

The U.S. National Library of Medicine

a library in transition

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At the beginning of a new century, libraries are experiencing major changes in the resources they must manage, the types of users they serve, and the ways in which they provide access to information. The National Library of Medicine (NLM) is facing many of the same changes that are occurring in health science and other libraries throughout the world. The changes in information technology have stimulated the need to serve new user communities and broaden international involvement while addressing challenging issues in delivery and preservation of electronic information. In this time of transition, NLM's programs and priorities are guided by its published Long Range Plan (1).

NLM is one of 27 institutes of the National Institutes of Health, part of the US Department of Health and Human Services. The NLM budget in 2002 was \$277 million. The library employs more than 650 full time equivalent staff plus a large number of contractor staff who work in six divisions.

* Library Operations, the largest division, is responsible for acquiring, cataloging, indexing, preserving, and providing access to the world's biomedical literature and information.

* The Division of Specialized Information Services is responsible for developing information systems and services providing access to chemical and toxicological information, including the Toxnet databases.

* The Lister Hill Center for Biomedical Communications conducts research and development for the broad purpose of improving health-care.

* The Office of Computer and Communications Services provides systems support for internal and external databases and systems.

* Extramural Programs division awards grants in information management and the utility of computers and telecommunication for improving storage, retrieval, access, and use of biomedical information.

* The newest NLM division established in 1988, the National Center for Biotechnology Information (NCBI), is an international resource for databases and software in molecular biology and the Human Genome Project, research in computational biology, dissemination of biomedical information, and is the developer of the Entrez retrieval system that provides access to PubMed.

The National Library of Medicine is part of the National Institutes of Health (NIH), the Federal focal point for medical research in

the United States. The NIH conducts its own research, and is the major funder of biomedical research in the U.S. In Fiscal Year 2002 the budget of the entire NIH was \$23.4 billion. Of this budget, 82% supports research and training grants, 10% supports the NIH's own research programs, and 8% covers administrative costs.

Over the past 50 years, the U.S. investment in scientific research has resulted in phenomenal progress in biology and medicine. Likewise, more recent investments in information and communications technology hold the promise of reaching billions of people worldwide. The National Library of Medicine has engaged in long range planning since 1985; the most recent update of our plan occurred in 2000 and identified four goals:

Organize health-related information and provide access to it
Encourage use of high quality information by health professionals and the public
Strengthen the informatics infrastructure for biomedical research
Conduct and support informatics research.

These 4 goals and their objectives are NLM's map to charting the future of health information while continuing to meet our responsibility as library of record in biomedicine and making the transition to a 21st Century library. Within these goals, seven areas were identified as those on which the library should focus as new initiatives or areas of special interest. They are:
Health information for the public
Research publication of the future
Permanent access to electronic information
Global health partnerships
Molecular biology information systems
Training for computational biology
Fundamental informatics research

This paper will describe representative programs under the first four areas with special attention to international activities.

Health Information for the Public

MEDLINE® (Medical Literature, Analysis, and Retrieval System Online) is the U.S. National Library of Medicine's premier bibliographic database that contains over 12 million references to journal articles in life sciences with a concentration on biomedicine. A watershed event in MEDLINE service occurred in June 1997 when MEDLINE became available free on the Internet via PubMed®. An explosion in searching resulted. The number of searches has grown from 7 million per year in 1997, to an estimated 400 million per year at the end of this 2002. Now users from all parts of the globe can use MEDLINE and they do! Nearly half of the use of PubMed comes from outside the US. NLM conducted a study of PubMed use in 2002 and found that the top 12 countries from which searching is done are: United States, Japan, United Kingdom, Germany, France, Canada, Italy, Netherlands, Spain, Australia, Sweden, and Israel.

Providing access to MEDLINE free via the Internet marked a major turning point for NLM in that it fundamentally changed not only the way users access MEDLINE, but also who accesses the database. The dramatic increase in MEDLINE searches led to a brief study to determine who was doing this searching. The study found that approximately one-third of these searches were performed by members of the general public, a shift from the traditional user base of physicians and scientists and the information professionals supporting their information needs. This has led to a major new initiative to provide health information

to patients, families and members of the public.

NLM's mission had never included providing information for the general public, although as a Federal institution our reading rooms are open to all. As an index to the research and professional clinical literature, MEDLINE is not the appropriate place for most individuals without some health-related education background to begin their search for health information. Therefore, the Library's initial response was a pilot project launched in 1998 which included the development of a consumer health information website called MEDLINEplus®, and a pilot program with 39 public libraries in 9 states and the District of Columbia as community places where any member of the public can go to find health information.

Why public libraries? In the US the number of individuals with access to the Internet continues to grow, but there are still significant segments of the population who do not have access at work or at home. Nearly 100% of public libraries in the US have free Internet access for residents in their communities. We felt that working with these libraries would be a good way to reach parts of the population who do not have their own access. As a national library, and building on past success in relying on health science libraries in our National Network of Libraries of Medicine as key partners in all of our efforts to reach out to health professionals, it was logical for NLM to turn to public libraries as partners in reaching the public.

The result of this successful pilot was an NLM Board of Regents recommendation in May 1999, that the Library's mission be expanded to include the provision of electronic health information for the public. The primary vehicle for providing this service is MEDLINEplus. Use and coverage of MEDLINEplus has increased dramatically in the past four years. Since its debut in the Fall of 1998, it has grown from 20 health topics to nearly 600. A medical encyclopedia, two drug encyclopedias, more than 160 interactive health tutorials with pictures and sound, and a Spanish version have also been added. Development of the site has been shaped by extensive evaluation through librarian and user feedback, usability testing, online customer surveys, online focus groups and other mechanisms. Use of the site has grown to more than 1.7 million unique users and 14 million page views per month. Approximately 28% of the use of MEDLINEplus comes from outside the U.S.

The Library continues to work with public and health sciences libraries and a variety of other community organizations to reach out to all patients, families and members of the public. We have funded more than 60 projects through our NN/LM and will fund additional projects in 2003.

Research Publication of the Future

The Long Range Plan calls for NLM to play an active role in defining the research publication of the future, including contributing to the development of new forms of publishing. The NCBI has developed PubMed Central, a digital archive of the life sciences literature providing barrier-free access to the public. It is one example of the way in which electronic publishing can improve the dissemination of biomedical research and is the major effort underway at NLM to address the development of ways to provide access to the research publication of the future. There are currently 80 titles in PubMed Central. Soon we will begin adding the back files of many journals so that complete runs of the titles will be available. This will be accomplished through high volume scanning of these titles, which have been donated by publishers or outside libraries, or represent second copies in the NLM collection.

Permanent Access to Electronic Information

One of the biggest challenges libraries face today is the need to develop strategies for preserving materials in electronic form – especially publications that are “born digital”. This is clearly an area of transition and libraries must be proactive or information

is in danger of being lost. We do not have the luxury of dealing with the preservation of the information “when we get to it” as the information may not be there to be preserved.

To begin to address this problem, NLM staff has developed a system of permanence ratings to indicate to users whether the location, content, or availability of NLM's electronic publications is subject to change. A report on the rating system is available at www.nlm.nih.gov/pubs/reports/permanence.pdf. Work is underway to develop an electronic archive for NLM's web resources that have been rated Permanent. NLM also continues to work with other libraries and organizations to resolve the many complex issues related to preserving materials in electronic form.

Global Health Partnerships

Finally, the area of global health partnerships leads us to transitions occurring in NLM's international programs. In the 1960s, NLM pioneered the creation of MEDLARS Centers, which were developed as cooperative centers to provide access to the MEDLINE database to researchers and clinicians outside the United States. The network of international MEDLARS Centers has grown to more than 20 and is an early and longstanding example of how NLM works with other institutions to disseminate information to researchers and health professionals throughout the world. In September, 1998 the NLM Board of Regents issued “A Global Vision for the National Library of Medicine”, a report of its Long Range Planning Panel on NLM's international activities (2). The plan affirmed that NLM's first objective should be to “strengthen and expand global access



to the world's health-related knowledge" and specifically recommended that NLM expand its international partnerships with additional countries and regions.

Two notable examples of NLM's programs that expand global access are PubMed, which is used directly by health professionals all over the world, and DOCLINE, NLM's automated document delivery request and referral system. The number of international DOCLINE partners continues to expand, as does the number of libraries outside the U.S. providing document delivery service to health professionals in a country or region they have agreed to serve via the Library's Loansome Doc. International DOCLINE partners now number 50 and there are 30 libraries outside the U.S. delivering documents to health professionals through Loansome Doc. Additional examples of NLM's global programs include GenBank, one component of an international database collaboration of remarkable significance; the Visible Human data which is distributed free to more than 716 non-U.S. licensees; and the Unified Medical Language System, which is also available free to licensees anywhere in the world. Of 1835 active licenses, 573 UMLS licensees are non-U.S. organizations.

There are a number of other important projects illustrating NLM's commitment to the international community. An recent collaboration with the British Library highlighting NLM's historical collections is Turning The Pages, which uses computer animation, high-quality digitized images, and touch screen technology to simulate the action of turning the pages of a rare book. The British Library created the system and allowed NLM to be the first to use it in the U.S. Pages from Elizabeth Blackwell's *A Curious Herbal* and Vesalius' *De Humani Corporis Fabrica* are the first titles to be digitized.

NLM has been targeting other special international areas of opportunity. A partnership

with the Pan American Health Organization and the Foundation for the Coordination of Information Resources for Disaster Prevention (CRID) in Nicaragua, is working to improve access to health related disaster information in Latin America. Two university libraries in Honduras and two in Nicaragua, as well as the Ministry of Health and the Center for the Protection Against Disasters in El Salvador are participating in this project, which is providing Internet connectivity, basic computer resources, training, and the development of special disaster information services in these Latin American countries. The objective is for target countries to have the capability to collect, organize, store, and disseminate health and medical information related to disasters.

In another international area of opportunity, NLM has created an electronic network for malaria researchers in Africa, in collaboration with the Multilateral Initiative on Malaria (MIM), begun in 1997 with the support of NIH. In this project, African scientists and malaria researchers in Ghana, Kenya, Tanzania and Uganda can now connect with one another and with sources of research and health information through full access to the Internet. MIM is a model for connectivity and communications in developing regions of the world. This project is one attempt to lessen the isolation of African researchers by enabling greater interaction between sites studying the same disease, in this case malaria. It should also improve their ability to communicate with researchers throughout the globe.

NLM is also working with the World Health Organization (WHO) to provide better links to the electronic biomedical literature for researchers in less developed countries. WHO's Health InterNetwork Access to Research Initiative (HINARI) which provides electronic access to more than 2,000 scientific and medical publications free or at greatly reduced cost to developing countries, will be using PubMed as an access point for many

of these titles. We are working with WHO to implement PubMed's LinkOut feature so that researchers with access to the HINARI titles can search for them using PubMed and link directly to the full text.

While it is true that NLM is in a period of transition with our user base expanding and technology presenting unprecedented challenges and opportunities, the Library's mission to collect, organize, disseminate and preserve the world's biomedical literature remains unchanged. NLM's commitment to strengthen and expand global access to the world's health literature and to chart new routes to biomedical knowledge, are key to fulfilling this mission through the 21st century.

References

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