Proceedings of the Contributed Papers Session
Seattle June 11, 1997

Special Libraries Association

Biological Sciences Division

The Internet in the Library/Classroom: Genetics at the University of Florida

by
Michele R. Tennant, Ph.D., M.L.I.S.
Assistant Librarian
Reference, Education and Information Management/Resource Management
Health Science Center Library
University of Florida
michele@library.health.ufl.edu

Abstract

A cooperative effort between the Health Science Center Library (HSCL) and the Department of Zoology at the University of Florida brought library services into the classroom for 119 undergraduate genetics students. One reference librarian with a background in genetics was invited to team teach the course with a Zoology faculty member. Each student received a different gene/genetic disorder to research. Searching assignments and a final paper summarizing the genetics of the gene/disease were required. Students were introduced to a variety of bibliographic resources as well as genetics databases available over the Internet. Students completed a survey to evaluate the effectiveness of the project and the library/database instruction (92.5% response rate).

Students indicated that the project and library sessions were beneficial. The Internet, especially, allowed the students to utilize many of the research tools (i.e., GenBank, BLAST) used by practicing geneticists. 56.1% of the evaluation respondents indicated that they had no previous experience using the Internet; 96.9% indicated that they believe that they will be using the Internet in their future educational or professional careers. Respondents "very comfortable" using computers rose from 38.8% to 60.2% following the course. 60.2% of respondents reported being "less anxious" using the library. "Very confident" library users increased from 17.3% to 84.7%. Respondents reported overwhelmingly that the integration of the library, Internet, and classroom lectures resulted in a cohesive, comprehensive learning experience.

Internet aspects of the project, evaluation, challenges and rewards are discussed.

Introduction

PCB3063 is a rigorous introduction to genetics offered through the Zoology Department at the University of Florida. This class is one of two required courses for Zoology majors at the University and is taken by most students who are in the pre-health professional programs (pre-dentistry, -medicine, -pharmacy, -veterinary medicine). This course is designed for upper division undergraduates who have completed core biology and

thus possess a basic understanding of the biological sciences.

PCB3063 has been taught traditionally through a series of lectures, textbook readings and problem sessions. Evaluation of students' progress has been through standard written examinations. Professor Michael M. Miyamoto of the Zoology Department first taught PCB3063 during the Spring 1996 semester. In preparing for the class, Dr. Miyamoto determined that he wanted to create a more innovative learning environment for the students; something beyond memorization from lecture and textbooks. He decided that students should complete some sort of project which would require them to use the primary literature and the information tools used by research geneticists. The students would be expected to locate information and combine it with information learned in class. The final product would be a short paper summarizing the genetics of a particular gene/genetic syndrome, demonstrating the students' ability to put into practice that which they had learned.

Once a project was envisioned, it became clear that the students would need instruction in information resources. It was at this point that Dr. Miyamoto entered into discussions with me, at that time a Visiting Librarian at the Health Science Center Library at the University of Florida. These discussions began with the idea that I would help develop a project and teach the necessary information sessions; my involvement in the project eventually escalated into co-instructor status. Following the success of the project in 1996, the collaboration was repeated in the Spring of 1997.

The Health Science Center Library and Bibliographic Instruction

The Health Science Center Library (HSCL) at the University of Florida provides instructional services to its six member colleges: Dentistry, Health Professions, Medicine, Nursing, Pharmacy and Veterinary Medicine. The library has a long history of providing instruction to its patrons through sessions integrated into the academic courses of the colleges, as well as by providing "stand alone" sessions in database searching. Librarians currently serve on the Curriculum Committees of three of the Colleges - Dentistry, Medicine and Nursing - and are working to develop formal relationships with the others (Francis and Fisher, 1997).

The HSCL had not previously offered a course integrated approach to instructors in the Department of Zoology. Zoology is a department in the College of Liberal Arts and Sciences, and as such, is primarily served by the Marston Science Library, not the HSCL. However, students and researchers in genetics have information needs which extend into HSCL's domain. Genetics can be studied from a variety of angles - Mendelian, medical, molecular, population. Since Dr. Miyamoto wanted the students to concentrate on molecular and medical genetics, MEDLINE and GenBank were the two major databases of choice. These two databases are used extensively by molecular and medical geneticists, and the expertise in searching these databases in the University of Florida library system resides at the HSCL. All reference librarians at the HSCL are proficient in searching MEDLINE. My background (a Ph.D. in biology with my dissertation relying on molecular genetic techniques) and experience with GenBank are unique in the UF library system. The use of the HSCL in instructional activities for programs primarily served by other campus libraries is not without precedent; library instruction for students in psychology and the history of medicine are recent examples. For these reasons it was decided that the HSCL would accept Dr. Miyamoto's invitation and participate in PCB3063.

The Project

During the Spring 1996 semester students in PCB3063 were evaluated through three examinations and the genetics project, each worth one quarter of the student's grade. The stated goal of the project was to teach the students to find information, use the knowledge gathered in class to understand the information, synthesize information from many sources, and then write a summary of what the student had discovered. Each of 119 students chose at random a gene/genetic disorder to research.

The project itself was divided into four parts. The students were introduced to print and electronic bibliographic resources. Following instruction in these resources, students were asked to complete Part A of the project, which required them to locate their gene/genetic disorder in *Mendelian Inheritance in Man* as well as find the appropriate MeSH term in *Medical Subject Headings - Annotated Alphabetic List*. Part B of the project entailed searching for citations in MEDLINE and Current Contents, and for books in the UF catalog. Later in the semester, after molecular genetics was introduced in the lecture portion of the course, the students were introduced to the Internet, GenBank, and a few other genetic resources. A required PowerPoint demonstration was offered which covered the basics of Netscape and how to use the genetic databases provided through the home page of the National Center for Biotechnology Information (NCBI). Students were required to search the Internet for information about their paper topics (Part C - see Appendix and discussion below). Finally, the students wrote a four page paper summarizing the genetics of the disease. Although the students were able to use the genetics that they learned in class as a basis for understanding the genetics of their gene/syndrome, they needed to use the genetic literature and information resources to learn the specifics of their particular topic.

Part C: Genetics on the Internet

As this presentation is meant to discuss the use of the Internet in library services, I will concentrate on that aspect of the project, reserving a thorough discussion of our classroom experiences for another forum.

During the Internet portion of the project the students used this tool in ways that actual genetics researchers do. Students were instructed in the use of the home page of NCBI. This home page allowed access to the GenBank nucleotide and protein databases using the Entrez search engine. Prior to any searching of the NCBI databases, the students were given background information on NCBI, the GenBank database, the vast amount of data it contains, and the model organisms which are most represented in the database.

Students were then instructed in searching GenBank, starting with a simple search using a GenBank accession number (M18038). The record which matches this accession number (orangutan beta- and eta-globin pseudogenes and Alu repeats) was sequenced by Miyamoto et. al. (1987). By the time the GenBank session was offered, the students had already been introduced to some of the molecular features of this sequence as it had been used in lecture to describe a number of genetics concepts (Alu sequences, exons and introns, stem/loop configurations, promoter elements, start and stop codons, direct repeats surrounding transposable elements, and the ratio of coding to noncoding DNA). The students were therefore already familiar with this sequence and understood that it represented actual data which had been collected by a research scientist. This particular sequence was also used to describe the general GenBank record and the searchable fields it contains.

Students then learned to perform a more complex search in the nucleotide database, searching the text term "pneum". They searched on this text term using all three possible search modes, "automatic", "selection" and "truncate" and explained why retrieval differed among these modes. The students also learned how to search using multiple text terms. The Genome database was then introduced. Genome contains graphical information on complete genome and long stretches of mapped DNA; this database is also searched by Entrez. The students were then introduced to BLAST (Basic Local Alignment Search Tool) which allows the user to search on a string of nucleotides to locate other matching strings of nucleotides. BLAST has a number of uses in biology; most recently geneticists have begun using it to identify and understand the functions of particular genes.

Students also used Entrez links to other databases, two of which are products which they had already used in other forms. The first was MEDLINE. Entrez may be used to search a molecular biology subset of MEDLINE. Searching this version of MEDLINE helped the students understand that the same database (in this case MEDLINE) may be available in a number of forms, each searched by a different search engine

with its own search syntax. Earlier in the semester the students searched extensively SilverPlatter MEDLINE. Entrez MEDLINE differs from this product in important ways - it includes mostly MeSH terms from the G5 (genetics) tree. The Entrez version also explodes automatically all explodable terms - a big difference from SilverPlatter MEDLINE.

Students also searched the online version of *Mendelian Inheritance in Man* (OMIM). Students had previously used the 1994 print version in Part A of their project. Searching the online version allowed the students to experience two aspects of an online system that many of them had not considered - the ability to search the full-text of a large document; and the ability of the online product to update information frequently and include an edit history of the gene record. This searching led to a discussion of print versus online versions of information resources.

Additional genetic resources were surveyed quickly to inform the students that there is more genetic/molecular information available aside from that provided by NCBI. The Protein Data Bank at Brookhaven and the Mouse Genetics databases at the Jackson Laboratory were additional sources surveyed during the first two years of the project.

Students were expected to try to find a web site which discussed their gene/syndrome. Following the initial lecture on how to use Netscape the students were introduced to various search tools available on the WWW. They were asked to search for information on their projects using Yahoo! and Lycos, two search tools with links from the University of Florida home page. Since the students had been introduced to search engines when learning to use the bibliographic databases, this was not a completely new concept. Once a home page was retrieved, the class discussed the importance of evaluating material from the Internet, and some of the criteria which may be used to do so (source, institution, references, date of update, etc.). For most of the students, the idea that Internet sources might need to be evaluated was a new concept. This part of the demonstration was a good opportunity to discuss the differences between journal articles which have been reviewed by experts in the field, and Internet sources which may not have been reviewed in any sense.

Therefore, this one lesson using the Internet as a teaching tool covered a variety of issues and helped meet the goals of the project in several ways. From the genetics viewpoint, the Internet session:

1. Allowed the students to find information on their paper topics;
2. Introduced the students to tools/databases used by practicing geneticists (WWW; NCBI databases and search engines, Protein Data Bank at Brookhaven; Mouse Genome Database);
3. Made the elusive phrase "gene sequence" more real to the students by providing an example;
4. Gave the students background information on NCBI and its genetic resources.

From the information skills side, the students learn:

1. How to use Netscape;
2. The importance of evaluating information found on the Internet;
3. That one information product might be available in a variety of forms (SilverPlatter versus Entrez MEDLINE);
4. To compare a print and online version of the same resource (*Mendelian Inheritance in Man*).

These information skills will be of value to the students whether or not they become geneticists/research scientists.

Project Evaluation

Formal course evaluation is completed for all classes at the University of Florida, however these evaluations rarely address specific aspects of a course or course assignment. It is rarer still that formal course

evaluations elicit from students useful recommendations for improving a course or assignment. During the last week of the course students were asked to complete a separate exit evaluation in order to elicit more specific information on the performance of this newly developed project. The evaluation was returned anonymously by the students, and students were reassured that their responses would have no bearing on their grade in the course. The survey instrument consisted of both objective and open-ended questions, primarily concerned with levels of information skills experience/confidence before and after PCB3063, what students liked best and least about particular components of the project, and which components students considered useful. The evaluation also asked for suggestions on how to improve the project and how well the project met its stated goal. The four page evaluation elicited a wealth of data and suggestions from the students; so much data that they can not all be discussed here. I will concentrate on those aspects dealing with computer expertise, the Internet session, and the students' feelings about the project as a whole.

It was expected that all of the students would have experience using computers and the Internet. However, different levels of computer and Internet experience was discerned through the evaluation. Figures from the 1996 class indicated that although all but one of the 98 students had used a computer before, 56.1% of students had never used the Internet, and 57.1% had never used Netscape. However, 58.2% of students reported that they owned their own computer, and 19.4% had Netscape access from home (Table 1). Given the lack of experience of some students, it was necessary to spend some time teaching about the Internet and how to navigate in Netscape. Comfort levels were also addressed by the evaluation. Students were asked how comfortable they were in using computers prior to PCB3063 and after. The number of students "very comfortable" using computers increased from 38.8% to 60.2%, while those who were "not very comfortable" decreased from 19.4% to 3.1% (Table 2). Answers to open-ended questions indicated that some students in the course were programmers or worked in computer stores, while others had never used a computer for much more than e-mail or word processing. These responses point out the difficulty in planning an Internet session at this transitional stage. As might be imagined, these differences in experience levels/comfort make it difficult to prepare a presentation which will hold the interest of experienced users while not being too advanced for their less experienced counterparts. The following quotes summarize the dilemma:

> "GenBank (and the Internet in general) are all new to me - I'm in the Dark Ages. This [instruction] was essential to the project."
>
> "I found relearning Netscape to be ... um ... boring."

Preliminary figures from the Spring of 1997 indicate that this problem may soon diminish. Approximately 70-80% of the students in 1997 have used Netscape before entering PCB3063 (final figures will be determined through a Spring 1997 survey). As more students are using Netscape for class assignments and recreation, they come to our class more experienced. The students seem to enjoy their discovery of the WWW much more than that of the bibliographic databases. Once introduced, one student noted:

> "I never knew that kind of information was out there. I've been playing with it for weeks now :) ."

It is expected that by the Spring of 1998, it may be unnecessary to teach how to use Netscape; at the least it will be possible to fit all inexperienced users into one session.

Another challenge during the Spring of 1996 was the lack of Netscape access on the 10 PCs in the HSCL Informatics Laboratory classroom. The GenBank session was taught through a PowerPoint presentation augmented by several handouts, however there was no hands-on experience for the students. Optional hands-on help sessions were set up in the Department of Zoology's undergraduate computer lab (7 machines, no teaching computer set-up). Even without the hands-on work in the required sessions, 54.3% of

attending students found the sessions to be "very helpful" (Table 3). The major complaint among all students was the lack of hands-on work; 16 students indicated that they least liked the fact that the session was not hands-on. Most students who indicated what they liked best reported that they liked learning how to use the Internet (Table 4). In the Spring of 1997, all 10 computers in the HSCL Informatics Laboratory classroom were upgraded and fitted with Windows 95 and Netscape. The required GenBank session became hands-on with lecture and handouts and the students seem to this point to be very pleased.

95 of the 98 respondents indicated that they believe that they will be using the Internet in their future education and/or career. This is greater than the number who thought they would be using MEDLINE or Current Contents (Table 5). There was, however, some resistance to the use of these information tools and to the project in general. Two students (including one finance major who plans to be a physician) indicated that they will not be using any of these products. However, this is an unlikely scenario for their future success.

Aside from these two students, and some minor complaints concerning the "required" nature of the information sessions and the grading of Parts A-C, the students showed great interest in the project and maturity concerning what the project had done for them. The project was no small amount of work for the students, or for Dr. Miyamoto and me. Overall the students indicated that this combination of library/information instruction and genetics served them well. Although few of the students wrote specifically about the Internet aspect, the following comments seem to sum up the feelings of the majority of the class toward the project as a whole:

> "The most surprising thing to me was the fact that what we learned in the lectures was actually being used and practiced in the real world" (junior zoology pre-medical student).
>
> "I think it did a great job. I found that I did understand the articles because of what I'd learned in genetics and other classes. I also did learn how to research more efficiently" (senior zoology pre-med).
>
> "I've learned many of the necessary research tools that I haven't learned in any other undergraduate class ... Did a superb job; I've learned a lot, it made my senior thesis research much easier, and I'm not so afraid of a Ph.D. dissertation anymore" (senior pharmacology/physiology major who wants to become a professor/clinical pharmacist).
>
> "I am very glad you made us do this project. I learned a lot that I'm sure I will use in the future. Without this class I wouldn't have known about these resources" (junior zoology major working in a genetics laboratory at the HSC; wants to be a pediatrician).

The co-instructors of this class believe that it was so successful because of the full integration of the information sessions into the course itself. Allegri (1985) listed the following criteria as aspects of course integrated instruction: "1) faculty outside the library are involved in the design, execution and evaluation of the program; 2) the instruction is curriculum-based, in other words, directly related to the students' course work and/or assignments; 3) students are required to participate; and 4) the students' work is graded or credit is received for participation". In Allegri's article, she required that three of the four criteria be met to define the instruction as being "course integrated". In PCB3063, all four criteria have been met. Dr. Miyamoto made a full commitment to the project by making the instructional sessions required, and having Parts A, B, and C graded by me. One information skills question was also asked on each of the first two examinations of the semester. The students quickly learned that these sessions were to be taken seriously. Additionally, the library and I made a great commitment in terms of time. I attended the lectures on genetics presented by Dr. Miyamoto, and presented 5 hours of problem sessions in each of the semesters. The students came to think of me as the co-instructor that I was. Finally, each required information skills session was presented

by me 6 times per semester, to accommodate the large number of students in the class (1996, 119 students; 1997, 116 students). Each optional help session was also offered 6 times per semester.

Rewards/The Future

Course evaluations indicated that the students received through this course instruction which was beneficial to them, both in terms of genetics and in terms of information/computer skills. The HSCL also received benefits, some of which were unanticipated when the Library Director agreed to HSCL's participation in this project.

It was expected that the students would become more confident, capable library users, and the final survey bears out this hypothesis (Table 6, Table 7). Although these users are undergraduates and not considered the HSCL's primary clientele, I expected that some of these science majors would be using the HSCL for other course work anyway, so the library would gain some of the benefits of this training. However, it developed that at least 72.5% of the students were pre-health professional majors (Table 8). Many of these students are likely to enroll in professional degree programs at the HSC, so we have pretrained, as well as made more "library-friendly" this future clientele. At least 29.8% of responding students worked in laboratories associated with the Health Science Center (Table 9). These students acted to publicize to the students and researchers in those labs the library's involvement in this course.

Additionally, the HSCL serves a number of undergraduate degree programs in the six colleges (occupational therapy, physical therapy, nursing) as well as from outside the colleges (for example, undergraduate psychology majors). The project is intended to act as a model for course integrated instruction for some of these undergraduate groups, and as an argument for complete course integration. It is also possible that the library will modify the Internet and other sessions to serve as models for graduate courses.

Other plans for the future are related to PCB3063 in particular. Dr. Miyamoto and I will continue to use the additional project evaluations to strive to improve the course. It is possible that a genetic analysis tool, such as GCG (Genetic Computer Group) might be taught to the students. Since the students learn to retrieve genetic information, it would follow that they should be exposed to a data analysis program. Dr. Miyamoto and I would like to develop a PCB3063 home page that would link to the HSCL's home page and contain the course syllabus, assignments, and handouts. And finally, we would like to be able to take better advantage of e-mail and create a student distribution list so that we could easily communicate with them as a group.

Acknowledgments

Thanks go to my current and former supervisors, library director, coworkers, co-instructor, and students of PCB3063, all of whom gave me great support in this endeavor.

Author's address:
Michele R. Tennant
Assistant Librarian
Reference, Education and Information Management/ Resource Management
Health Science Center Library
University of Florida
Gainesville, FL 32610-0206
michele@library.health.ufl.edu

References Cited

Allegri, F. 1985. Course integrated instruction: Metamorphosis for the twenty-first century. *Medical Reference Services Quarterly*, 4:47-66.

Altschul, S.F., W. Gish, W. Miller, E.W. Myers, and D.J. Lipman. 1990. Basic local alignment search tool. *Journal of Molecular Biology*, 215:403-410.

Brookhaven National Laboratory. Protein Data Bank, NRL 3D Database. http://www.gdb.org/Dan/proteins/nrl3d.html

Francis, B.W. and C.C. Fisher. 1997. Librarians as liaisons to college curriculum committees. *Medical Reference Services Quarterly*, 16:in press.

Jackson Laboratory. Mouse Genome Informatics Home Page. http://www.informatics.jax.org/mgd.html

McKusick, V.A. (ed.). 1994. *Mendelian Inheritance in Man: A catalog of human genes and genetic disorders*. Baltimore: Johns Hopkins University Press. 11th ed.

Miyamoto, M.M., J.L. Slightom, and M. Goodman. 1987. Phylogenetic relations of humans and African apes from DNA sequences in the pseudo-eta-globin region. *Science*, 238:369-373.

National Center for Biotechnology Information. NCBI Home Page. http://www.ncbi.nlm.nih.gov

---

Table 1: PCB3063 students reporting prior experience in computer/database products, 1996.

Have used a computer: 99.0% (97)
Have used a mouse: 87.8% (86)
Have used Windows: 85.7% (84)
Have used the Internet (Aside from Netscape): 43.9% (43)
Have used Netscape: 42.9% (42)
Own a computer: 58.2% (57)
Have Netscape access from home: 19.4 (19)

Table 2: Reported "comfort level" using computers before and after PCB3063, 1996.

	Before	After
Very comfortable	38.8% (38)	60.2% (59)
Somewhat comfortable	40.8% (40)	36.7% (36)
Not very comfortable	19.4% (19)	3.1% (3)
Never used one	1.0% (1)	----- (0)

Table 3: "Helpfulness" of required and optional GenBank (Internet) sessions, 1996.

	Required	Optional
Very helpful*	54.3% (51)	86.2% (50)
Somewhat helpful*	36.2% (34)	13.8% (8)
Not very helpful*	9.6% (9)	----- (0)
Did not attend	4.1% (4)	40.8% (40)

*Percentages of those attending.

Table 4: Least/most liked aspects of required GenBank (Internet) sessions, 1996.

Least liked by those who thought session was:

	Very Useful:	Somewhat Useful:
Disliked nothing	16	0
Not hands-on	9	7
Too much information	2	0
Boring	0	2

Most liked by those who thought session was:

	Very Useful:	Somewhat Useful:
Taught how to use Internet	7	6
PowerPoint show	5	0
Good information/instruction	4	0
Helped with the project	0	3

Table 5: Reported future information product use expectations, 1996.

Internet: 96.9% (95)
MEDLINE: 90.8% (89)
Current Contents: 64.3% (63)
None of the above: 2.0% (2)

Table 6: Reported confidence in ability to find needed information at the library, 1996, before and after PCB3063.

	Before	After
Very confident	17.3% (17)	84.7% (83)
Somewhat confident	60.2% (59)	14.3% (14)
Not very confident	21.4% (21)	1.0% (1)

Never used the library	1.0% (1)	----- (0)

Table 7: Reported library anxiety levels, PCB3063 students, 1996.

	Of total respondents:	Of respondents reporting anxiety:
Feel less anxiety	60.2% (59)	95.2% (59)
Do not feel less anxiety	3.1% (3)	4.8% (3)
Never felt anxiety using libraries	36.7% (36)	----- -----

Table 8: Reported professional school plans of PCB3063 students, 1996.

Medical school: 51.6% (47)
Dental school: 6.6% (6)
Veterinary Medicine school: 6.6% (6)
Physician's Assistant program: 2.2% (2)
Optometry program: 2.2% (2)
Pharmacy school: 1.1% (1)
Undecided health professional school: 2.2% (2)
Undecided health professional school/graduate school: 5.5% (5)
Graduate school: 22.0% (20)

Table 9: Employment in campus laboratories of PCB3063 students, 1996*.

Employed by a laboratory on campus: 47.4% (27)

- College of Agriculture: 1.8% (1)
- College of Medicine: 26.3% (15)
- College of Liberal Arts and Sciences
    - Department of Computer Science: 1.8% (1)
    - Department of Physics: 1.8% (1)
    - Department of Zoology: 12.3% (7)
- College of Pharmacy: 1.8% (1)
- College of Veterinary Medicine: 1.8% (1)

Not employed by a laboratory on campus: 52.6% (30)
Did not respond: ----- (35)

*Figures based on 57 respondents; question was omitted from some surveys.

APPENDIX

Project Part C

(**Note:** the spaces/lines for answering the questions in this assignment were removed; the questions in the assignment remain unchanged.)

PART C: SEARCHING QUESTIONS II

GENETICS TERM PROJECT

DUE 20 MARCH 1997, IN CLASS

25 points

(also include as part of final project due **8 April**)

1. MIM lists several references in its write-up of your disorder. Choose one of these articles published between the years of 1970 and 1990. Be sure that the citation is to a journal article. Which citation did you choose?

   Now check to see if the paper you have chosen was cited within three years of its publication (for example, if the paper was written in 1975, how many times was it cited in 1976-1978?) What source will you use to do this? Why is this source so important? Include appropriate photocopies from this source.

2. Were you able to determine from SilverPlatter MEDLINE whether any sequence data are available for your disorder? How did you do this?

   If you found a GenBank Accession Number(s) for your condition through MEDLINE, include at least one here. Print no more than the five most relevant GenBank records.

3. Now try searching for GenBank records for your disease/gene using a Text Term search in the Entrez search system. What terms did you try to use? Were you successful in finding records for your disease/gene? How would a Text Term search in GenBank using Entrez differ from a Keyword search in GenBank (what fields are they searching/controlled vs. uncontrolled vocabulary, etc.)?

   Print no more than the five most relevant GenBank records (don't reprint any you printed for question number 2).

4. If you were not able to locate an Accession Number for your disease/gene by following the directions in number 2 or number 3, locate a GenBank Accession Number for one of the following conditions: obesity, stroke, mental retardation, schizophrenia. List the number here. Print a copy of the GenBank record. (You **DO NOT** need to do this question if you were successful in numbers 2 or 3 above).
5. Look at the GenBank record you used in question number 2, 3 or 4. What species is this record from? What is the name of the gene? Does your record include amino acid sequence data as well as nucleotide sequence data? How do you know?

Look at the Features field of your GenBank record. Are there any molecular features listed that have been discussed in lecture? If so, list and define them.

6. List the first 20 bases from any of the GenBank sequence records you found (try to use the one most relevant for your topic). Be sure to cite the paper below so I can grade this question.
7. Is there another sequence in GenBank which matches the 20 base sequence you listed in question #6 ? Which search tool did you use to determine this? How did you search for this matching sequence?

   What is the GenBank Accession number of the matching sequence?
   Provide a computer print-out of this GenBank record.

8. Find your disease in the online version of *Mendelian Inheritance in Man*. Knowing all that you know about your disease, what is the easiest way to do this search?

   Give two reasons why the online version **might** be a better way to search for your disease than using the print version

9. Were you successful in finding a home page for your disease? If so, give the WWW address and title of the home page here.

GO TO:
Proceedings Table of Contents

Comments should be directed to Tom Turner tom.turner@asu.edu

HTML Document Preparation by Linda Shackle and Tom Turner
May 1997