
Vignettes: diverse library staff offering diverse bioinformatics services*

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Objectives: The paper gives examples of the bioinformatics services provided in a variety of different libraries by librarians with a broad range of educational background and training.

Methods: Two investigators sent an email inquiry to attendees of the "National Center for Biotechnology Information's (NCBI) Introduction to Molecular Biology Information Resources" or "NCBI Advanced Workshop for Bioinformatics Information Specialists (NAWBIS)" courses. The thirty-five-item questionnaire addressed areas such as educational background, library setting, types and numbers of users served, and bioinformatics training and support services provided. Answers were compiled into program vignettes.

Discussion: The bioinformatics support services addressed in the paper are based in libraries with academic and clinical settings. Services have been established through different means: in collaboration with biology faculty as part of formal courses, through teaching workshops in the library, through one-on-one consultations, and by other methods. Librarians with backgrounds from art history to doctoral degrees in genetics have worked to establish these programs.

Conclusion: Successful bioinformatics support programs can be established in libraries in a variety of different settings and by staff with a variety of different backgrounds and approaches.

Complete paper available online only <<http://www.pubmedcentral.nih.gov/tocrender.fcgi?action=archive&journal=93>>.

*David Osterbur is the senior author of this work; the other authors are listed alphabetically and all contributed equally; Renata Geer coordinated the paper.

INTRODUCTION

The following brief program descriptions are meant to provide librarians with a survey of different approaches for beginning library-based bioinformatics support programs. These vignettes cover a spectrum of programs developed by staff whose positions are not strictly dedicated to bioinformatics support and who have diverse educational backgrounds ranging from doctoral and medical degrees with extensive science training to those with bachelor's degrees in the humanities and little or no science training. Represented libraries include small private colleges, hospital libraries, and large research institutions. One feature that they share is that they are among the first to establish library-based bioinformatics support and training programs in the United States.

One of the common themes for the libraries that have established bioinformatics support is library sponsorship of the "National Center for Biotechnology Information's (NCBI) Field Guide" [1] at their respective institutions. The "Field Guide" workshops are well-respected and well-attended programs that can promote the connection between bioinformatics and the library. Sponsorship of a workshop does not constitute a bioinformatics support program, however, and librarians with appropriate training are needed to answer at least introductory questions [2]. The amount of time that individuals in the programs described here spend participating in bioinformatics support varies from 10% to 90%; the number of users served annually varies from 10 to 220 (not including the number of people who attended the "NCBI Field Guide" classes); and the number of bioinformatics questions addressed varies from less than 1 per month to more than 30. Consultations with individual researchers are a part of all of the library programs. The number of these consultations varies, depending on the academic setting, the size of the library user base, and the visibility of the library's bioinformatics services, but consultations generally last between 30 minutes to an hour (though some are considerably longer) and take place in the library or in the researcher's office.

As would be expected most consultation requestors and workshop attendees are graduate students and postdoctoral fellows, followed by technicians and faculty. Bioinformatics support can help establish good working relationships with users via course-integrated instruction or research collaborations. The examples here can be matched to individual library settings and used as a guide to help determine the types of library-based bioinformatics support services that could be offered.

PROGRAM VIGNETTES

Norris Medical Library, University of Southern California

- Staff: Pamela M. Corley, AHIP
- Titles/Positions: Research support librarian

- Education: Bachelor's of science in animal science and a master's of science in library science
- Staff: Yongchun Wu
- Titles/Positions: Bioinformatics specialist
- Education: Master's of science in computer science and a doctoral degree in plant pathology

The research support librarian at Norris Medical Library has provided assistance in the area of molecular biology and genetics since 1990. Workshops on Basic Local Alignment Search Tool (BLAST) and GenBank are offered as well as individual consultations. Questions addressed cover the range from straightforward (finding a record by accession or GI number), to moderately complex (changing defaults in the BLAST to improve results), to more complex (assistance in interpreting results), to very complex (recommendations for approaches to specific problems). Consultations provided via the service are typically hour-long sessions covering computer skills and locating and understanding resources; such consultations often do not require specific subject expertise.

Due to the growing interest in and the increasing complexity of bioinformatics resources and tools, the library hired a bioinformatics specialist with a doctoral degree in 2005. The bioinformatics specialist has begun offering workshops on sequence, structure, microarray data analysis, Vector NTI, and NCBI resources as well as bioinformatics-related course lectures and workshops in departments such as the schools of pharmacy and biostatistics. In addition, consultations on the effective application of bioinformatics tools for specific research projects and assistance in visualizing, analyzing, manipulating, and interpreting molecular biology data are now available.

Medical Sciences Library, New York Medical College

- Staff: Janet Ohles
- Title/Position: Currently, associate director of library services, Western Connecticut State University
- Education: Bachelor of arts degree in speech: rhetoric and master's of library science

Services offered as part of the bioinformatics support program at the New York Medical College (NYMC) Medical Sciences Library included a Web companion for a grant-funded clinical genetics training program [3], "Genetics in Primary Care: Think Genetics, Teach Genetics" [4]. Other library-based bioinformatics support services included workshops, in which library faculty demonstrated NCBI resources such as LocusLink (the predecessor to Entrez Gene), the Conserved Domain Database (CDD), BLAST, MapViewer, and the GeneTests resource. These presentations led to library collaboration with clinical faculty in researching Internet sites and preparing Web companions for evidence-based medicine-focused courses for NYMC for the genetics curriculum at NYMC [5].

Samuel J. Wood Library, Weill Medical College of Cornell University, and Public Health Library, New York City Department of Health and Mental Hygiene

- Staff: Kristine Alpi, AHIP
- Title/Position: Associate library director and lecturer in public health
- Education: Bachelor of arts in history of art and Spanish, certificate in business foundations, master's of library science, and master's of public health (community health education focus)

Alpi has provided bioinformatics support for the past five years at two different institutions, the Weill Cornell Medical Library and the Public Health Library of the New York City Department of Health and Mental Hygiene. The Weill Cornell Medical Library has developed introductory and advanced workshops on using Entrez, BLAST, and other NCBI resources, as well as a clinical genetics workshop that is taught once a semester to the general medical center audience.

At the Public Health Library, practitioners' questions typically related to viral mutations and infectious agent transmission. These questions can be addressed with tools for phylogenetic analysis and multiple sequence alignment. Workshops were introduced to demonstrate NCBI-developed infectious disease analysis tools such as the Influenza Virus Resource, HIV resources, and malaria resources of international interest. In environmental health, cancer chromosome databases with information regarding mutations associated with different cancer types were demonstrated. The library offered annual molecular biology-focused workshops covering these and other resources.

Health Sciences Library, University of North Carolina at Chapel Hill

- Staff: K.T.L. Vaughan
- Title/Position: Librarian for bioinformatics and pharmacy
- Education: Bachelor of arts (AB) in biology and master's of science in library science

The University of North Carolina at Chapel Hill (UNC-Chapel Hill) Health Sciences Library is an academic health sciences facility supporting five professional health affairs schools (dentistry, medicine, nursing, public health, and pharmacy), three hospitals, and the main campus for the University of North Carolina academic system. The library has provided bioinformatics support services for two years. Bioinformatics services are provided in the library setting and are integrated into course work.

The library sponsors a quarterly forum series that spotlights a different tool in each session and offers hands-on practice in the use of that tool. Past topics have included PubMed for basic genetic research, an overview of the Entrez system, new databases listed in the January databases issue of *Nucleic Acids Research*, funding sources for biomedicine, and the GeneSpring database. Targeted workshops are also taught for laboratory groups.

In addition to these services, the bioinformatics and pharmacy librarian provides guest lectures on a regular basis for graduate-level courses in the school of information and library science (SILS) and the bioinformatics and computational biology (BCB) program. The library also facilitates the instruction programs of UNC-Chapel Hill's Center for Bioinformatics in a hands-on computer classroom. These open classes focus on proprietary databases such as GeneSpring, GCG, and PathArt and are taught by staff from the UNC-Chapel Hill Center for Bioinformatics.

Bernard Becker Medical Library, Washington University School of Medicine

- Staff: Lili Wang
- Title/Position: Bioinformatics specialist
- Education: Medical degree in radiation oncology and master's of science in biostatistics

The Bernard Becker Medical Library has been offering bioinformatics support services since 2003. Several workshops—including classes on BLAST, genetic variation, and human genome resources—are offered on a regular basis to the entire research and teaching staff of Washington University, and the specialist provides individual research consultations.

The library also supports training in the Spotfire proprietary software; Spotfire is used for functional genomics applications and microarray analysis of gene expression as well as other applications. The bioinformatics specialist teaches the use of Spotfire's microarray analyzer in conjunction with statistical analyses of microarray data. The library also provides support for DNASTAR's LaserGene and the Cambridge Crystal Structure Database (CSD).

In addition, the bioinformatics specialist serves as a reference source for bioinformatics questions about such topics as finding the chromosomal location of a gene of interest, optimizing BLAST searches, finding Web-based tools for restriction mapping and RNA secondary structure analysis, and locating candidate genes associated with a particular sequence tagged site marker.

Albert R. Mann Library, Cornell University

- Staff: Medha Devare
- Title/Position: Bioinformatics and life sciences specialist
- Education: Doctoral degree in crop and soil sciences

Mann Library primarily serves students, faculty, and staff in the college of agriculture and life sciences and the college of human ecology. The bioinformatics specialist has developed a library-based workshop, "Introduction to Data Mining in Bioinformatics," which covers Entrez Nucleotide, Protein, and Gene; BLAST; and Cn3D. A version of this workshop has also been presented to the medical students at Cornell's Weill Medical College in 2005, focusing on medically applicable examples using dbSNP and Entrez Gene. Another version of this workshop will be presented at Cornell's New York State Agricultural Ex-

periment Station, tailored primarily for plant biologists and entomologists.

The bioinformatics specialist collaborates with faculty to present bioinformatics resources in the curriculum and tailor workshops and services to clientele interests. For example, lectures in relevant technologies (e.g., sequencing, proteomics, and microarray analysis and use of the appropriate databases to support these technologies) are taught by the bioinformatics specialist in a course covering plant-microbe interactions. The bioinformatics specialist has organized and taught a modular course for Cornell's new minor in genomics, "Bioinformatics Tools for Genomics." She also teaches a lecture on bioinformatics and life sciences resources important to chemists (e.g., Entrez Nucleotide, Protein and SNP, and BLAST) in a course on chemistry resources presented using drug design and delivery as the over-arching theme.

Spencer S. Eccles Health Sciences Library, University of Utah

- Staff: Nicola Gaedeke
- Title/Position: Bioinformatics information specialist
- Education: Doctoral degree in molecular biology

Bioinformatics services have been provided at the Spencer S. Eccles Health Science Library since 2000. For the last three years, the bioinformatics specialist and the technical support staff of the library have developed distance education support services delivered via the Web. A series of approximately hour-long workshops have been developed for online delivery using Breeze, a software product used to create dynamic presentations and training courses. Workshops concentrate on NCBI resources: "Gene-centered Information," "Organism-centered Information," "How to Search Entrez Nucleotide and Other Entrez Databases," "BLAST: The Algorithm," and "Blink: The BLAST Link." Additional topics are under development. Unique to this program is that all bioinformatics services, including individual consultations, are delivered via the Web with the bioinformatics specialist residing in Germany [5].

Tompkins-McCaw Library for the Health Sciences, Virginia Commonwealth University Libraries, Medical College of Virginia Campus, and James Branch Cabell Library, Monroe Park Campus, Virginia Commonwealth University

- Staff: Catharine Canevari
- Title/Position: Head, Education and User Services, and basic sciences library liaison
- Education: Bachelor of arts in history and master's of library science
- Staff: Peter Kirlew
- Title/Position: Reference librarian for the sciences and engineering
- Education: Bachelor of science in chemistry, master's of science in soil science/agronomy, master's of library science, and doctoral degree in analytical chemistry

The Tompkins-McCaw Library has been providing

bioinformatics support services since 2002, the James Branch Cabell Library since 2004. Two librarians serve in the bioinformatics support role, providing services to two campuses. Where possible, they collaborate on projects to promote training on both campuses and increase awareness of the services. Services include an annual "NCBI Resources Overview" workshop open to anyone at the university. They also offer an introductory workshop in spectrometry and structures including the use of bioinformatics structure tools (Cn3D, etc.), sequence viewers (Map Viewer, etc.), chemical structure viewers, and search tools (from PDB, CAS, etc.) that is offered semi-annually at each campus.

Course-integrated instruction in bioinformatics is an important part of the collaboration between the libraries and faculty on both campuses. On the Medical College of Virginia Campus, the basic sciences library liaison has collaborated with the faculty to teach a workshop on NCBI resources (Entrez, Cn3D, sequence viewers, BLAST, and Map Viewer) for a biochemistry class and presents a lecture on NCBI resources for a human genetics class, providing an overview of resources prior to the students being assigned research of a specific genetic disease. On the Monroe Park Campus, the reference librarian for the sciences has collaborated with biology faculty in classes in which students are given an assignment to locate sequence and protein domain information for specific genes, design PCR primers, and build multiple sequence alignments. The science librarian assists students in creating the strategies and methods for completing the assignment and teaches classes on NCBI resources to students enrolled in genetics classes and creates appropriate online tutorials and really simple syndication (RSS) feed resources.

Timken Science Library, The College of Wooster

- Staff: Donna Jacobs
- Title/Position: Science librarian
- Education: Bachelor of arts in zoology and master's of library science

The College of Wooster is a private liberal arts college with a focus on independent learning throughout the four-year curriculum. The science librarian collaborates with a biology faculty member to integrate bioinformatics and information literacy into an undergraduate cell physiology course, a sophomore-level writing-intensive course that is a bridge between introductory biology and chemistry courses, and a three-semester independent study sequence. Students conduct a series of laboratory investigations and writing assignments that reinforce how knowledge of the literature guides the execution of science. Each assignment focuses on specific bioinformatics, bibliographic, or general information literacy competencies.

By incorporating library instruction and collaborating to integrate bioinformatics and information literacy competencies into the series of assignments culminating in the final paper, the biology professor and the science librarian are providing students with a more

comprehensive understanding of the organization of information, including data contained in the bioinformatics databases, and are assisting them in developing strategies for accessing, evaluating, and utilizing that information in their investigation of the function of a particular gene.

CONCLUSION

Medical, academic, and special libraries are in the midst of a transition period that began in the 1990s. As the focus of library collections shifts from primarily print to primarily electronic resources and users switch from using resources in print to using them online, additional electronic tools and databases assume a more natural fit with library services. Busy faculty have readily accepted the transition from print to electronic and support these resources in the library [3, 7, 8]. As Lynch pointed out in 1999, the support of bioinformatics databases and tools is a natural fit for libraries as well [9]. As demonstrated here and in several other articles in this issue, the use and acceptance of bioinformatics support programs in libraries is growing. Several of the libraries mentioned in this article have also found bioinformatics to be an excellent way to build new collaborative relationships with research and clinical faculty and staff.

Libraries in institutions whose subject areas include the biological or medical sciences may want to take advantage of the opportunities offered by bioinformatics and begin to build support programs. Help in undertaking this goal is available from the literature [2, 10]. Help is also available both from NCBI, with its regional workshops [11], and from the Medical Library Association's Molecular Biology and Genomics Special Interest Group [12]. The vignettes presented here also provide examples of the types of bioinformatics support libraries can provide.

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