PROCEEDINGS OF THE CONTRIBUTED PAPERS SESSION
BIOMEDICAL AND LIFE SCIENCES DIVISION

SLA.gif (2650 bytes)

89th Annual Conference
Indianapolis, Indiana
June 10, 1998

Harnessing Biomedical Resources for Cooperation and Collaboration: Cases in Bioinformatics and Nutritional Sciences

Polin P. Lei, Associate Librarian, Arizona Health Sciences Library, University of Arizona
Tucson, AZ

INTERNET FOR TEACHING AND RESEARCH

The arrival of Internet and information technology (IT) provides great opportunities for librarians to increase their collaborative and cooperative partnership with their institutional customers. "Collaborate: to work, one with another; to cooperate, usually willingly".[1] This is especially true in the academic environment. Librarians cooperate with faculty in integrating the electronic information resources into the academic curriculum and research activities. Librarians collaborate with faculty to share knowledge resources[2]. To encourage and facilitate this partnership, library administrators should provide an environment similar to the "playground of the mind"[3] for librarian/faculty to explore their creative knowledge skills. Library literature on "the library's walls are tumbling down"[4], or "the librarians are now for hired to external departments"[5] shed light on the changing roles of librarians. Michael Harris and Stan Hannah emphasized that, "Librarians advocating a conservative, even reactionary, stance relative to the emerging integrated digital communication environment place the future of the library and information services at risk"[6]. Therefore, librarians should use the team approach and play a leadership role in utilizing technology to attend to the increasingly sophisticated information needs of the consumers, and to expand the value of the library within the organization.

Internet and Biomedical Sciences

Since the birth of the Internet in 1969[7], the biomedical communities are quick to realize that the Internet is a tool ideally and uniquely suited for the advancement of communications and data delivery. Internet is also the gateway for rapid release of research findings and literature. The million Web sites can be metaphorically named as one huge Web encyclopedia for all

purposes. However, there are also drawbacks. The appropriate utilization of the multimedia and interactive features of the World Wide Web (WWW) as an instructional tool, and the vast storage of data, is presently the ultimate challenge to researchers, educators, and information providers[8]. To ease the challenge, librarians should acquire Web technology to search the labyrinth of information; know Internet is an integrated interface to tele-education (distance learning); and critically utilize the WWW resources as supplemental educational or research materials.

Generally, scientists rely on the expertise of the librarians to guide them through the labyrinth of resources. This information-seeking behavior leads them to form alliance with librarians to strengthen their educational and research activities. In order to earn trust and respect from the faculty, it is imperative for librarians to lead the way to the cutting edge of biomedical resources, and be the first to acquire information technology on biotechnology[9]. Selected cases in bioinformatics and nutritional sciences are listed below to exemplify the scenario at the Arizona Health Sciences Library. Many faculty/librarian partnership success stories were documented, such as the Milner Library at Illinois State University's Web projects[10], and the University of California, San Francisco's library instruction in genome informatics[11].

The Arizona Health Sciences Library of the University of Arizona is the only academic health sciences library in Arizona to support the biomedical information needs of the students, faculty, and staff of the University, and the health professionals within the State, including numerous rural health care providers. The library administration is progressive in implementing the Arizona Health Information Network (AZHIN) in 1994[12] to provide remote access of Medline and other health related databases to its members. With this advancement in health information delivery in Arizona, librarians are encouraged to participate actively in teaching and networking with faculty and researchers. There were technical differences on how the approach would be conducted. With time and experience, these differences were resolved when the end products contributed significantly to the mission of the library.

BIOINFORMATICS

Bioinformatics is the development and application of computational tools for the organization and study of electronic data[13]. With the assistance of high-performance parallel computer to enhance the network connections and interactive user interface, the scaleable parallel computer architectures provide the biomedical researchers with massive amount of accurate data for long searches or computations in record time[14].

Mapping Genomes

History of small genome sequencing began when the bacteriophage phi-x174 (5386 bp) became the first organism to be sequenced completely by Sanger and colleagues in 1977[15]. At that time, it took thirteen years to sequence completely a nonviral organism. In 1988, the Human Genome Project took clear form. This international drive expects the complete

identification of the estimated 100,000 human genes by year 2005[16]. However, in 1993, the first draft of the human genome was claimed to be available by French scientists on the Internet[17].

In 1995, the first free-living organism, *Haemophilus influenczae* (1,830, 137 bp) genome was completed. In 1997, small genome sequencing projects on *Escherichia coli* (University of Wisconsin), *Helicobacter pylori* (TIGR), *Archaeoglobus fulgidis* (TIGR), and *Methanobacterium thermoautotrophicum* (Genome Therapeutics) were completed[18]. Recently, the National Institutes of Health announced the discovery of the location for a gene that could be responsible for Parkinson's Disease in a family that immigrated to the United States from Contursi, Italy. With the assistance of sophisticated bioinformatic software, the scientists were able to identify the Contursi gene in six months! [19]

Bioinformatic Computation Tools

Presently the billion base pairs of nucleotides and literature are available for use on the Net. New sequence analytical tools (DNAscan, Gene Inspector, GENBRIGHT, Gene Jockey II, GCG, OMIGA, etc.); three-dimensional software (Cn3D, Rasmol, MMDB, Threading, Vast, etc.); new databases (PKU, Gene Expression, GenCard, ProtoMap, etc.); digital publications; patent information; and ethical, legal, and social issues (ELSI) (Dolly and Polly phenomena); coming from private or public sectors, appear on the horizons. Molecular medicine specialists, genetic counselors, molecular biologists are at a loss in facing the daily insurgence of new bioinformatics available at their fingertips.

Initiation of Alliance

In the spring of 1996, several faculty at the Arizona Cancer Center of the University of Arizona felt a strong need to include Internet molecular resources in their faculty and staff development. As a result, two librarians with known interest in molecular biology from the Arizona Health Sciences Library and the Science Engineering Library were invited to present a three-hour lecture and demonstration on "Internet Bioinformatic Resources." This specific request for inservice created a team effort in bringing librarians from the biomedical and science discipline, and the researchers and faculty together to plan this presentation. Over eighty researchers, physicians, and laboratory staff attended. This presentation demonstrated the novel usage of the Internet to find resources. Internet access was not common then. Extensive WWW molecular databases such as GenBank, GDB, OMIM, Prosite, SwissPro, and analytical tools such as Bankit, sequin, and Blast, were introduced. Any misconception that the Internet is only for entertainment was erased.

A bioinformatic Web page was created for this lecture. In addition, an article written with the research Unit on the same subject was published[20]. After numerous modifications and updating, this bioinformatic Web page is now residing on the Library's home page <ahsl.arizona.edu/genetics>. Moreover, the two librarians published an article entitled "Gateway to bioinformatics: the Internet"[9]. Subsequently, the biomedical librarian presented a

series of papers on genetic databases at the regional and national meetings. The key ingredient for this success is that both librarians share the same philosophy on the how IT will influence the future role of librarianship.

Continuous Partnership

With the initiation of a strong alliance between the Arizona Health Sciences Library and the faculty in the area of molecular biology, genetics, and molecular medicine, other collaborative activities followed. The librarian was invited to present at the grand round of Pathology on the Human Genome Project. Special molecular pharmacology class time was dedicated to the use of bioinformatic resources. Invitations for presentations were received from various laboratories to give in-service to laboratory assistants on the use of Blast, Entrez, GenQuest, and specific requests on genetic databases. Consultation sessions on how to access the genetic databases began to thrive. Regular bioinformatic classes were offered. For networking, a molecular biology special interest group was established within the Medical Library Association in 1996. Many librarians of this special interest group have doctorate degrees in molecular biology. To motivate other librarians to become interested in similar collaborative efforts with faculty, librarians share their knowledge and experience on listservs, and professional meetings.

NUTRITIONAL SCIENCES

Nutrition is a subject of interest to most customers. Apart from the printed sources on this popular topic, the Internet information on diet, vitamins, antioxidants, and current frauds are abundant[21]. With integrated medicine slowly coming into the mainstream of people's daily living, the commercial or educational Web resources on herbal medicine, naturopathy, ethnobotany, dietary supplements, and others are increasing at an exponential rate. At the same time, the demand from patients for nutrition and diet information is so great that medical schools are putting strong emphasis on a nutrition curriculum. Dietitians, physicians, nutritionists, public health specialists, nurses, and counselors are involved in team-teaching human nutrition and metabolic diseases to medical students. Librarians are not slow to follow.

Initiation of Alliance

A team of nutritionists, dietitians, physicians, and researchers from the College of Medicine of the University of Arizona, under the leadership of the Department of Family and Community Medicine, developed an integrated and pervasive approach to provide medical students with a nutrition curriculum in 1995. Funding of this project is received from a National Institutes of Health educational grant. The Arizona Health Sciences Library cooperated by supplying library faculty to assist in two phases of this research project. The Graduate Library School Internship Program of the University of Arizona also participated. The goal was to provide training for medical graduates so that at the end of four years of course work, they will be able to identify the patients and medical conditions which will benefit from nutrition intervention for both disease prevention and therapy[22].

Phase one of this project was to coordinate the nutrition curriculum with the newly

established Arizona Health Information Network (AZHIN), an Ovid Medline information system for students, residents, and health professionals. Pre-formulated search strategies on numerous nutrition objectives of the nutrition curriculum were developed with appropriate medical subject headings. The search strategies were saved for execution at all times by the students. The library school intern earned school credits by inputting data and designing the search strategies under the guidance of the education and information services librarians. The two librarians and library school intern spent many hours to facilitate, learn, and create this online nutrition education objective. After numerous evaluations of the effectiveness of such "canned" programmed searches, this portion of the project was completed.

Phase two was to create nutrition Web page to provide nutrition information for health professionals around the world. A library intern took charge of this mission and together with the education librarian, a preliminary nutrition and health Web page was released for viewing in the spring of 1995. Afterward, the care of this Web site was transferred to the Information Services of the Library. The challenge at that moment was for the information librarian to learn the technical skills of writing HTML and the entire procedure of registering, mounting, and upgrading this page within a short period of two months. With intense time line in place, the second edition of this nutrition page was published by the fall of 1995 with cgi count and Java script. During the following three years, this Web page slowly evolves into a well-used nutrition site with continuous effort in updating and reconstructing. This Web page was reviewed in journals[23] <ahsl.arizona.edu/nutrition>.

Continuous Partnership

Since 1996, there is a continuous trend to recruit librarians to write Web pages for academic departments[10] for the purpose of new students and faculty recruitment, and to publicize their research and teaching programs. The Department of Nutritional Sciences of the University of Arizona began to rewrite the department home page in 1966. By the spring of 1997, the biomedical librarian was invited to become the Web consultant. It was a collaborative effort between a dietitian, a librarian, and the Department Head. The dietitian contributed his clinical dietetic skills and technical HTML writing skills, the Department head offered the funding, and the librarian led the organization by reviewing the contents, structure, and Web design of the final product. The revised NSC Web page was released in the fall of 1997 <ag.arizona.edu/nsc/nschome.htm>.

Offers to design Web pages from other departments followed. The librarians can screen the requests and to "carefully select our partners for a win-win situation", as recommended by Judith Field, President of SLA, who came to Phoenix, Arizona to address members of the Arizona Chapter on the 20th anniversary celebration in February 1998.

FUTURE OPPORTUNITIES

The bioinformatics and nutrition benchmarking in this library led to many novel and untraditional activities such as team-teach classes on Internet resources with faculty; answer daily queries on diverse topics from the Web users; respond to global Web sites requests for

links, field requests from book publishers to write books on Web resources, review books for publishers, and screen commercial vendors' "push technique" to promote their new products. Foreign visiting physicians and researchers networked with the librarians through the faculty. Librarians are included in the social and educational functions for the international academic visitors. Foreign invitations to present papers or consult begin to materialize[24].

With extensive collaboration and cooperation, the librarians are presently active in providing continuing medical education credits to physicians. Librarians are a part of the teaching team and are included in the curriculum committee of the College of Medicine. In addition, the biomedical librarian is assisting a molecular nutrition research team in the submission of gene sequences, and to provide information update and management. This biomedical librarian is included as a co-author in this research team's scientific publication[25]. New collaboration in the design of educational courseware may be forthcoming due to this positive inclusion[2].

All in all, the way for librarians to get out of "the box" stems from their willingness to take risk, spend time to acquire new skills and knowledge, show leadership in marketing their expertise, and venture across campus boundaries. Encouragement from the library administration is essential to motivate increased interaction between faculty and librarians. As trust and respect are earned, more librarians will participate in the delivery of course-integrated library resources in the classrooms with faculty. Students benefit greatly from this team-effort. Every librarian should become leader in information delivery. This leadership quality should not belong solely to the library administration[26].

Lead your customers to "the right information-when you need it"[27] is the Medical Library Association's slogan. With IT spinning its wheels, traditional library information desk service is only a component of what librarians can do for customers[28]. There are other challenging and non-traditional roles for librarians to explore. Whether the initiation for collaboration is coming from the faculty or librarians, either way is refreshing. In 1996, Dr. H. White posed this hypothetical question to his audience: "Which do you think is greater, the number of doctors invited to lecture to medical librarians, or the number of medical librarians invited to speak at the meetings of the American Medical Association?"[29] And this question is thought provoking.

Endnotes

1. Flexner SB. (1993) Random House unabridged dictionary. 2nd Ed. New York: Random House.

2. Lei PP. (1997) Biomedical courseware: opportunities for faculty/librarian partnership, Papers and Poster Sessions from the 88th Annual conference of the Special Libraries Association, June 7-12th, 1997, Seattle, Washington, p. 222-229.

3. Cretch, SD. (1994) The Information arcade: playground for the mind. *Journal of Academic Librarianship*, 20(1): 22-3.

4. Rogers M, ES Lifer. (1995) Many libraries and their walls are tumbling down. *Library Journal*, 120(6): 14.

5. Schatz CA, Whitehead SE. (1995) "Librarian for hire": contracting a librarian's services to external departments. *Bulletin of the Medical Library Association*, 83(4): 469-472.

6. Harris MH, SA Hannah. (1996) "The Treason of the librarians: core communication technologies and opportunity costs in the information era. *Journal of Academic Librarianship, 22(1): 3-8.*

7. Howe W. (1996) When did the Internet start? A Brief capsure history. 9 May. <http://www.delphi.com/navnet/faq/history.html>

8. Barrie JM, DE Presti. (1996) The World Wide Web as an instructional tool. *Science*, 274: 371-2.

9. Lei PP, JP Martinez. (1996) Gateway to bioinformatics: the Internet. *Medical Reference Services Quarterly*, 15(2): 1-22.

10. Day PA, KL Armstrong. (1996) Librarians, faculty, and the Internet: developing a new information partnership. *Computers in Libraries*, 16(5): 56-8.

11. Owen DJ. (1995) Library instruction in genome informatics: an introductory library class for retrieving information from molecular genetics databases. *Science & Technology Libraries*, 15(3): 3-15.

12. McCray JC, K Maloney. (1997) Improving access to knowledge-based health sciences information: early results from a statewide collaborative effort. *Bulletin of the Medical Library Association*, 85(2): 136-40.

13. Buguski MA. (1994) Bioinformatics. *Current Opinion in Genetics and Development*, 4: 383-88.

14. Martino RL, CA Johnson, EB Suh, BL Trus, TK Yap. (1994) Parallel computing in biomedical research. *Science*, 265: 902-8.

15. Sanger F, GM Air, BG Barrell, NL Brown, AR Coulson, CA Fiddes, Hutchison CA, PM Slocombe, M Smith. Nucleotide sequence of bacteriophage phi X174 DNA. *Nature,* 246: 687 1977

16. Olson MV. (1993) The Human genome project. *Proceedings of the National Academy of Sciences USA*. 90: 4338-44.

17. Nowak R. (1993) Draft genome map debuts on Internet. *Science*, 262: 1967.

18. Early history of small genome sequencing. (1997) *Human Genome News*, 8(3-4): 5.

19. A Parkinson gene discovered. (1997) *Parkinson's Disease Foundation Newsletter,* October, p2.

20. Powis G, PP Lei, J Martinez. (1996) Use of Internet for your research. *Arizona Cancer Center Research News*, 3(4): 1-3.

21. Kipp DE, JD Radel, JA Hogue. (1996) The Internet and the nutritional scientist. *American Journal of Clinical Nutrition*, 64: 659-62.

22. Nutritional education in the medical school curriculum CA53459. 1995-97. NIH Grant Application.

23. Houston A. (1998) Healthy eating online: nutrition sites on the Web. *Health Care on the Internet*, 2(1): 3-14.

24. Lei PP. (1996) Potential health information market in China: telemedicine. IN Proceedings of the International Conference on "Global Business in Transition, Prospects for the Twenty First Century", 14-16 December 1995, Hong Kong. Hong Kong: Lingnan College, P.573-79.

25. Wu JYJ, JJ Zhang, Y Wang, SK Reaves, YR Wang, PP Lei, KY Lei. (1997) Regulation of appolipoprotein A-I gene expression in Hep G2 cells depleted of Cu by cupruretic tetramine. *American Journal of physiology*, 273 (Cell Physiol. 42): C1362-70.

26. Mech T. (1996) Leadership and the evolution of academic librarianship. *Journal of Academic Librarianship,* 22(5): 345-53.

27. Medical Library Association promotional material, Chicago, 1996.

28. Heaton GT. (1996) Rethinking the provision of reference services in academic medical school libraries. *Bulletin of the Medical Library Association, 84(1): 17-24.*

29. H.S. White. (1996) "The Perilous but also opportune future for special librarians". *Library Journal*, 121(1): 59-60

Return to 1998 Contributed Papers Contents

Return to BIO Home Page