so that they will be accessible to historical scholars, clinicians, and medical scientists.

IAIMS Programs. The NLM-supported study by the Association of American Medical Colleges, "Academic Information in the Academic Health Sciences Center: Roles for the Library in Information Management,"

identified the need for academic health sciences centers and hospitals to take immediate steps to use new information technologies to facilitate the flow of recorded biomedical knowledge throughout the institution in as direct and useful a form as possible. The study recommended the development of prototype network systems as well as programs that encourage the rapid integration of information technologies in the learning and practice of the health professions.

In response to the study's recommendations, NLM launched a program to support the development of Integrated Academic Information Management Systems (IAIMS). The IAIMS concept is to use computer and communications technologies to bring together operational and academic information in support of health research, education, patient care, and management. NLM's foremost activity in this area is support of strategic planning for the development of integrated information systems in academic health science centers. The next phases in sequence are to develop models in which IAIMS concepts resulting from the plan are tested on a small scale, followed by the implementation phase of full-scale development based on successful modelling of critical plan elements.

NLM's initial response to the AAMC report was to solicit proposals for IAIMS strategic planning activity in accord with specific steps recommended in the report. In September 1983, contracts were awarded for IAIMS planning to Columbia University, Georgetown University, the University of Maryland, and the University of Utah. These contractors, guided by NLM's contract requirements and specifications, began the strategic planning process for health sciences information management through a series of self-studies to assess the technological capabilities, potentials, and needs of their own institutions and to define the academic information management system accordingly. These contracts will end in June 1985. Another IAIMS planning contract was awarded in January 1984 to the Oregon Health Sciences University in response to congressional interest stimulated by the AAMC report and by a perceived need to test the IAIMS concept in the state of Oregon.

NLM subsequently announced the availability of IAIMS grants as a part of the Medical Library Resource Project Grant program for FY 1984. Utilizing the grant mechanism for support recognizes the advantages of supporting IAIMS planning operations which are institutionally unique and therefore institution-initiated. The first two awards under the IAIMS grant program were made in June 1984 to the University of Cincinnati Medical Center and the Baylor College of Medicine.

Training Program

Research issues in the health information and health computer sciences call for highly trained, creative talent, able to articulate medicine with computers and health care with information science. There is a particular need in academic medicine for a new discipline—health information or health computer science. Through its training program, NLM provides grants for research career training in this field of medical informatics.

In 1984, five awards were made in this new Health Computer Sciences Research Training program. Each site offers an excellent setting for didactic instruction; involvement in major, ongoing health computer science studies; and opportunities for work in advanced information science research. Subsequent to their training period, these newly trained investigators will contribute to the growth of science by their studies of the role of knowledge in professional life, by analyses of the social structures for managing knowledge, and by advancing the frontiers of the computer sciences for organizing, retrieving, and utilizing health knowledge. Twenty-two postdoctoral trainees are authorized for this year.

The five training sites and Directors are:

Marsden S. Blois M.D., Ph.D.
University of California, San Francisco
School of Medicine
San Francisco, CA 94143

Lael Gatewood, Ph.D.
University of Minnesota
School of Medicine
Minneapolis, MN 55455

Robert R. Greenes, M.D., Ph.D.
School of Public Health
Harvard University
Boston, MA 02115

Stephen G. Pauker, M.D.
Tufts-New England
Medical Center Hospital
Boston, MA 02111

Edward H. Shortliffe, MD., Ph.D.
Stanford University
School of Medicine
Stanford, CA 94305

Publication Grants

Biomedical scientific publication grants facilitate the dissemination of health information important to medical progress. The domestic Publication Grant Program provides selective support for not-for-profit 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; proceedings of symposia related to U.S. health needs; and secondary literature tools in the health sciences (such as annotated bibliographies, catalogs, and atlases).

Together with its complementary activity, the Special Foreign Currency Program, the Publication Grant Program assists the advancement of the medical sciences and aids in the dissemination and exchange of scientific and other information important to the progress of medicine and health.

During FY 1984, 20 publication grants were awarded, totaling \$623,151. Of these, 9 were new awards, including one for a comprehensive inventory by the American Hospital Association of machine-readable data files containing U.S. health care data since 1970. The continuing emphasis in this program upon high-quality, but low-cost, projects that are scheduled for early publication was reflected in the average amount of a publication grant in FY 1984—approximately \$23,000 in direct costs.

Among the 25 studies received in FY 1984* which had been supported earlier by the Publication Grant Program was a monograph on *Simulation of Infectious Disease Epidemics*, by Eugene Ackerman, Lila R. Elveback and John P. Fox (Springfield, Illinois: Charles C. Thomas, 1984), in which the authors present mathematical models for examining the behavior of pathogenic agents in human populations. Their study is expected to contribute to the improvement of the public health control of infectious diseases. Another significant volume published this year is a reference source for researchers of craniofacial development, depicting the mammalian species most widely used in medical research: *The Postnatal Development of the Rat Skull*, by Melvyn J. Baer, James F. Bosma, and James L. Ackerman (Ann Arbor, Michigan: The University of Michigan Press, 1983). Also completed this year with grant support was a historical study on Morgagni (1682–1771), recognized as one of the founders of modern pathology. This collection of the records of one hundred of his most interesting consultations makes available for the first time in English an important resource in the history of clinical medicine: *The Clinical Consultations of Giambattista Morgagni: The Edition of Enrico Benassi (1935)*. Translated and Revised by Saul

*See Appendix 2 for a complete listing of books, periodicals and journal articles received in FY 1984 resulting from NLM Extramural Program Grants and Special Foreign Currency Awards.

Jarcho, with new preface and supplements. (Boston: The Francis A. Countway Library of Medicine, 1984.)

Special Foreign Currency Program

Authorized originally under Public Law 480, the Special Foreign Currency Program is today a valuable supplement to the domestic Publication Grant Program in the preparation and publication of biomedical studies useful to the U.S. health professions. The oldest of the Library's extramural support activities, the P.L. 480 Program is not funded in U.S. dollars, but with U.S.-owned foreign currencies which accrue in certain countries abroad from the sale of surplus U.S. agricultural products. During FY 1984, NLM's Special Foreign Currency Program funded projects in Poland, Yugoslavia, Egypt, India, and Pakistan.

Administered jointly with the Publication Grant Program by the International Programs Branch, the P.L. 480 Program in FY 1984 sponsored 68 active projects, totaling \$1,084,939 U.S. equivalent dollars. Almost 60 percent of the program was carried out in India, about 25 percent in Poland and the remaining projects in Egypt, Israel, Pakistan, and Yugoslavia.

About half of the awards supported the preparation of scholarly research monographs and the translation and publication of classics in the history of medicine. Another fourth of the program funded the preparation and publication of critical reviews and biomedical monographs identifying the status of research and practice in various health fields and emerging trends

for future developments. The program also supported the translation and publication of current foreign language biomedical studies, as well as several bibliographies.

Among the other new projects activated in the Public Law 480 Program in FY 1984 was the publication of an English-language translation of Kharitonova and Leonov's *Omsk Hemorrhagic Fever*, a Russian study described as a "benchmark work" in the identification of Omsk hemorrhagic fever as a waterborne infectious agent. The use of P.L. 480 funding for the printing costs of two significant historical translations, prepared by eminent U.S. scholars under the Publication Grant Program, extended the resources for NLM's scientific publication activities: *Johannes Mueller and the Nineteenth-Century Origins of Tumor Cell Theory*, edited and translated by Dr. L.J. Rather; and *Vincenzo Chiarugi, On Insanity and Its Classification*, translated and edited by Dr. George Mora.

Among the books received in FY 1984 were a critical review by the late Polish hematologist, Dr. Maria Wazewska-Czyzewska, on *Erythrokinetics*, a survey of the quantitative, dynamic study of *in vivo* production and destruction of erythrocytes; Boris E. Kotliar's *Neural Mechanism of Conditioning*, translated in Tunisia and published in Yugoslavia; and K.V. Sudakov's *Emotional Stress and Hypertension*, a review of the relationship between emotional stress reactions and cardiovascular disorders, with particular reference to hypertension.

Table 12
Extramural Grant and Contract Programs

| Category | | FY 1982 | | FY 1983 | | FY 1984 |
|---|-------|---------|-------|---------|-------|---------|
| Research..... | (31) | \$2,574 | (29) | \$2,782 | (29) | \$2,399 |
| Resource Projects..... | (14) | 520 | (11) | 575 | (16) | *1,114 |
| Resource Improvement..... | (25) | 551 | (29) | 636 | (22) | 614 |
| Training..... | (9) | 930 | (9) | 733 | (9) | 786 |
| Special Scientific Projects..... | (2) | 22 | (1) | 34 | | |
| Regional Medical Libraries (contracts)..... | (9) | 2,399 | (7) | 2,300 | (7) | 2,000 |
| Publications..... | (20) | 504 | (19) | 440 | (20) | 587 |
| Total..... | (110) | \$7,500 | (105) | \$7,500 | (103) | \$7,500 |

Note: Figures in parentheses refer to number of projects.
*Includes IAIMS Projects (2) \$134

INTERNATIONAL PROGRAMS

Calvin H. Plimpton, M.D.

Special Assistant for International Programs

The International programs of the National Library of Medicine are a natural extension of NLM's domestic responsibilities and illustrate the impact of a national resource on international communications.

International MEDLARS Agreements

The National Library of Medicine currently has MEDLARS agreements with partners in 13 foreign countries and with the Pan American Health Organization in Brazil (BIREME). (See Table 13.) A technical meeting followed by an International MEDLARS Policy Advisory Group (IMPAG) meeting will be held in Bethesda, Maryland in November 1984. Major topics to be discussed are progress in MEDLARS III (the National Library of Medicine's third major automation improvement and development program), pricing of NLM services, downloading and vending, future trends vis-a-vis file merging, impact of electronic publishing, quality filters and other output options, and scope and coverage in relation to other databases.

Collaboration with the Chinese Academy of Medical Sciences

The Chinese Academy of Medical Sciences, Institute of Medical Information, continues to show increased interest in setting up a MEDLARS Center in the People's Republic of China. Attempts are being made through correspondence to arrange proper computer compatibility with NLM. In the interim, NLM continues to provide Selective Dissemination of Information (SDI) searches to the Chinese Academy of Medical Sciences. It is hoped all problems will be resolved in the near future so that NLM may begin to send MEDLARS tapes.

Collaboration with India

India has shown an interest in sharing advances in science and technology. As a result, the NLM sent a

delegation of three to India in February to discuss the possibility of setting up a MEDLARS Center in New Delhi. It was agreed by the NLM and the Indian Council of Medical Research and the National Planning Commission that the main base of the service should be in the National Informatics Center with terminals at the National Medical Library as well as other locations to be later designated. Negotiations between NLM and the various Indian agencies are underway.

Collaboration with the World Health Organization

The National Library of Medicine and the World Health Organization Special Program for Research and Training in Tropical Diseases continued to cooperate in the publication of the *Quarterly Bibliography of Major Tropical Diseases*. NLM prepares camera-ready copy which WHO prints and distributes to 6,000 institutions in the developing countries. The bibliography is prepared from the MEDLINE system and covers diseases identified by WHO for special attention—filariasis, leishmaniasis, leprosy, malaria, schistosomiasis, and trypanosomiasis.

NLM has begun its third year of collaboration with the WHO programs for control of diarrheal diseases to publish a recurring *Bibliography of Acute Diarrheal Diseases*. The same arrangement, whereby NLM produces camera-ready copy from MEDLINE and WHO prints and distributes the publication, is used for both recurring bibliographies.

NLM and WHO continued the collaborative arrangement to provide photocopies of journal articles to requesters in developing countries of the WHO Regions of Africa, Eastern Mediterranean, and South East Asia. Under the arrangement, WHO supports one individual who is in residence at NLM to provide this service. The activity is essential but it can only respond partially to the existing biomedical and health informa-

tion needs of developing countries. Some 18,000 photocopies of articles have been provided to developing countries since this arrangement began October 1, 1979.

Collaboration with the Pan American Health Organization

The National Library of Medicine and the Pan American Health Organization continued to cooperate to publish a recurring *Bibliography of Respiratory Infections in Children*. This bibliography is drawn from the contents of the MEDLINE system with NLM providing PAHO with camera-ready copy which PAHO prints and distributes.

International Visitors

In FY 1984, the National Library of Medicine received international visitors from Austria, Australia, Benin, Brazil, Bulgaria, Canada, People's Republic of

China, Republic of China, Colombia, Costa Rica, Cyprus, Denmark, Egypt, Finland, France, Germany, Guyana, Guatemala, Haiti, Honduras, India, Indonesia, Italy, Jamaica, Japan, Korea, Lebanon, Nigeria, Romania, Saudi Arabia, Spain, Sweden, Switzerland, Tunisia, Turkey, Yugoslavia, United Kingdom, and Venezuela. The visitors represented developed and developing countries throughout the world and were provided detailed discussions by NLM staff on activities of mutual interest. Formal delegations were received from Germany, Japan, Romania, People's Republic of China, France, Saudi Arabia and Italy. Topics of general interest included biomedical and health information programs, medical research and education, library science, setting up new libraries, and research and development.

In addition, the National Library of Medicine provided specialized training to several individuals from various countries during the past year.

Table 13
Non-U.S. MEDLARS Centers

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

*Online NLM also

APPENDIX 1: STAFF BIBLIOGRAPHY

The following works were published by National Library of Medicine staff in FY 1984:

- Benson, D.A., Gottlieb, A., and Vasta, B.M.: Microcomputer-based information workstation (abstract). *American Chemical Society Abstracts Bulletin* 36(1): 14, 1984.
- Bernstein, L.M., Siegel, E.R., and Sneiderman, C.A.: Computer retrieval and analysis of gastroenterology literature. *Frontiers of Gastrointestinal Research* 7: 147-185, 1984.
- Bernstein, L.M. and Williamson, R.E.: Testing of a natural language retrieval system for a full text knowledge base. *Journal of the American Society for Information Science* 35(4): 235-247, 1984.
- Burnside, J., Craig, P.N., and Guthrie, G.T.: NLM-CHEMSORT: an algorithm and computer program for sorting chemical names. *Journal of Chemical Information and Computer Sciences* 24(1): 39-41, 1984.
- Cassedy, J.H.: *American Medicine and Statistical Thinking, 1800-1860*. Cambridge, Mass., Harvard University Press, 1984, 306 pp.
- Cassedy, J.H.: *Highlights in the Development of Medical History in the United States: Materials from an Exhibit*. Bethesda, Md., National Library of Medicine, 1984, 30 pp.
- Cassedy, J.H.: Review of *This Land, This South: An Environmental History* by Albert E. Cowdrey. *Bulletin of the History of Medicine* 58(3): 444-445, 1984.
- Colaianne, L.: Administration of personnel. In Bradley, J., (Ed.): *Hospital Library Management*. Chicago, Ill., Medical Library Association, 1983, pp. 229-243.
- Colaianne, L.: President's page, Phyllis S. Mirsky, 1984/85. *Bulletin of the Medical Library Association*. 72(3): 316-318, 1984.
- Cookson, J.: A demonstration database for document images. In André Duerinckx, et al. (Eds.): *Proceedings of the IEEE Computer Society International Symposium on Medical Images and Icons*. Silver Spring, Md., IEEE Computer Society Press, 1984, pp. 30-38.
- Craig, P.N.: QSAR-origins and present status: an historical perspective. *Drug Information Journal* 18: 123-130, 1984.
- Doszkocs, T.E.: Automatic vocabulary mapping in online searching. *International Classification* 10(2): 78-83, 1983.
- Doszkocs, T.E.: CITE NLM: natural-language searching in an online catalog. *Information Technology* 2(4): 364-80, 1983.
- Friedman, R.B.: The academic medical center. *Journal of Medical Education* 59: 539-546, 1984.
- Friedman, R.B.: Myths about computers and medicine. *Cornell University Medical College Alumni Quarterly* 47(2): 2-10, September 1984.
- Friedman, R.B.: Selecting a personal computer. *MEDCOMP* 1(1): 60-71, 1983.
- Friedman, R.B., Entine, S., Carbone, P.: Experience with an automated cancer protocol surveillance system. *American Journal of Clinical Oncology* 6: 583-592, 1983.
- Goldstein, C.M.: Computer-based information storage technologies. *Annual Review of Information Science and Technology (ARIST)* 19: 65-96, 1984.
- Goldstein, C.M.: Storage technology: present and future. *Microcomputers for Information Management: An International Journal for Library and Information Service* 1(2): 79-94, 1984.
- Humphrey, S.M.: Current awareness in biomedical computing by searching MEDLINE at NLM. *SIGBIO Newsletter* 6(4): 21-32, 1984.
- Humphrey, S.M.: File maintenance of MeSH headings in MEDLINE. *Journal of the American Society for Information Science* 35(1): 34-44, 1984.

Humphreys, B.L. Cataloging: general considerations and descriptive cataloging. In Darling, L., Bishop, D., and Colaianni, L.A. (Eds.): *Handbook of Medical Library Practice*, Fourth Edition, Vol. II. Chicago, Ill., Medical Library Association, 1983, pp. 183-251.

Kenton, D.: The development of a more equitable method of billing for online services. *Online* 8(5): 13-17, 1984.

Krivatsy, P.: *Medical Incunabula and the Diffusion of Scientific Knowledge: Incunabula in the National Library of Medicine*. Bethesda, Md., National Library of Medicine, 1984, 14 pp.

Locatis, C. and Atkinson, F.: *Media and Technology for Education and Training*. Columbus, Ohio, Charles E. Merrill, 1984.

McHale, C.G.: MEDOC: index to U.S. Government publications in the medical and health sciences. *Microform Review* 12(4): 289-90, 1983.

Mehnert, R.B.: National Library of Medicine. In Ehresman, J. (Ed.): *The Bowker Annual of Library & Book Trade Information*. New York, R.R. Bowker, 1984, pp. 135-138.

Merriam, M.S. and Thoma, G.R.: An interactive videodisc for visitor information. In Williams, M.E. and Thomas, H.H. (Comps.): *Proceedings of the Fifth National Online Meeting*. New York, April 10-12, 1984. Medford, N.J., Learned Information, Inc., 1984, pp. 195-206.

Page, N.P. and Kissman, H.M.: On-line sources for toxicology and safety data. In Bennett, G. and Bernard, H. (Eds.): *Proceedings of the National Conference and Exhibition on Hazardous Wastes and Environmental Emergencies (Toxicology & Health)*, Houston, Texas March 12-14, 1984. Silver Spring, Md., Hazardous Materials Control Research Institute, 1984, pp. 409-412.

Parascandola, J.: John J. Abel and the founding of ASPET. *The Pharmacologist* 26: 37-40, 1984.

Parascandola, J.: Review of *A Bio-Bibliography for the History of Biochemical Sciences Since 1800* by Joseph S. Fruton. *Bulletin of the History of Medicine* 58: 281, 1984.

Parascandola, J.: Review of *History of Clinical Chemistry* by Johannes Buttner. *Pharmacy in History* 26: 163-164, 1984.

Pomeroy, E. and Toothman, JP: *Medical Applications Microcomputer Software*. Springfield, Va., National Technical Information Service, 1983, 22 pp.

Pomeroy, E. and Toothman, JP: *Videodisc and Medical Education*. Springfield, Va., National Technical Information Service, 1983, 8 pp.

Price, D.: *Video Bulletin Board: A Microcomputer Based Information Distribution System*. Springfield, Va., National Technical Information Service, 1984, 34 pp.

Schoolman, H.M.: Overwhelmed and underprepared: the clinician and medical information. *Update: Computers in Medicine* 2(4): 20-23, 1984.

Siegel, E.R., Kameen, K., Sinn, S.K., and Weise, F.O.: A comparative evaluation of the technical performance and user acceptance of two prototype online catalog systems. *Information Technology and Libraries* 3(1): 35-46, 1984.

Smith, K.A.: National Library of Medicine. *ALA Yearbook* 8:188, 1983.

Smith, K.A.: Review of *The Information Dilemma* by Harry M. Kibirige. *FLC Newsletter*, pp. 6-7, August 1984.

Sneiderman, C.A.: Keeping up with the literature of family practice: a bibliometric approach. *Family Practice Research Journal* 3: 12-23, 1983.

Sparks, S.M.: Computerized access to clinical nursing literature on AIDS. *Topics in Clinical Nursing* 6(2): 79-82, July 1984.

Sparks, S.M.: The National Library of Medicine's bibliographic databases: tools for nursing research. *Image: The Journal of Nursing Scholarship* 16(1): 24-27, 1984.

Suthasinekul, S.: Making information computer accessible: why and how? In *Proceedings of the 2nd Annual Conference of the American Association for Medical Systems and Informatics*, Baltimore, Md., October 21-23, 1983, pp. 184-186.

Suthasinekul, S., Walker, F.L., Cookson, J., Rashidian, M., Thoma, G.R.: A prototype system for electronic document image storage and retrieval. In *Proceedings of the 1st International Electronic Imaging Exposition and Conference*, Boston, Mass., September 10-13, 1984, pp. 174-177.

Thoma, G.R., Grier, R., Merriam, S., and Leonard, W.: *Videodisc Premastering Facility: Technical Evaluation*. Springfield, Va., National Technical Information Service, 1984, 145 pp.

Thoma, G.R.: Premastering: a critical step in videodisc development. *Proceeding of the American Society for Information Science* 20: 41-47, 1983.

Toothman, JP and Sylver, S.: Design of interactive video computer-assisted instruction. In *Proceedings of*

the American Association for Medical Systems and Informatics 1984 pp. 255-257.

Vasta, B.M. and Kissman, H.M.: Toxicology Data Bank (TDB)—peer review augmentation via computer conferencing (abstract). *American Chemical Society Abstracts Bulletin* 36(1): 13, 1984.

Walker, F.L. and Thoma, F.R.: An experimental system to link citation retrieval to document image display. *Proceedings of the 23rd Annual Technical Symposium of the Washington, D.C. Chapter of the Association for Computing Machinery*, June 28, 1984, pp. D.3.1-12.

Waserman, M.: An important John Shaw Billings find. *Bulletin of the Medical Library Association* 72§: 23-25, 1984.

Waserman, M. and Clausen, C.: *Index to Bulletin of the History of Medicine, 1933-1982*, Baltimore, Md., Johns Hopkins University Press, 1983, 195 pp.

Waserman, M.: Review of *A Catalogue of the Manuscripts and Archives of the Library of the College of Physicians of Philadelphia* by Rudolf Hirsch (Ed.) *Transactions and Studies of the College of Physicians of Philadelphia*. Series V(5): 385-387, 1983.

Waserman, M.: Review of *Quetzalcoatl and the Irony of Empire: Myths and Prophecies in the Aztec Tradition* by David Carrasco. *Journal of the History of Medicine and Allied Sciences* 38: 481, 1983.

Williamson, E.: *ANNOD: A Navigator of Natural Language Organized Textual Data*. Bethesda, Md., Knowledge Systems, Inc., 1984, 30 pp.

Williamson, E.: *Experience with and Plans for Extending an Interactive Text Management System*. Bethesda, Md., Knowledge Systems, Inc., 1984.

Woods, J.W.: Optical videodiscs and computers in life science education. *Computers in Life Science Education* 1(4): 25-28, 1984.

APPENDIX 2: SUPPORTED PUBLICATIONS*

Ackerman, D.L., et al.: The Lithium Index: An innovative approach to consultation by computer. *American Journal of Psychiatry* 141: 415-417, 1984.

Ackerman, E., Elveback, L.R. and Fox, J.P.: *Simulation of Infectious Disease Epidemics*. Springfield, Illinois, Charles C. Thomas, 1984, 202 pp.

Ackerman, E.B.: Medical care in the countryside near Paris, 1800-1914. *Annals of the New York Academy of Sciences* 412: 1-18, 1983.

An Atlas of Ixodid Tick Ultrastructure. Edited by Yu. S. Balashov, Zoological Institute, USSR Academy of Sciences, Nauka Publishers, Leningrad Department, Leningrad, 1979. Translated by Alexander S. Raikhel. English Publication Edited by Alexander S. Raikhel and Harry Hoogstraal. College Park, Maryland, Entomological Society of America, 1982, 289 pp.

Baer, M.J., Bosma, J.F. and Ackerman, J.L.: *The Postnatal Development of the Rat Skull*. Ann Arbor, Michigan, The University of Michigan Press, 1983, 432 pp.

Bauer, T.W., et al.: Prognostic factors in patients with Stage 1, estrogen receptor-negative carcinoma of the breast: A clinicopathologic study. *Cancer* 52: 1423-1431, 1983.

Beck, J.R. and Pauker, S.G.: The Markov process in medical prognosis. *Medical Decision Making* 3: 419-458, 1983.

Blum, R.L.: Discovery, confirmation, and incorporation of causal relationships from a large time-oriented clinical data base: The RX Project. *Computers and Bio-medical Research* 15: 164-187, 1982.

Bowden, V.M., Comeaux, E.A. and Eakin, D.: Evaluation of the TALON Cooperative Acquisitions Program for Monographs. *Bulletin of the Medical Library Association* 72: 241-250, 1984.

Boyce, B.R., et al.: A drill and practice program for online retrieval. *Journal of the American Society for Information Science* 35: 129-134, 1984.

Brandon, D.: *SAVE Consortium: Audio Visual Catalog 1984*. Schenectady, N.Y., Ellis Hospital, 1984, 170 pp.

Chalmers, T.C., et al.: Bias in treatment assignment in controlled clinical trials. *The New England Journal of Medicine* 309: 1358-1361, 1983.

Chi, E.C., et al.: Relational data base modelling of free-text medical narrative. *Medical Informatics* 8: 209-223, 1983.

Cleveland, D.B. and Cleveland, A.D.: Depth of indexing using a non-Boolean searching model. *International Forum on Information and Documentation* 8: 10-13, 1983.

Cleveland, D.B., Cleveland, A.D. and Wise, O.B.: Less than full-text indexing using a non-Boolean searching model. *Journal of the American Society for Information Science* 35: 19-28, 1984.

The Clinical Consultations of Giambattista Morgagni: The Edition of Enrico Benassi (1935). Translated and Revised by Saul Jarcho, with new preface and supplements. Boston, The Francis A. Countway Library of Medicine, 1984, 450 pp. (Distributed by the University Press of Virginia, Charlottesville).

De la Monte, S.M., Moore, G.W. and Hutchins, G.M.: Patterned distribution of metastases from malignant melanoma in humans. *Cancer Research* 43: 3427-3433, 1983.

———: Nonrandom distribution of metastases in neuroblastic tumors. *Cancer* 52: 915-925, 1983.

———: Endocrine organ metastases from breast carcinoma. *American Journal of Pathology* 114: 131-136, 1984.

———: Estrogen and progesterone receptors in prediction of metastatic behavior of breast carcinoma. *The American Journal of Medicine* 76: 11-17, 1984.

*Includes 1983/84 supported publications and published works resulting from research grants (not previously listed).

- De la Monte, S.M., et al.: Midzonal necrosis as a pattern of hepatocellular injury after shock. *Gastroenterology* 86: 627-631, 1984.
- Detweiler, D.K.: Electrocardiographic monitoring in toxicological studies: Principles and interpretations. In: Spitzer, J.J. (Ed.) *Myocardial Injury*. N.Y., Plenum Publishing Corporation, 1983, pp. 579-606.
- Doe, Janet: Interview by Estelle Brodman, 20 July 1977. Oral history interview, Medical Library Association, Chicago.
- Doubilet, P. and Abrams, H.L.: The cost of underutilization: Percutaneous transluminal angioplasty for peripheral vascular disease. *New England Journal of Medicine* 310: 95-102, 1984.
- Duda, R.O. and Shortliffe, E.H.: Expert systems research. *Science* 220: 261-268, 1983.
- Elstein, A.S., et al.: Medical decisions in perspective: Applied research in cognitive psychology. *Perspectives in Biology and Medicine* 26: 486-501, 1983.
- First, M.B., et al.: LOCALIZE: Computer-assisted localization of peripheral nervous system lesions. *Computers and Biomedical Research* 15: 525-543, 1982.
- Friedman, C., et al.: Computer structuring of free-text patient data. In: Dayhoff, R. E. (Ed.) *Proceedings of the Seventh Annual Symposium on Computer Applications in Medical Care*. Silver Spring, Maryland, IEEE Computer Society, 1983, pp. 688-691.
- Grishman, R., Hirschman, L. and Friedman, C.: Natural language interfaces using limited semantic information. In: Horecky, J. (Ed.) *Proceedings of the Ninth International Conference on Computational Linguistics*. New York, North-Holland Publishing Co., 1982, pp. 89-94.
- : Isolating domain dependencies in natural language interfaces. In: *Proceedings of the Conference on Applied Natural Language Processing*. Santa Monica, California, 1983, pp. 46-53.
- Hall, T.S.: Spallanzani on matter and life: With notes on the influence of Descartes. In: Bernardi, W. and La Vergata, A. (Eds.) *Lazzaro Spallanzani e la Biologia del Settecento*. Florence, Leo S. Olschki, 1982, pp. 67-82.
- : Critical notes on the neurology and neuroembryology of Rene Descartes: 1596-1650. In: Cowan, W.M., *Studies in Developmental Neurobiology: Essays in Honor of Viktor Hamburger*. N.Y., Oxford University Press, 1981, pp. 436-445.
- Hannaway, C.C.: The regulation of remedies in eighteenth century France. *Histoire Des Sciences Medicales* XVII: 265-269, 1982.
- Hirschman, L. and Sager, N. Automatic information formatting of a medical sublanguage. In: Kittredge, R. and Lehrberger, J. (Eds.) *Sublanguage: Studies of Language in Restricted Semantic Domains*. Berlin, Walter de Gruyter & Company, 1982, pp. 27-80.
- Holmes, M.M., et al.: Factors affecting laboratory utilization in clinical practice. *Medical Decision Making* 2; 471-482, 1982.
- Holtzman, G.B., et al.: Physicians' judgments about estrogen replacement therapy for menopausal women. *Obstetrics & Gynecology* 63: 303-311, 1984.
- Horowitz, G.L., Jackson, J.D. and Bleich, H.L.: PaperChase: Self-service bibliographic retrieval. *The Journal of the American Medical Association* 250: 2494-2499, 1983.
- Jefferson, J.W., Greist, J. H. and Ackerman, D.L.: *Lithium Encyclopedia for Clinical Practice*. Washington, D.C., American Psychiatric Press, Inc., 1983, 319 pp.
- Jefferson, J.W.: Lithium and affective disorder in the elderly. *Comprehensive Psychiatry* 24: 166-178, 1983.
- Kantor, P.B.: Cost and usage of health sciences libraries: Economic aspects. *Bulletin of the Medical Library Association* 72: 274-286, 1984.
- Katz, J.: *The Silent World of Doctor and Patient*. New York, The Free Press, Macmillan, Inc., 1984, 263 pp.
- Kirschenbaum, D.M.: A compilation of amino acid analyses of protein. XVIII. Residues per thousand residues—5. *Applied Biochemistry and Biotechnology* 8: 315-368, 1983.
- : Molar absorptivity and $A^{1\%}_{1\text{cm}}$ values for proteins at selected wavelengths of the ultraviolet and visible regions—XXIII. *Applied Biochemistry and Biotechnology* 9: 187-205, 1984.
- Kotliar, B.E.: Weinberger, N.M. (Ed.) *Neural Mechanism of Conditioning*. Translated in Tunisia. Printed in Belgrade, Yugoslavia by the NOLIT Publishing House. Elmsford, N.Y., Pergamon Press, Inc., 1983, 248 pp.
- Krieg, N.R. (Ed.): *Bergey's Manual of Systematic Bacteriology, Volume 1*. Baltimore, Williams & Wilkins, 1984, 964 pp.
- Langlotz, C.P. and Shortliffe, E.H.: Adapting a consultation system to critique user plans. *International Journal of Man-Machine Studies* 19: 479-496, 1983.
- Lieber, E.: Galen in Hebrew: The transmission of Galen's works in the medieval Islamic world. In: Nutton, V. (Ed.) *Galen: Problems and Prospects*.

London, Wellcome Institute of the History of Medicine, 1981, pp. 167-186.

———: Galen: Physician as philosopher; Maimonides: Philosopher as physician. *Bulletin of the History of Medicine* 53: 268-285, 1979.

Lyman, M., et al.: Automated case review of acute bacterial meningitis of childhood. In: van Bommel, J.H., Ball, M.J. and Wigertz, O. (Eds.) *Proceedings of the Fourth World Conference on Medical Informatics*, New York, North-Holland Publishing Co., 1983, pp. 790-793.

Manning, P.R., et al.: *Self-Directed Learning Project*. Norris Medical Library, The University of Southern California, School of Medicine, November 1983, 128 pp.

Marcus, R.S.: An experimental comparison of the effectiveness of computers and humans as search intermediaries. *Journal of the American Society for Information Science* 34: 381-404, 1983.

Marsh, E. and Sager, N.: Analysis and processing of compact text. In: Horecky, J. (Ed.) *Proceedings of the Ninth International Conference on Computational Linguistics*. New York, North-Holland Publishing Co., 1982, pp. 201-206.

Marsh, E.: Utilizing domain-specific information for processing compact text. In: *Proceedings of the Conference on Applied Natural Language Processing*. Santa Monica, California, 1983, pp. 99-103.

Marshall, Mary Louise: Interview by Estelle Brodman, September and October 1977. Oral history interview, Medical Library Association, Chicago.

McDonnell, P.J., Toye, P.A. and Hutchins, G.M.: Primary pulmonary hypertension and cirrhosis: Are they related? *American Review of Respiratory Disease* 127: 437-441, 1983.

Messer, J., et al.: Association of adrenocorticosteroid therapy and peptic ulcer disease. *The New England Journal of Medicine* 309: 21-24, 1983.

Miller, P.L.: Critiquing anesthetic management: The "ATTENDING" computer system. *Anesthesiology* 58: 362-369, 1983.

———: Medical plan-analysis by computer. In: van Bommel, J.H., Ball, M.J. and Wigertz, O. (Eds.) *Proceedings of the Fourth World Conference on Medical Informatics*. New York, North-Holland Publishing Co., 1983, pp. 593-596.

———: ATTENDING: Critiquing a physician's management plan. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 5: 449-461, 1983.

———: A heuristic approach to risk in computer-assisted anesthetic management. In: *Proceedings of the*

International Symposium on Computers in Anesthesia and Intensive Care. Rotterdam, 1983, p. 118.

———: Critiquing as a modality for computer advice in medical management and work-up. In: Dayhoff, R.E. (Ed.) *Proceedings of the Seventh Annual Symposium on Computer Applications in Medical Care*. Silver Spring, Maryland, IEEE Computer Society, 1983, pp. 842-843.

Miller, P.L., et al.: ATTENDING: Tutorial use of an expert system. In: *Proceedings of the International Symposium on Computers in Anesthesia and Intensive Care*. Rotterdam, 1983, p. 64.

Miller, P.L. and Black, H.R.: Medical plan-analysis and the management of essential hypertension. In: *Proceedings of the AAMSI Second Annual Conference*. Baltimore, October 1983, pp. 72-74.

———: HT-ATTENDING: Critiquing the pharmacologic management of essential hypertension. In: Dayhoff, R.E. (Ed.) *Proceedings on the Seventh Annual Symposium on Computer Applications in Medical Care*. Silver Spring, Maryland, IEEE Computer Society, 1983, pp. 824-827.

———: Medical plan-analysis by computer: Critiquing the pharmacologic management of essential hypertension. *Computers and Biomedical Research* 17: 38-54, 1984.

Miller, R.A.: Internist-1/Caduceus: Problems facing expert consultant programs. *Methods of Information in Medicine* 23: 9-14, 1984.

Miller, R.A., Kapoor, W.N. and Peterson J.: The use of relational databases as a tool for conducting clinical studies. In: Dayhoff, R.E. (Ed.) *Proceedings of the Seventh Annual Symposium on Computer Applications in Medical Care*. Silver Spring, Maryland, IEEE Computer Society, 1983, pp. 705-708.

Moore, G.W. and Hutchins, G.M.: Consistency versus completeness in medical decision-making: Exemplar of 155 patients autopsied after coronary artery bypass graft surgery. *Medical Informatics* 8: 197-207, 1983.

Moore, G.W., Hutchins, G.M. and Miller, R.E.: Strategies for searching medical natural language text. *American Journal of Pathology* 115: 36-41, 1984.

Myers, J.D.: Artificial intelligence and medical education. *The Medical Journal* 18: 193-202, 1983.

Myers, J.D., Pople, H.E. and Miller, R.A.: CADUCEUS: A computerized diagnostic consultation system in internal medicine. In: *Proceedings of the Sixth Annual Symposium on Computer Applications in Medical Care*. Silver Spring, Maryland, IEEE Computer Society, 1982, pp. 44-47.

Nomina Histologica. Second Edition. Prepared by the International Anatomical Nomenclature Committee. In: *Nomina Anatomica*. Fifth Edition, Baltimore, Williams & Wilkins, 1983, 38 pp. + ix.

Northup, D.E., et al.: Characteristics of clinical information-searching: Investigation using critical incident technique. *Journal of Medical Education* 58: 873-881, 1983.

Northup, D.E. and Umland, B.E.: *Searching For Information—A Self-Directed Learning Guide. Problem 1: Diagnosis and Treatment: Hirsutism*. Albuquerque, Medical Center Library, University of New Mexico, 1983, 367 pp.

———: *Searching for Information—A Self-Directed Learning Guide. Problem 2: Subacute Bacterial Endocarditis*. Albuquerque, Medical Center Library, University of New Mexico, 1983, 393 pp.

———: *Searching for Information—A Self-Directed Learning Guide. Problem 4: Drug Side Effects*. Albuquerque, Medical Center Library, University of New Mexico, 1984, 329 pp.

Northup, D.E. and Bowermaster, J.P.: *Searching for Information—A Self-Directed Learning Guide. Problem 7: Psychosocial: An Irresistible Impulse to Steal*. Albuquerque, Medical Center Library, University of New Mexico, 1984, 328 pp.

———: *Searching for Information—A Self-Directed Learning Guide. Problem 9: Patient Education: Multiple Sclerosis*. Albuquerque, Medical Center Library, University of New Mexico, 1984, 325 pp.

Nugent, A.: Fit for work: The introduction of physical examinations in industry. *Bulletin of the History of Medicine* 57: 578-595, 1983.

Parascandola, J.: Reflections on the history of pharmacology. *Pharmacy in History* 22: 131-140, 1980.

Parascandola, J. and Swann, J.: Development of pharmacology in American schools of pharmacy. *Pharmacy in History* 25: 95-115, 1983.

———: Charles Homes Herty and the effort to establish an institute for drug research in post World War I America. In: Parascandola, J. and Whorton, J. (Eds.) *Chemistry and Modern Society: Historical Essays in Honor of Aaron J. Ihde*. Washington, D.C., American Chemical Society, 1983, pp. 85-103.

Parascandola, J. and Keeney, E.: *Sources in the History of American Pharmacology*. Madison, Wisconsin, American Institute of the History of Pharmacy, 1983, 55 pp.

Patterson, K.D.: The influenza epidemic of 1918-19 in the Gold Coast. *Journal of African History* 24: 485-502, 1983.

Politzer, P.: Decision analysis and clinical judgment: A re-evaluation. *Medical Decision Making* 1: 361-389, 1981.

———: Reliability, decision rules, and the value of repeated tests. *Medical Decision Making* 2: 48-68, 1982.

Postell, William D. Interview by Estelle Brodman, 29 October 1977. Oral history interview, Medical Library Association, Chicago.

Ravitch, M.M., et al.: A chart audit study of the referral of obese patients to endocrinologists. *Medical Decision Making* 3: 69-79, 1983.

Riede, U. and Moore, G.W.: Quantitative pathology by means of symbolic logic. *CRC Critical Reviews in Toxicology* 11: 279-332, 1983.

Roberts, J.: Matching MARC to a picture collection: Development of a computer format for medical illustrations. *Information Processing & Management* 19: 131-139, 1983.

Rothert, M.L., et al.: Differences in medical referral decisions for obesity among family practitioners, general internists, and gynecologists. *Medical Care* 22: 42-55, 1984.

Sager, N., et al.: Relational database design for computer-analyzed medical narrative. In: Blum, B.I. (Ed.) *Proceedings of the Sixth Annual Symposium on Computer Applications in Medical Care*. Silver Spring, Maryland, IEEE Computer Society, 1982, pp. 797-804.

Sager, N., et al.: Data model for natural language information. *ACM-SIGART Newsletter* 86: 51, 1983.

Sager, N. and Wong, R.: Developing a database from free-text clinical data. *Journal of Clinical Computing* 11: 184-194, 1983.

Sager, N. and Kosaka, M.: A database of literature organized by relations. In: Dayhoff, R.E. (Ed.) *Proceedings of the Seventh Annual Symposium on Computer Applications in Medical Care*. Silver Spring, Maryland, IEEE Computer Society, 1983, pp. 692-695.

Savitt, T.L.: The education of black physicians at Shaw University, 1882-1918. In: Crow, J.J. and Hatley, F.J. (Eds.), *Black Americans in North Carolina and the South*. Chapel Hill, North Carolina, The University of North Carolina Press, 1984, pp. 160-188.

Shortliffe, E.H. and Fagan, L.M.: Modeling the medical decision-making process. In: Gravenstein, J.S., Newbower, R.S., Ream, A.K. and Smith, N.T. (Eds.) *An*

Integrated Approach to Monitoring. Woburn, Massachusetts, Butterworth Publishers, 1983, pp. 183-200.

Sudakov, K.V. *Emotional Stress and Arterial Hypertension: Review of Experimental Data*. Translated in Pakistan. Samuel A. Corson, Scientific Translation Editor; Elizabeth O'Leary Corson, Associate Editor. Printed in New Delhi, India: Amerind Publishing Co. Pvt. Ltd., 1983, 88 pp. (Distributed by the National Technical Information Service, Springfield, VA).

Taine, Seymour Irving. Interview by Carol H. Fenichel. 4 October 1982. Oral history interview, Medical Library Association, Chicago.

Trendelenburg, F: *From My Joyful Days of Youth, A Memoir*, with a Preface by Guenter B. Risse. Translated in Tunisia. Printed in Cairo, Egypt, by the Al-Ahram Publishing House, 1984, 289 pp. (Distributed by the National Technical Information Service).

Undersea Medical Society (Compl.). *Key Documents of the Biomedical Aspects of Deep-Sea Diving: Selected from the World's Literature 1608-1982*. Vol. I-V. Bethesda, Maryland, Undersea Medical Society, 1983.

Walters, L. (Ed.): *Bibliography of Bioethics*. Volume 9. N.Y., The Free Press, 1983, 346 pp.

Warner, J.H.: A southern medical reform: The meaning of the antebellum argument for southern med-

ical education. *Bulletin of the History of Medicine* 57: 364-381, 1983.

Wazewska-Czyzewska, M.: *Erythrokinetics: Radioisotopic Methods of Investigation and Mathematical Approach*. Warsaw, Poland: Foreign Scientific Publications Department of the National Center for Scientific, Technical and Economic Information, 1983, 221 pp. (Distributed by the National Technical Information Service).

Whorton, J.C.: "Physiologic Optimism": Horace Fletcher and hygienic ideology in progressive America. *Bulletin of the History of Medicine* 55: 59-87, 1981.

Yamamoto, W.S.: Information systems approach to integrated responses in the respiratory control system. *Annals of Biomedical Engineering* 11: 349-360, 1983.

Yamamoto, W.S. and Wolff, P.G.: On the identification of verbs in computer programs of physiological models. *Computers and Biomedical Research* 17: 175-184, 1984.

Periodical Publication

The Behavioral and Brain Sciences, N.Y., Cambridge University Press, Vol. 6, No. 3, September 1983, and following issues.

APPENDIX 3: BOARD OF REGENTS

The NLM Board of Regents meets three times a year to consider Library issues and policies and make recommendations to the Secretary of Health and Human Services on matters affecting the Library.

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