

Biotechnology

APRC 1998-1999

section 1 of 6

BIOTECHNOLOGY PROGRAM

PROGRAM REVIEW PANEL REPORT

SEPTEMBER 11, 1998

PROGRAM REVIEW PANEL MEMBERS

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Coordinator**
- 2. Kim Colvert, Physical Sciences Department, Program Faculty**
- 3. Russell Hart, President, Assay Designs, Inc.; External Advisory
Committee Member**
- 4. Jim Hoerter, Head, Biology Department**
- 5. Roger Mitchell II, Biology Department, Program Faculty**
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SECTION 1:

BIOTECHNOLOGY PROGRAM OVERVIEW

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BIOTECHNOLOGY PROGRAM OVERVIEW

History:

The Biotechnology Program accepted its first students in 1989. It was designed to provide intensive hands-on laboratory experience to feed the growing biotechnology industry. It was therefore designed to have a very focused curriculum, oriented toward understanding of both the principles and theory of biotechnology, and the ability to perform relevant procedures in the laboratory. It was designed to be a small program, with a maximum capacity of 16 students per year, and considered to be full at 12 students per year. Enlarging the program beyond this number of students prevents the laboratory experience from being considered "hands-on," since students are then working in large groups.

The educational goals of the Biotechnology Program are to provide students with a quality baccalaureate degree in biotechnology, encompassing a solid grounding in liberal arts, an ability to communicate well in written and oral interactions, and technical expertise in the theoretical and practical aspects of biotechnology.

Graduates possess an occupational skill level equivalent to an entry-level research technician. Performance objectives include but are not limited to the following:

- a. good oral and written communication skills
- b. geographical, social and cultural awareness, through required coursework in social awareness and cultural general education.
- c. an understanding of the major areas of biology, including general biology, physiology and anatomy, microbiology and immunology, genetics, and molecular and cell biology.
- d. an understanding of inorganic, organic and biological chemistry
- e. an in-depth understanding of the four major areas of biotechnology, including proteins, nucleic acids, immunology, and cell/molecular biology.
- f. an ability to function efficiently in a research laboratory in any one of the four areas listed in "e" above.

The Curriculum:

The Pre-Professional Sequence:

Because the curriculum is focused into the area of biotechnology, there is limited flexibility in course selection. The Biotechnology Program is similar in level of sophistication to other professional programs such as Pharmacy, Optometry, Pre-Medicine, and Pre-Dentistry. These programs share very similar first, second, and even third year requirements. This enables students who come to Ferris to reserve a final decision on their major field of study until the

third year. Students in these programs take two years of majors Biology classes (BIOL 121-2, BIOL 231-2), two years of majors Chemistry classes (CHEM 121-2; CHEM 221-2), a year of non-majors Physics (PHYS 211-2) and mathematics through Analytical Trigonometry (MATH 130). Biotechnology requires, in addition to these, CHEM 231, Quantitative Analysis, and Statistics. Transfer students from community colleges may take most of these classes elsewhere before transferring to Ferris in their junior year. The exception to this is BIOL 231-2, which is not usually available at community colleges. This course sequence is offered every summer, and transfer students usually take it during that time. CHEM 231, which is also not available at community colleges, is scheduled in such a way that transfer students can take it in their first year here, as juniors. The higher level courses of the professional sequence in the second two years of the program all assume a basic knowledge of the material taught in these majors classes. Therefore, substitutions of lower-level science classes for these science-majors classes are not allowed. The curriculum of the first two years is rounded out with general education electives to satisfy the requirements for cultural enrichment, global consciousness, and communications.

The Professional Sequence:

The professional sequence of the second two years of the curriculum is designed to address the major areas of biotechnology in both theory (lecture) and lab. The major areas of biotechnology are: protein purification, recombinant DNA work, cell and tissue culture (with small animal handling), and microbiology/immunology. Therefore, the course requirements include: one year of majors biochemistry (CHEM 364 and CHEM 474), one year of biochemistry laboratory (CHEM 332-333), Genetics (BIOL 375), Developmental Biology (BIOL 370), Microbiology and Immunology (BIOL 386), Advanced Immunology Lab (BIOL 388), Proteins (BIOL 472), Proteins Lab (BIOL 473), Advanced Cell and Molecular Biology (BIOL 474), Cell and Tissue Culture Lab (BIOL 379), Molecular Genetics (BIOL 470), and Recombinant DNA Lab (BIOL 471). In addition, ENGL 311 (Technical Writing) is required, because of the importance of this ability in the biotechnology job market. Our capstone course in an internship or independent research project, which most students complete off-campus, at other universities, at industry sites, or at government or medical foundation research labs.

Because the curriculum is full, we do not require students to complete courses in computer classes. However, all students must use computers in the course of completing the labwork.

In the course of the last ten years, the curriculum has been reviewed three times. Because of the rapidly changing nature of the field, we consider this to be an important and on-going exercise.

The Program Facilities:

There is one major lab which serves for biochemistry and biotechnology. In this lab (Sci 337, and the instrument room adjacent to it, Sci 343, and in the cold room across the hall in Sci 338), most of the laboratory courses are taught. There is a separate lab (Sci201A) for tissue culture, since the organic fumes would kill the cells if this were carried out in the same room with organic solvents. In addition, the immunology lab and the tissue culture lab make use of the animal care facility located in pharmacy. These facilities, and the equipment contained in them, are outlined in the section on Facilities and Equipment.

The Program Faculty:

The program makes primary use of faculty in the biology department and the physical sciences department. The major faculty who contribute to the program are: Dr Kim Colvert (Physical Sciences), Dr. Roger Mitchell (Biology), Dr. Connie Boogaard (Biology, Program Coordinator), Mr. Frank Hartley (Biology) and Ms. Mary Bacon (Biology). Dr. Jim Hoerter (Biology Department Head) contributes to the program by offering Biotechnology Workshops for community college and high school teachers and students, by establishing partnerships with industry for industrial internships, by grant-writing to cover the costs of renovation of the lab and purchase of new equipment, and by establishing articulation agreements with community colleges. All faculty involved in the program teach other courses as well as biotechnology courses. Of the required 130 credits for graduation, only 4 credits are taught by part-time faculty who have not earned the PhD degree in their fields.

The program also makes use of industry intern supervisors as adjunct faculty members. Our adjunct faculty include: Dr. Vijay Baragi (Parke-Davis/Warner-Lambert), Dr. Les Eaton (Pharmacia & Upjohn), Mr. Steve Haleen (Parke-Davis/Warner-Lambert), Dr. John Linz (Michigan State University), Dr. Sandra Rempel (Henry Ford Hospital), and Dr. Russell Hart (Assay Designs, Inc.). Adjunct faculty supervise interns and present seminars on their work to the department and the program students.

The Biotechnology Program Students:

The typical biotechnology laboratory worker is an intelligent but quiet person who prefers to stay out of the limelight and to work somewhat independently. This is a fairly good description of our average biotechnology student. Fifty percent of biotechnology students are eligible for the honors program. The requirement for entry into the professional sequence is a gpa of 2.7 or higher in the lower-level science classes, as well as over-all. This selective group of students is generally self-motivated, hard-working, and intelligent. They are capable of responding to the challenge of the program. The presence of these students on campus is one of the major contributions of the program to the university community.

The Relevance of the Biotechnology Program to the Mission Statement of FSU:

The FSU Mission Statement reads: *Ferris State University will be a national leader in providing opportunities for innovative teaching and learning in career-oriented, technological and professional education.* Ferris specializes in combining hands-on training with liberal arts education. It is therefore especially fitting that Ferris has the state's first BS-level Biotechnology Program. This program teaches hands-on skills in an extremely intensive sequence of advanced laboratory classes. These courses re-create the laboratory work atmosphere. This "applied" part of the program is what makes it unique in the state and nation. At the same time that the program is scientifically and technologically strong, it also has a significant requirement for liberal studies. This is consistent with the mission statement's emphasis that liberal studies must be part of every student's program. Quality teaching is stressed throughout the Biotechnology Program. This is reflected in the success of our graduates, 90% of whom have found employment in the field.

The Contribution of the Program to the University:

The Biotechnology Program brings to the campus community many very well-qualified students, who come here specifically to take this program. Since they represent a population that is significantly above the average at Ferris in terms of academic ability, they contribute to an enhancement of the quality of the courses they take.

The Biotechnology Program is a highly visible and attractive program that brings publicity to the school. Through the workshops sponsored by Dr. Hoerter, many community colleges have become aware of this opportunity. He has also established laddering curricula with many of them. High school teachers also come here to take these workshops, and then in turn send us their better students for the program.

The Biotechnology Program sponsors seminars by visiting faculty and industry representatives who update our own faculty on matters of recent development in this rapidly-changing field, thus assisting in our professional development.

Through the research carried out by the students and faculty, and through the quality of the courses that are taught, the Biotechnology Program contributes to academic excellence in the community at large.

The Biotechnology Program contributes to the state and nation through the training of students in an area that has traditionally been ignored in the academic community at large: hands-on laboratory experience. Our graduates readily find employment because of the high demand for this training, and we have more requests for interns than we can fill.

Relationship of The Biotechnology Program to Other Programs:

For the first three years of its' existence, the Biotechnology Program was part of the Applied Biology Program. However, the differences between this and the other tracks of the Applied Biology Program were sufficiently significant to warrant establishing this as a separate program. These differences include: a reduced number of general education electives, an increased number of overall credits required to graduate, a very narrowly focused scientific curriculum which leaves very little choice in terms of electives, a requirement for three years of chemistry-majors level chemistry courses in addition to the biology courses (Applied Biology students are only required to take a minimum of one semester of non-majors chemistry), an emphasis on advanced laboratory classes, and a pre-requisite of a gpa of 2.7 for entry into the professional sequence. In addition to these major differences, the advantage to graduates in terms of salary was approximately \$5000/year, the program was separated from the Applied Biology Program and given its own standing.

The Biotechnology Program is similar to the Medical Technology Program in that both programs train students in labwork. Medical Technologists primarily work in hospital labs carrying out routine assays on blood or urine samples. Biotechnologists typically work in research labs or industry labs designing assays (that will perhaps someday be used by those medical technologists), splicing genes, purifying proteins from large or small scale cultures, culturing cells, sequencing DNA, mapping the genome, characterizing malignant transformations, designing drugs or testing them on animal cells, etc. This level of laboratory skill has traditionally been learned in graduate school. However, our program is not a graduate level program, because of the lack of involvement with the advanced scientific literature, and the lack of experimental design and independent research design and completion.

Program Strengths and Concerns:

The following are strengths of the program:

1. Quality hands-on training in laboratory skills
2. Quality teaching in all aspects of theory in the field of biotechnology.
3. A very focused curriculum.
4. Average costs
5. The small number of students, and increased teacher-to-student ratio in the lab.

The following are concerns of the program:

1. The program should be fully enrolled, with 15 students per academic year. However, the program can never be a generator of large numbers of student credit hours.
2. The program should review the use of computers by students.
3. We may consider requiring ENGL 321 for Science majors instead of ENGL 311.

BIOTECHNOLOGY PROGRAM ROLE AND MISSION STATEMENT

MISSION:

An understanding of the basic concepts of biology, a solid grounding in the liberal arts, an ability to communicate well in oral and written interactions, an understanding of basic concepts underlying biotechnical techniques, and an ability to carry out basic biotechnical procedures, are all essential for students to become productively employed members of the biotechnical community.

The mission of the Biotechnology Program is to provide a quality 4-year degree in biology, encompassing a good general education in liberal arts as well as a sound understanding of the basic principles and laboratory practices of biotechnology.

GOALS:

1. To increase student understanding of basic biological and chemical principles, and to increase student knowledge in basic areas of biology and chemistry.
2. To increase student ability in carrying out such technical skills as:
 - a. careful observation
 - b. attention to detail
 - c. record keeping and documentation
 - d. relevant calculations
 - e. taking direction
3. To increase student understanding of the basic areas of biotechnology.
4. To increase student awareness of, or ability in carrying out, such advanced technical skills as:
 - a. data manipulation and interpretation
 - b. experimental design with proper controls
 - c. combination of several techniques into a reasonable sequence
 - d. coordination of several projects for the maximum utilization of time.
 - e. following instructions at an intermediate to advanced level of difficulty, such as those found in research lab manuals and in technical literature supplied by product manufacturers.
5. To increase student awareness of the career opportunities in biotechnology.

OBJECTIVES:

1. To develop educational strategies designed to enhance the ability to think critically about scientific questions.
2. To develop educational experiences designed to increase the ability to function in a biotechnology laboratory.
3. To encourage student-faculty discussions about specific career opportunities in biotechnology.
4. To provide opportunities to observe biotechnology laboratories directly.

BIOTECHNOLOGY PROGRAM GRADUATES

STUDENT	INTERN SITE	JOB SITE
Glen Alberts	Pharmacia and Upjohn	Pharmacia and Upjohn
Dana Biroscak	Assay Designs	Assay Designs
Rebecca Bishop	FSU, Colvert	unknown
Scott Bowen	Cancer Center MSU; & Amgen	Cayman Chemicals; Parke-Davis
John Bryant	Parke Davis	Parke Davis
Dennis Buckley	FSU, Colvert	Neogen
Brian Chisholm	FSU, Buss	Jackson Labs, Bar Harbor Maine
James Corrigan	Nitrate Elimination Co.	Nitrate Elimination Co.; Cayman Chemical
Melissa Crane	Henry Ford Hospital	Dow Chemical/Dow Corning
William Cripps	Oxford Biomedical Co.	Oxford Biomedical Co.
Tawny DeWulf Dahring	none	UM Dermatology Research; Parke Davis
Ernest Delameester	MSU, Microbial Ecology	Pharmacia & Upjohn
James Epperson	FSU, Hoerter	UM Protein Facility
Tammy Fowler	FSU, Mitchell	U Wisconsin, Madison
Nicole Fuester	none	graduate school
Nicole Gerard	Parke-Davis	Pharmacy Dept, Meijers; Eli Lilly
Shelli Gaul	UM Medical Center	Parke-Davis
Martin Gaut	Cancer Res. Ctr; U Missouri	unknown
Laura Rentfrow Hagen	none	Enzyme Research Labs; Pharmacia-Upjohn
Jennifer Allington Hansen	MSU	Pharmacia/Upjohn
Carla Henry	Parke-Davis	graduate school
Lara Huetter	Northeast Missouri State	UM Animal Care Facility
Van Le Huynh	Parke-Davis	UM Molecular Biology Dept.; Cayman Chemi
Eric Jerks	University of Kansas	UM DNA Sequencing Core Facility
Howard Johnson	Pharmacia & Upjohn	Pharmacia & Upjohn
John Joubran	MSU, Food Science	Scripps Clinic and Research Institute
Dinh Luu	FSU; Hoerter	unknown
Jeff Magalski	Pharmacia & Upjohn	unknown
Angela Miller	FSU, Hoerter	Enzyme Research Labs? (Indiana)
Charlene Nichols	FSU, Hoerter	Greyson and Sons
Funmi Onowu	none	Genesys
Nicole Oswald	Parke-Davis	graduate school
Christopher Parrish	Pharmacia & Upjohn	Aastrom Biosciences
Gregory Poynter	Mayo Clinic	Mayo Clinic
Faith Prior	Iowa State University	Parke-Davis
Don Rempinski	FSU, Hoerter	graduate school
Chad Storer	Parke-Davis	Cayman Chemicals; Parke-Davis
Jon Supernault	FSU, Mitchell	Assay Designs
Robert Tierney	Kansas State University	graduate school
Jacob Tropea	none	UM Protein facility, then Genentech
Erik Troxtel	Cancer Res. Ctr; U Missouri	Lab Support
Shana Wallace	MSU; Pharmacia & Upjohn	Amway Chemical Labs

BIOTECHNOLOGY EXTERNAL ADVISORY COMMITTEE

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Sandra Rempel, Ph.D., Director, Molecular Neuro-Oncology Laboratories, Henry Ford Hospital/Case Western Reserve University, Detroit, MI nssan@neuro.hfh.edu

Doug Rivers, Ph.D., Vice President, Research and Operations, Michigan Biotechnology Institute, Lansing, MI rivers@mbi.org

Barbara Scheuer, M.T. (ASCP), Director of Operations, Assay Designs Inc, Ann Arbor, MI. assaydes@pipeline.com

SECTION TWO:

PROGRAM EVALUATION PLAN:

TECHNIQUES AND BUDGET

MEMO

FERRIS STATE UNIVERSITY

TO: Doug Haneline, Chair, Academic Program Review Committee
FROM: Connie Boogaard, Chair, Biotechnology Program Review Panel
DATE: October 31, 1997
RE: PRP budget

The Biotechnology PRP met October 30, 1997. The PRP accepted (with revisions) the Academic Program Review Document, agreed on a statement of purpose and scope for the review, assigned various surveys and data collection techniques to the people on the panel, estimated the number of individuals to be surveyed in each category, and arrived at an estimated budget. The budget is as follows:

Graduate Surveys: (~50)

Copying costs:	\$5.00
Mailing Costs:	\$19.20
Return Envelope Printing:	\$5.00
Return Mailing Costs:	\$19.20

Secretarial/Student Support:

40 hours at \$4.75/hour	\$190.00
Telephone Expenses:	\$300.00
Final Document Copying Costs:	\$75.00
External Advisory Committee Meeting:	\$400.00
TOTAL	\$1013.40

Two items on the budget require explanation. The telephone expense is likely to be high because our graduates are working all over the country: at Scripps Medical Research

Institute in San Diego, at Genentech in San Francisco, at the Mayo Clinic, etc. Since the biotechnology industry is a national and international community, our students are working at distant sites. The second item is the External Advisory Committee meeting. The members of the External Advisory Committee must travel to Ferris from as far as Detroit and Ann Arbor. Those members from that area must be provided overnight accommodation in Big Rapids. To keep meal expenses down, we plan to schedule the meeting for a Friday afternoon at 1 or 2 pm, offer dinner afterward for all, and accommodation to those three who travel from the Detroit/Ann Arbor area. If this cannot be approved, the alternative is a conference call. It should be pointed out, however, that the External Advisory Committee has not met for several years because of this problem.

MEMO

FERRIS STATE UNIVERSITY

TO: Biotechnology Program Review Panel

FROM: Connie Boogaard

RE: Minutes of the Meeting Nov. 20, 1997

DATE: November 21, 1997

All present except Swartz and Hart.

Boogaard reported that the budget was rejected as submitted. Doug Haneline, Chair of APRC, indicated that the maximum budget was \$800. It was decided to re-submit the budget less the \$213, and that Dr. Hoerter would apply for this money from the Dean.

The survey questions were reviewed and revised. The committee agreed to write questions that reflected the goals and objectives stated in the Role and Mission Statement of the Program, and simply asked graduates to compare themselves to other BS-level entry laboratory personnel or graduate students. Employers will be asked to compare graduates to other employees with the same background. The surveys are ready for copying.

Appendix F

Evaluation Plan Format

Program: Biotechnology

Degrees Awarded by Program: B.S. Biotechnology

Purpose: To conduct an evaluation of the Biotechnology Program in order to identify its strengths and weaknesses, and in doing so, to improve the program and its service to students, to the biotechnology industry, and to the academic community.

Data Collection Techniques and Information Sources:

Surveys of Graduates, Students, Employers, Faculty, Internal Advisory Committee and External Advisory Committee will be conducted. A labor market analysis will be made from public announcements of positions vacancies advertised in *Science*, which is the major forum for advertising technical positions. Nevertheless, only a small percentage of the total positions are advertised, since many; are filled by word of mouth. The curriculum, facilities and equipment, will be evaluated by program teaching faculty, in consultation with the advisory committee.

Schedule of Events:

Activity	Members	Target Dates
Graduate Survey	Boogaard, Colvert, Mitchell	4/30/98
Employer Survey	Hoerter, Hart	4/30/98
Faculty Survey	Hoerter, Boogaard	4/30/98
Facilities/Equipment	Boogaard, Colvert, Mitchell	4/30/98
Labor Market Analysis	Boogaard, Hoerter	4/30/98
Internal Advisory Committee	all members	4/30/98
External Advisory Committee	Boogaard, Hoerter	4/30/98
Curriculum Evaluation	all	4/30/98
Student Evaluation Surveys	Boogaard, Colvert, Mitchell	4/30/98

It should be noted that the Program Review Panel decided not to assign one "leader" to be responsible for each activity. Rather, all members taking part in each activity will be jointly responsible for that activity. All surveys have already been developed and agreed on, except the written survey of the external advisory committee. However, a meeting of the External Advisory Committee has already been held, and the input of the members was received orally at that meeting.

Signature of Program Review Panel Chair: _____

SECTION 3:

GRADUATE SURVEY

Summary of Survey Results

The Detailed Results of the Survey

GRADUATE SURVEY

Because our graduates must enter a highly competitive job market in which their peers often graduate from more prestigious institutions, we were concerned that they may have suffered some disadvantage for having come from a lesser-known school. We therefore asked, with some trepidation, that the graduates compare themselves to other BS-level entry laboratory workers in the areas indicated. Essentially, we wished to know if we could compete with these larger schools in giving the students what they need to succeed. The responses were very heartening to us, as our graduates overwhelmingly felt they had received a very valuable experience and excellent training. 88% had received a job offer.

For each of the first eleven questions on the survey, a response of "1" is considered the most desirable from the perspective of the biotechnology program. Any response less than "3" or "acceptable" is considered an unfavorable response. Graduates rated their chemistry background as "good" (2.1), their biology background as "excellent" (1.3), and their laboratory experience as excellent (1.1) compared to other BS-level graduates. When compared to other BS-level graduates, our graduates felt that their general education, technical writing, and math backgrounds were "good" (1.9, 2.2, and 2.2 respectively). They felt that, compared to other BS-level graduates, their problem solving and critical thinking skill were "good" (1.8). They expressed a very high opinion for the biotechnology program ("excellent" to "good", or 1.4), and a very high opinion of the biotechnology program faculty (1.4, or "excellent" to "good").

Graduates gave their lowest rating (2.6, or "good to acceptable") to their training in computer skills. We must consider the report of graduates that their computer skills need improvement. Most of these responses are from graduates who graduated previous to our last curriculum revision, when computer usage was increased in the program. It is only in the last year that we have been able to purchase a Power Mac for student and faculty use. Only our current seniors have been trained on it. In addition, this is the first year that the computer lab in the renovated science building has been available and used by our students. Therefore, this problem may have already been addressed, in part. We wish to continue to improve computer usage in the program. We will be asking for appropriate support for Mac use on campus.

Graduates gave their second lowest rating (2.2, or "good") to their experience in oral and interpersonal communication. Students take COMM 105 or COMM 121, plus ENGL311. It may be more appropriate to have students complete ENGL 321 for Science Students. This is a matter that must be referred to the Internal and External Advisory Committees.

In response to Question 12, graduates were equally divided between recommending public speaking or interpersonal communication.

In response to Question 13, "Was there any one course which was least beneficial to you?", graduates answered: statistics (3) (because "too poorly taught"), ecology (2) (this course is no longer required by the program), calculus(3) or any math above trig (the program does not require such courses), technical writing, Pharmacy Biochemistry (no longer required), Quantitative Analysis.

In response to Question 14, the most beneficial course was identified as “all lab courses” or “lab work in general” (3), biochemistry lab (3), “all core biotech classes”, “outside of the science classes, Technical writing (2), and statistics were extremely useful”, “Molecular Biology and lab”, Protein Purification lab (3).

Under the request for “comments”, the following (paraphrased) responses were made:

1. Move the Advanced Biochemistry to the senior year (this has already been done)
2. “I feel fortunate to have chosen a program as well run and highly advantageous” as this one.
3. “Thanks to the program, I have been able to impress my employer and have obtained recognition (in the company) on several occasions.”
4. Improve computer usage (3) (especially Macs, 2) and grade harder on lab notebooks. Reduce salary expectations (2).
5. Increase biochemistry lecture time, and enzyme kinetics experiments and HPLC in lab.
6. Emphasize labwork and undergraduate research. Embryology was not relevant.
7. Visit more biotechnology facilities.
8. The program is unique; the training is excellent. A Ferris grad is ‘hands-down more prepared’: The program offers the equivalent on one year of work experience. The program should advertise itself better. Extend the Recombinant DNA class to 2 semesters.
9. I was very well-prepared. I hardly needed to be trained in the lab. But, include more information on manufacturing.
10. I recommend the program to students that I now supervise.
11. Do a better job with placement.

The following uses will be made of these findings:

1. They will be reported to the Internal Advisory Committee for their scrutiny, evaluation and recommendations. The committee continually reviews the curriculum, as an on-going exercise. Since the reviews have been so positive, we do not anticipate any major changes.
2. The unofficial policy has been to allow students to complete either COMM 121 or COMM 105, and we may decide to make this the official policy.
3. They will be reported to the Biology Department Head and to the Biology Department Faculty.

Graduate Survey of the FSU Biotechnology Program

Dear Graduate: The Biotechnology Program is being reviewed this academic year, and the Program Review Panel would appreciate your candid responses to the following questions. Please **circle your responses** and **return this form as soon as possible** in the post paid envelope. Thank you very much. You can elaborate on your responses, if you wish, on the backside of the questionnaire.

I entered Biotechnology as: (circle one) I graduated in 199 . 90-2 91-2 94-1 96-6 97-2

a. a freshman? (1)

b. from another program at Ferris? If so, which one? Pre-Pharm-6, Pre-Opt-6, Directed Studies-1, BSN-1

c. a transfer student? (2)

	Excellent (Top 10)	Good (Top 1/3)	Acceptable (Middle 1/3)	Below Expectation (Lowest 1/3)	Poor (Bottom 10%)	Unknown	Average
1. Compared to other BSc entry- level lab personnel or graduate students, my background in chemistry was:	1 (4)	2 (8)	3 (5)	4	5	U	2.058
2. Compared to other BSc entry- level lab personnel or graduate students, my background in biology was:	1 (12)	2 (5)	3	4	5	U	1.294
3. Compared to other BSc entry- level personnel or graduate students, my laboratory experience was:	1 (16)	2 (1)	3	4	5	U	1.058
4. Compared to other BSc entry- level lab personnel or graduate students, my problem solving and critical thinking ability was:	1 (6)	2 (9)	3 (1)	4 (1)	5	U	1.823
5. Compared to other BSc entry-level lab personnel or graduate students, my background in computer usage was:	1 (3)	2 (5)	3 (4)	4 (5)	5	U	2.647
6. Compared to other BSc entry-level lab personnel or graduate students, my background in math was:	1 (2)	2 (10)	3 (5)	4	5	U	2.176
7. Compared to other BSc entry-level lab personnel or graduate students, my background in technical writing was:	1 (3)	2 (7)	3 (6)	4	5	U (1)	2.187
8. Compared to other BSc entry-level lab personnel or graduate students, my experience in oral and interpersonal communications was:	1 (3)	2 (7)	3 (7)	4	5	U	2.235
9. Compared to other BSc entry-level lab personnel or graduate students, my background in general education (social awareness and cultural enrichment) was:	1 (6)	2 (6)	3 (5)	4	5	U	1.941
10. My opinion of the level of expertise of the biotechnology program faculty in their professional areas is:	1 (10)	2 (7)	3	4	5	U	1.411
11. My overall opinion of the biotechnology program is:	1 (11)	2 (4)	3 (2)	4	5	U	1.47

10./11. You must realize however that I graduated from this program in 1990. I'm sure that the faculty and curriculum have changed over the years.

11. I thought that a more general/basic biotech prep class(es) was needed when I was in the program. We jumped very deep into difficult subject matter early in the program, before good foundations were laid with the students.

12. Would COMM 105 (Interpersonal Communication) or COMM 121 (Public Speaking) be most helpful? (circle one) (8) (9)

- COMM 105—Too many topics covered in that class were simply “common sense”.
- COMM 121—Excellent for making presentations and proposals.
- I have been called on to speak publically many times since I graduated and found my COMM 121 by far more useful than the blow-off class 105.
- Public speaking in which a journal article is reviewed and presented would be most helpful.

13. Was there any one course which you can identify as being least beneficial to you in your career?

- Statistics
- Embryology & Development—The class was not a waste of time by any means. It just doesn't apply as much as the other courses.
- I thought the statistics class had the potential to be useful, but was so poorly taught that it was the least beneficial.
- Calculus. (Any math above trig.)
- Technical Writing. . .the course that I took focused too much on the technical description of a mechanical device instead of scientific writing.
- Ecology
- Calculus
- Pharmacy Biochem as it was more geared toward medicine. I was fortunate/unfortunate in that I took Dr. Colvert's as well and was much better suited to industry/academia laboratory Biochemistry.
- Can't think of any right now.
- Statistics
- Quantitative Analysis

14. Was there any one course which you can identify as being most beneficial to you in your career?

- All lab courses were very helpful.
- BIOCHEMISTRY LAB.
- I think all of the core Biotech classes gave me an edge that no other BSC graduates had.
- Outside of science related courses, English 310 (?), Technical Writing, was very helpful with resumes and technical papers. Also Statistics for Biology was extremely useful.
- Molecular Biology/lab experience.

- Biochemistry & Lab
- Protein Purification Lab
- Technical writing with Bulkema/Biochemistry Lab write-ups with Dr. Colvert. Writing is absolutely critical in industry.
- More visit to biotechnology facilities.
- Protein Lab
- Protein Purification Lab class
- Any of the hands on experience. The lab experience I experienced was definitely most beneficial.
- Not one course, but lab work was highly beneficial in general.

15. Have you **received** or **accepted** a job offer in a biotechnology-related area?

Yes No
(15) (2)

- Yes, but as a temporary only.
- Yes- accepted.
- Accepted right after my internship

In the space below, please make any comments you feel would be helpful.

I feel that moving the Advanced Biochemistry course to the senior year would be more beneficial. More opportunity for independent study. Many of the people I work with had projects of their own in college. Mayo employs many research tech from the University of Wisconsin-Eau Claire; they seem to have an excellent background in Biochemistry and Molecular Biology. I'd suggest looking at their curriculum, or maybe contacting the department chair for ways to improve Ferris' Biotech program.

I've had several job interviews & offers. The Biotech program prepares the graduates for a very wide area of science. I've been offered chemist positions, product development jobs, a career in quality assurance, etc. The biggest thing on my resume (that gets me noticed by hiring personnel) is the hands-on experience I've had with sophisticated laboratory equipment. HPLC has been the number one lab skill sought by all of my potential employers.

I'm working for a major fruit processor at this time. Although I'm not doing anything 100% Biotech, there are plenty of things in the job that require me to use the knowledge and lab skills I obtained through the Biotech program. Enzymes are the major "ingredients I work with every day. I have confidence when a new enzyme problem comes up; whereas, the others in the lab prefer to shy away.

Thanks to the intensive program, Biotechnology at FSU, I've been able to impress my current employer and have obtained recognition (in the company) on several occasions.

I feel fortunate to have chosen a program as well run and highly advantageous as the FSU Biotechnology Program. Keep up the great work.

Computer use was limited to courses taken when extra credits were needed, or small usage in Dr. Mitchell's recombinant class. In my job, we use Mac's so learning an IBM is not that useful, although there are some similarities.

Students need to be graded harder on lab notebooks. Mr. Hartley's Advanced Immunology was the only class where this happened. This "style" needs to be introduced earlier in order for students to get in the habit of having a good note-book → one that can be used as a reference by others in the company. Also, students need more real world information. The world doesn't revolve around R & D scientists making \$30K/year.

The areas that should be stressed from a lab experience point include:

1. Nucleic acids—Northern, Southern, etc.
2. PCR amplification
3. Cloning
4. Transfection of cells in culture
5. Sequencing
6. Protein analysis—SDS Page & immuno-blotting
7. In Situ hybridization

Good Luck!

--Tawny Dahring (DeWolf)

1. More time w/ Biochemistry courses (lecture) maybe 2 semesters of book & then the semester of Advanced Biochemistry. Included more lab time spent on kinetics study's of specific proteins (i.e. K_m , K_i , Dose Responses W/ inhibitors, reversibility) (Also use of μM nM dilutions)
 2. More updated equipment. (electronic pipetors, channel pipetors, plate readers) (I know funding is low but these are in heavy use in industry).
 3. More HPLC purification exposure.
-

Students need to be trained in the use of Mac's vs. PC's. They also need to be given more realistic idea of what starting salaries are.

I am not sure if the courses are presently the same as those I had taken but I will talk in the past. Computer & writing skills are/should be considered as important as the Biotech core classes themselves. I do not think there is such a thing as too much of either. For me and my current profession I believe that embryology could have been taught better for example instead of going through the first ¼ of the book in 10 weeks, a sort of big picture to the scheme of things could have been more useful. I currently work in research and very rarely am I hearing about most things we learned in the class it was pertinent for ophthalmology not for Biotech. An overview could be done in a longer lecture orientated class in the tissue culture classes. BTW tissue culture is a must as was most of the Biotech lab classes/Biochem labs. Undergraduate research should be emphasized, as if one is not fortunate enough to get an intern, job prospects will be nil, as this is a must for any CV. Overall I was happy with my education with the exception of my outdated knowledge of computers. Computer language/minor programming should be a major concern.

The Biotechnology program at Ferris has done an excellent job preparing it's graduates to perform in their chosen careers. Each student is given the opportunity to gain the necessary knowledge and skills to be a complete success in their field. The program is unique, so there are no other programs to compare directly with. The closest thing to compare would be a Biochemistry or Molecular Biology program. When looking at the two graduates side-by-side there is no competition the Ferris grad. is hands down more prepared. It's almost as if the Ferris graduate has already had a year of work experience or more.

But being the best doesn't matter if nobody knows about you. The only flaw the program has is that it doesn't advertise itself well. The program has been called one of the top Biotech schools in the U.S. But the program is not even well known in it's own home state. I feel if this problem were corrected it would make an excellent program even better.

I also think that the Recombinant DNA course should be extended into 2 semesters, allowing the students to work with RNA, RT-PCR, and recombinant protein expression. The lab courses should be allowed to interact with each other, having experiments that are done in two or more lab course. Since one of the unique things about biotech is that it crosses over between traditional Biochemistry and Molecular Biology.

One concept that should be considered is manufacturing areas. I had no knowledge or pharmaceutical manufacturing. Many technical skills are needed for this area.

I was very prepared for my first lab position. I am currently in a department (Pharmaceutical Technology) in which we support manufacturing, problem solve, and use many critical thinking techniques. Overall this program prepared me quite well. I hardly needed to be trained in the lab because of the lab courses and my internship prepared me for my first job.

I work in an environmental lab. Most of my work is chemistry related. However, the Biotech Program definitely prepared me for the lab work I currently do. I would recommend the Biotech Program to any of my younger peers. In fact, I'm currently a supervisor of college age students + have recommended the program to them.

You must do a better job with placement. It took me too long--2 years! No kidding! to get here from graduation day.

P.S. Hello Mrs. Bacon! Hope things are well. Cleveland is a mess--no snow, too much roadwork, & too much traffic. Job's good, tho. Wanted you to know, I'm at Case Western, under a Dr. Glenn Kirsch, working on sodium channels and kidney disease. The only reason I got the job was because of my tissue culture experience, at Ferris and at Neovcom (Grad school didn't work out). Find myself thinking of Big Rapids as "home" on occasion.

P.S. FSU Bulldogs/Detroit Tigers--Forever!

Drempinski@research.mhmc.org

--Don Rempinski

SECTION 4:

EMPLOYER SURVEY

Summary of Survey Results

Detailed Results of Survey

EMPLOYER SURVEY

The survey of employers of biotechnology program graduates was carried out by Dr. Jim Hoerter, the Biology Department Head. He was supplied with a list of graduates and their employers, where known, and a list of questions, which Dr. Connie Boogaard had compiled. In his survey, the following problems were encountered:

1. The biotechnology industry undergoes rapid turnover in its employees, especially at the higher levels. Although our graduates usually are not hired into senior positions, this instability at the higher levels of industry means that very often the person who supervised our graduate at his/her first job is no longer with the same company. This made it difficult to contact supervisors. 40% of the employers of our graduates responded.
2. The biotechnology industry is nation-wide, and graduates often take advantage of this to move about and see the country. They do not stay in their first positions very long. If they do not move up within the company, they usually move on.
3. Graduates get married, change their names, and move away, without letting us know their new whereabouts.
4. Graduates have children and stop working for a few years to raise them.
5. Supervisors are very busy and do not wish to take the time to answer surveys. Dr. Hoerter found that if the survey could be conducted by e-mail, there was a better chance of getting a response.

Employers were asked to rate the graduate with other BS-level entry laboratory workers. Thus, our graduates are competing statewide with graduates from the state's major institutions, and competing nation-wide in a like manner. Following are the questions asked of employers. The responses obtained are summarized after each question.

1. Compared to other BS entry-level laboratory personnel, how has our graduate performed in the lab?

100% of employers felt that our graduate had performed very well, or superior, or far above average, etc. in the lab.

2. Compared to other BS entry-level laboratory personnel, how was our graduate's academic preparation?

92% rated our graduates, in comparison to other employees, as "better than others" or "good" or "compared favorably".

8% indicated "holes" in the employees preparation (plants), but that the graduate had sufficient background in basic science to pick up the material.

3. Compared to other BS entry-level laboratory personnel, how was our graduate's oral and written communication skills?

85%: "Fine", "very good", "much above average", "excellent", "above average, with superior lab note-taking", "very good on average, but variable", "above average"

8%: "average"

8%: "could have been a little better but he is learning quickly"

We make note of the fact that employers of our graduates estimate their communications skills to be at a higher level than the graduates themselves (see graduate survey).

4. Compared to other BS entry-laboratory personnel, how was our graduate's computer skills?

Very good: 8%

Above average: 8%

Average: 23%

Below average: 31% (two: require Mac use)

"Hard to measure"; or, "job does not use computers": 31%

We make note of the fact that our graduates' computer skills are less than satisfactory. Most of these responses are from employers of graduates who graduated previous to our last curriculum revision, when computer usage was increased in the program. It is only in the last year that we have been able to purchase a Power Mac for student and faculty use. Only our current seniors have been trained on it. In addition, this is the first year that the computer lab in the renovated science building has been available and used by our students. Therefore, this problem may have already been addressed, in part. We wish to continue to improve computer usage in the program. We will be asking for appropriate support for Mac use on campus.

5. In what area was our graduate best prepared for the job?

71% indicated the employee was best prepared by familiarity with a variety of lab techniques and understanding experimental procedures. The second most widely mentioned strength was lab record-keeping and documentation (14%); followed by analytical thinking skills, good broad education, organizational skills, or others, such as a good attitude, etc.

6. In what area was our graduate least prepared for the job?

There was no one area identified by many employers, so that the inadequacy may result from the unique situation in which each employee is placed. The answers were: Computer skills, excessive salary expectations (2); written skills; lack of hands-on experience; data interpretation; analytical instrumentation and statistical analysis; no complaints (2); chemistry knowledge; lack of exposure to manufacturing and production aspects of biotechnology.

7. Would you hire another of our graduates?

Yes: 92%. (Four of the companies have already hired multiple graduates.)

No: One response (8%)

8. For our information, is professional behavior at the BS entry-level position a matter of concern to you? What aspects of professional behavior do you consider important for entry-level personnel?

All: Yes. Attributes listed include: attitude, willingness to learn; ability to get along with others; professional behavior; ability to ask questions; responsibility; maturity.

The following uses will be made of these findings:

1. They will be reported to the Internal Advisory Committee for their scrutiny, evaluation, and recommendations.
2. They will be reported to the Department Head and the Biology Department.
3. The Internal Advisory Committee will consider the importance of computer skills in the program. This issue has in part already been addressed, but it will remain on the table as an issue which must be continually re-examined. We have recently instituted more computer usage and have purchased a Mac for students and faculty to use. However, this matter will be re-evaluated.

**BIOTECHNOLOGY PROGRAM REVIEW
EMPLOYER SURVEY**

I have answered as best I can. Hope this is adequate in helping you assess and improve your program. Overall I am very impressed with your graduates and would hire again from your school.

1. Compared to other BS entry-level laboratory personnel, how has our graduate performed in the lab?

Scott has performed very well – above average compared to other personnel. Good technique and skill. Very careful.

She is doing very well. We have hired her as our HPLC technician.

Both Dana and Jon Supernault have performed extremely well in our labs. Their level of skill seems to be higher than the average Biology/Biochemistry grad. We have been pleased with both of them.

Jim Corrigan is very eager to learn and has worked out really well in the lab.

She was hired into a Technologist position requiring a minimum of an Associate's degree in Chemistry. We are very pleased with her performance relative to other technologists we have hired.

Better to superior than average preparation in technical aspects of ELISA, PCR and hybridization assays. Seemed to have a better idea as to safety issues.

His performance has been far above the average.

Ferris Biotech grads have been above average compared to many BS Chemist grads. Several of them have been a few years older than typical graduates, and are therefore more mature. (3 employees)

Better.

Jake had 2 years of experience before joining my laboratory and he has performed well.

Jon's lab skills are definitely above average compared to other BS entry-level lab personnel. Students from other programs usually have to be shown how to use a pipet.

2. Compared to other BS entry-level laboratory personnel, how was our graduate's academic preparation?

Better than others.

Her preparation was good. While she didn't have extensive HPLC experience, she did have the necessary skills to pick it up rapidly and adapt to the systems we have in our lab.

Academic skills were as good as other people we have hired.

His schooling has probably been a big help but we hired him after he had worked in the field for a year.

Chemistry is not as well understood due to the degree not being in chemistry. Employee has shown tremendous initiative and energy in addressing this by taking evening courses in chemistry.

This is hard for us to judge since we deal with plants. Obviously there were holes, but the necessary background in chemistry and biology (physiology?) seemed to be there to help plug them in significant ways.

The only thing I measure in his academic training was how well he can follow instructions, written or oral. He has done well. He is favorably compared to other personnel in this respect.

Good match for my area's needs (biotech product registration activities and manufacturing support). Could benefit from greater exposure to more analytical instrumentation. (3 employees)

Similar.

His background knowledge is better on average compared to other recent graduates.

Jon's academic preparation is also above average in comparison to other personnel with BS degrees.

3. Compared to other BS entry-level laboratory personnel, how were our graduate's oral and written communication skills?

Much above average. Scott has given some excellent talks in some of our meetings and his technical writing is also above average.

Her oral skills are fine; we give presentations of recent papers in our company on a rotating schedule. She performed very well even the first time she had to present. For her written skills, they are fine except for her use of word processing programs (see below).

Oral and written skills seem to be very good.

His written skills could have been a little better but he is learning quickly.

Excellent from what I can gather so far.

These skills were about average, with the notable exception that Ms. Ness had superior training in laboratory note taking. The importance of this aspect of laboratory behavior cannot be overstressed.

Initially, he needed some coaching, probably not because of his lack of communication skills, but because of the complexity of the projects and multidisciplinary nature of the research project. This is very common with all personnel with BS or MS.

Very good on average, although quite variable similar to that seen in other school's programs. (3 employees)

Similar.

Jake's oral and written skills are about average compared to other recent graduates.

Other than handwriting that is sometimes hard to read, he does well.

4. Compared to other BS entry-level laboratory personnel, how were our graduate's computer skills?

Adequate. Hard to compare here since the job doesn't require extensive computer training.

Being able to write is great, but it doesn't do much good if the format looks horrible. I had to teach her the use of MS Word so that when I asked her to do revisions on a paper it wasn't difficult. Fortunately she is familiar with computers, so she picked up the skill quickly.

Bad, both came to us only knowing Windows. As we are a completely Mac environments both had to be retrained to use the operating system used mostly in biotech, chemistry and other fields.

He has had no problem adapting to our computer system.

Can use the essential Window's 95 software. Have not had the opportunity to evaluate on Instruments and related software but don't anticipate a problem.

Well above average—but she had been a supervisor in your school's computer clusters.

His computer skills are the best I have seen. This is in part due to his prior training in vocational electronics.

Hard to measure. It seems as if most learning is on the job. (3 employees)

Similar.

His computer skills were below average for other recent graduates.

Jon definitely knows his way around a computer but Biotech students need to be trained on Mac's instead of PC's due to the fact that Mac's are preferred in the majority of scientific settings.

5. In what area was our graduate best prepared for the job?

Broad exposure to a variety of lab techniques. Very detail oriented, especially in regard to keeping a good notebook. Great attitude about doing whatever is asked. One can never undervalue the necessity for a good attitude and excitement about work. If a new hire lacks some of the skill for particular techniques, they can always be trained (if they have the right attitude).

I was pleased that she seems to have a good, broad education which has prepared her for additional learning in several areas.

Laboratory skills especially were very good. They seem to have a better understanding of experimental procedures than other grads.

He was very familiar with lab work, which has been a great help.

Work ethics, organizational skills, initiative, interpersonal skills, willingness to learn from others.

Previous exposure to the diversity of assay types used in a diagnostic laboratory. Note taking ability.

He is best prepared in computers and general laboratory procedures.

Molecular biology, protein handling and characterization techniques, have some experience in biological systems including rabbit bleeding. (3 employees)

Lab experiment.

His analytical thinking skills are better on average than many recent graduates.

Jon was best prepared in his knowledge of lab techniques due to the wide range of lab experience that Biotech students receive at Ferris.

6. In what area was our graduate least prepared for the job?

At the BS level it's really hard to have good training in all the biochem techniques – especially when there are so many. The basics must be the area to do the training at this level and I think Scott has good understanding here.

Her computer skills.

Salary levels and what goes on in Biotech. Salary expectations were totally out of sight for starting positions in the industry, sure 1 in 1,000 may get a starting salary of \$30k, but the other 999 get a normal salary. They also are pushed toward R & D and almost no emphasis is place on QC, Manufacturing, Tech Service, etc. which are most of the jobs out there. Everyone does not work on discovering penicillin!! They also have no skills in what is normal in the Biotech industry in terms of Stock Options, Venture Capital funding, SBIR programs, etc.

His written skills

Lack of hands on experience.

No real complaints.

He needs more exposure to data handling and application of textbook concepts in data interpretation.

Could benefit from more exposure to analytical instrumentation and statistical analysis. (3 employees)

No idea.

Jake's knowledge of chemistry is extremely deficient. This is a very important area for most field in biochemistry and biotechnology and is almost impossible to learn on the job.

Jon was least prepared in knowing what to expect for starting salaries. Generally speaking, they're much lower than students are led to believe. It would also be beneficial if students were given some experience in Production (Quality Control, Manufacturing, Product Support, etc.) instead of only focusing on R & D.

7. Would you hire another of our graduates?

Yes.

Yes, our company has actually hired three other recent graduates from Ferris. They are Chad Storer, Jim Corrigan, and Scott Bowen. If you would like to speak with their supervisors they are Dr. Gong Chen (gong@caymanchem.com), Jenn Johnson (jenn@caymanchem.com), and Dr. Jeff Johnson (jeff@caymanchem.com) respectively.

We have hired 2 Ferris grads and would hire more. We will also look at more interns from Ferris.

We have hired three graduates from Ferris and all of them have been working out fine.

Yes, most definitely.

Yes.

I would consider your graduates for interviews.

Yes. (3 employees)

No.

Yes.

Yes, definitely!

8. For our information, is professional behavior at the BS entry-level position a matter of concern to you? What aspects of professional behavior do you consider important for entry-level personnel?

Absolutely! Attitude (as mentioned above) – positive, eager, willing to learn and try new things, willing to do whatever is asked, approachable, gets along well with other employees; Don't gossip; See co-workers as valuable team members.

Yes it is important. While our company tends to have a casual atmosphere, it is important for employees to maintain a certain level of professional behavior in any workplace. To maintain a comfortable workplace, employees must know how to dress and act appropriately in any environment. I also like to see interviewees dress like a professional (preferably a suit) and present a professional resume. I tend to immediately trash any resume with blatant errors – any professional knows to have their work proofed or to at the very minimum to use spell check.

The most important professional behavioral concern is the ability of the new employee to fit in and be productive. This means they have to be able to express themselves well and be able to ask lots and lots of questions. I hope this helps.

We expect our employees to learn our product line very well so that they can talk to customers, as well as, represent Cayman Chemicals at trade shows. We feel professional behavior is very important. I hope this information will help Ferris.

Maturity in handling responsibilities which include being totally reliable and trustworthy in delivering on the commitments. Being able to learn and practice science-based activities is critical. In this case, supervising college co-op students required a professional attitude and maturity on the part of the new hire. Being able to separate social from professional is also important.

Absolutely. Trainability—the “I know it all” syndrome is not wanted. Listening. Asking questions. Ability to cooperate with other people in cramped working areas while maintaining a pleasant and cooperative demeanor. If you have further questions please write.

We like Glen for his good work ethics and his steady demeanor.

Yes, I look for maturity and a professional attitude of doing what it takes to get the job done versus punching a clock. (3 employees)

(No answer)

We screen our job application very carefully and professional behavior is high on list of essential attributes. Some important aspects of professionalism include: doing the best job possible and willing to assist any employee who requests assistance with a problem.

I think it's important for Ferris Biotech graduates to realize that their jump on other BS graduates due to their lab experience will allow them the opportunity to quickly impress their employers. This will enable them to advance rapidly in the company but only if they have the right attitude to go along with that experience. Hope this helps!

SECTION 5 :

INTERNAL ADVISORY COMMITTEE PERCEPTIONS

Summary of Survey Results

Detailed Results of Survey

INTERNAL ADVISORY COMMITTEE PERCEPTIONS

The Biotechnology Program has had both an Internal and an External Advisory Committee since its inception. The Internal Advisory Committee is composed of all those who teach in the professional sequence, biotechnology-only courses, plus the heads of the Biology and Physical Sciences Departments. . It meets regularly, usually once or twice a term, to discuss matters regarding the administration of the program, the organization of the laboratory, curriculum revision, outcomes assessment, and other matters that affect the program. It offers advice to the Program Coordinator on these issues.

The current members of the Internal Biotechnology Advisory Committee are:

Ms. Mary Bacon, Biology
Dr. Connie Boogaard, Biology, Coordinator
Dr. Kim Colvert, Physical Sciences
Dr. Dave Frank, Physical Sciences Department Head
Mr. Frank Hartley, Biology
Dr. Jim Hoerter, Biology Department Head
Dr. Roger Mitchell, Biology

These people were asked to fill out the survey on the following page. Their responses can be summarized as follows:

The internal advisory committee members “strongly agreed” that the program is academically strong (1.2), offers quality instruction in lab technology that is not available at most undergraduate institutions (1.0), and have referred students to the program (1.0). They also “agree” to “strongly agree” that the program is technologically sound, meets the goals and objectives stated in its Role and Mission Statement (1.4), and is administered effectively (1.6). They felt that the program costs are in line with other science-based programs at FSU (2.2). In fact, the Biotechnology Program is in the middle one-third of all programs, with an average cost of \$126/sch, very nearly the average. The members of the internal advisory committee were “neutral to agreed” (2.4) that the facilities and equipment are sufficient to support quality education. This may reflect the major problem of a roof that leaks into a room full of very expensive electrical equipment, as well as the lack of any repair budget. The committee members also were “neutral: (3.0, the lowest rating), of the statement that support services are sufficient. There are no support services for biotechnology courses, such as those that are enjoyed by other biology courses. We have no lab prep person, and no lab support personnel.

Under comments, the following were noted:

The program is technologically sound.

There is a major need for lab support personnel, both to prep the wet labs, and to maintain the laboratory facility and equipment.

The roof needs to be fixed (this has already been scheduled) and the noise volume reduced, so that students can hear.

There needs to be a budget for equipment repair.

There are problems between the department in which the program physically resides (Physical Sciences) and the department which offers the program (Biology). There is no mechanism for conflict resolution. For reporting and responsibility purposes, the department where the program is located administratively needs to be identified.

These results will be made available to the Advisory Committees, the Biology Department and the Biology Department Head.

ADVISORY COMMITTEE PERCEPTIONS OF THE BIOTECHNOLOGY PROGRAM

The Biotechnology Program Review Panel would appreciate your candid responses to the following questions. Please circle your responses and **return** this form **as soon as possible** to Ms. Laurie Daniels, Biology Dept., ASC 2004.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Unknown	Average
1. The Program is academically strong.	1 (4)	2 (1)	3	4	5	U	1.2
2. I would\have refer(red) students into the Program.	1 (5)	2	3	4	5	U	1
3. The program is technologically sound.	1 (4)	2	3 (1)	4	5	U	1.4
4. The Program is administered effectively.	1 (2)	2 (3)	3	4	5	U	1.6
5. The facilities and equipment are sufficient to support quality education.	1	2 (3)	3 (2)	4	5	U	2.4
6. The support services are sufficient to support quality laboratory experiences.	1	2 (2)	3 (1)	4	5 (1)	U (1)	3.0
7. The Program meets the goals and objectives stated in its Role and Mission Statement.	1 (3)	2 (2)	3	4	5	U	1.4
8. The Program costs are in line with other science based programs at FSU.	1 (2)	2 (1)	3	4	5 (1)	U (1)	2.25
9. The program offers quality instruction in lab technology that is not available at most undergraduate institutions.	1 (4)	2	3	4	5	U (1)	1.0

In this space and on the reverse side, please comment on any of your responses. The PRP is most interested in identifying what you perceive as strengths, weaknesses and problems in the Biotechnology Program. Thank you.

The biotechnology program is very strong and provides students with unique, invaluable experience.

Its greatest strength is its lab courses, which guarantee that any student successfully completing the program will be well prepared for either a bachelor's level industry job or graduate school in the biological sciences. The students are exposed to a variety of lab instructors and a phenomenal range of lab techniques.

There are some problems in the program. These have not yet seriously compromised the quality of student education, but solving them would reduce potential for future difficulties. First, the program has no storage facilities of any kind. Second, the program does not have dedicated lab support personnel as most other lab courses do. Third, facility inadequacies (roof leaks and excessive hood noise in SCI room 337) will prevent teaching more than about five students per class for some instructors, and may lead to expensive equipment damage. Fourth, the lack of a regular budget for equipment repair or replacement is an ongoing source of worry. Finally, years of small changes have placed many important functions of the program coordinator in limbo between Biological Sciences, Physical Sciences, and the Biotechnology program itself. Authority for such functions as room layout, equipment placement, utility work, and room key management must be returned to the program coordinator if this program is to remain strong in the long term.

The following problems exist in the program: The program is administered by one department, and is physically located primarily in another department. There is conflict between these two regarding use of the facilities. The two groups do not agree on who is in control of the facilities, and there is no established procedure for deciding these questions when the facilities are located in a different department from the one which administers the program. This problem is compounded by the absence of any support personnel to manage the facilities and laboratory. This means that no one is in charge of making decisions about where things should be placed, maintaining a policy on loaning out equipment, or equipment repair, or even equipment location. If one teacher moves items without telling all others (and this is time-consuming and difficult to ensure, because often all are not present at the same time), then that one who is not told is unable to find needed equipment at the moment when the lab is full of students.

There is no mechanism of conflict resolution. This in turn leads to negative personal interactions among the members of the group. The program coordinator, having no jurisdiction in a different department, is not able to resolve disputes.

The program badly needs a facilities manager and a lab prep person.

As currently designed, the biotech program provides an excellent foundation in biochemistry/biology within the context of a bachelor's degree. The students have an exposure to a wide variety of laboratory techniques. Graduates have been successful in industry, graduate school and medical school. I wish more students were taking advantage of the opportunities this program offers.

Dave Frank

While more expensive to run than a traditional BS Biology degree, this degree in Biotechnology gives something far more valuable to its graduates—employment and the ability to critically think coupled with highly skilled training.

SECTION 6

BIOLOGY FACULTY PERCEPTIONS OF THE BIOTECHNOLOGY PROGRAM

Summary of Survey Results

Detailed Survey Results

BIOLOGY FACULTY PERCEPTIONS

Although all Biotechnology students take several courses offered in the Biology Department, all departmental offerings are not included in the program. Therefore, there are many Biology Department faculty members who do not have direct interaction with the Biotechnology Program. In addition, because the program is small in size and many courses that the program students take are shared with such large groups as pharmacy and optometry, many department faculty have only very indirect or peripheral interactions with the program. In addition, "Biology" in general is a very broad area, including all the various forms of plant, animal and microbial life, studied at all the various levels, from molecular and biochemical to physiological to organismal and ecological levels. This great diversity sometimes leads to an isolationism within so vast a field, where members of the same department can have relatively little understanding of each other's endeavors. This program is the most recently developed in the department, and it occupies a relatively new niche in the field of biology. Therefore, several department members are unaware of the difficulties and endeavors of the program.

All permanent faculty members in the Biology Department responded to the survey. The Biology faculty rated the program as being consistent with the FSU Mission Statement (1.4), and consistent with the goals and objectives of the Biology Department (1.5). The Department recognizes the program trains students for successful careers in labwork (1.7) and believes the program offers students sufficient opportunities for critical thinking and problem solving (1.8). The Biology faculty also agrees that the program offers students an opportunity to pursue academic and technological excellence (1.3), that the courses are arranged in a logical sequence (2.1), and offer the students sufficient opportunity to develop good oral and written communication skills (1.8). The Department faculty also agreed that the program offers students sufficient opportunity to master a broad knowledge of the major areas of biotechnology, in reasonable depth (1.3). The Department also recognizes that the program responds to the needs of a growing industry (1.4), and that the program is hindered by a lack of sufficient storage space (1.6) and by a lack of sufficient lab support personnel (2.2).

Question 5 ("I would like to be provided more information about the program.") was included to discern if the faculty would be interested in knowing more about the endeavors of the program. The department seems to be divided on this matter. Six individuals agreed or strongly agreed, while 9 indicated a lack of interest. One individual, who checked "Unknown" for 10 out of 14 questions, did not respond to this question. In addition, one individual expressed dissatisfaction with the leadership of the program. Nevertheless, the department as a whole sees itself as supporting the program (1.9).

These results have been made available to the department, the department head, and the internal advisory committee.

BIOLOGY FACULTY PERCEPTIONS OF THE BIOTECHNOLOGY PROGRAM

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Unknown	Average
1. The Biotechnology Program is consistent with the FSU Mission Statement.	1 (10)	2 (6)	3	4	5	U	1.4
2. The Biotechnology Program is consistent with the objectives and goals of the Biology Department.	1 (8)	2 (7)	3	4	5	U (1)	1.5
3. The Biology Faculty support the Biotechnology Program.	1 (5)	2 (7)	3 (3)	4	5	U (1)	1.9
4. FSU Administration supports the Biotechnology Program.	1 (2)	2 (8)	3 (3)	4	5	U (3)	2.1
5. I would like to be provided more information about the endeavors and concerns of the Biotechnology Program.	1 (2)	2 (4)	3 (7)	4	5 (2)	U	
6. The Biotechnology Program offers students an opportunity to pursue academic and technological excellence.	1 (10)	2 (5)	3	4	5	U (1)	1.3
7. The program trains students in current technological and lab management skill needed for success in a laboratory.	1 (11)	2 (3)	3 (1)	4	5	U (1)	1.7
8. The program courses are arranged in a logical sequence from least expertise required, to greatest expertise required.	1 (6)	2 (7)	3 (1)	4	5	U (2)	2.1
9. The program offers sufficient opportunity for students to develop good oral and written communication skills.	1 (6)	2 (3)	3 (4)	4	5	U (3)	1.8
10. The program offers sufficient opportunity for students to develop critical thinking and problem solving skills.	1 (6)	2 (5)	3 (3)	4	5	U (2)	1.8
11. The program offers sufficient opportunity for students to master a broad knowledge of the major areas of biotechnology, in reasonable depth.	1 (10)	2 (5)	3	4	5	U (1)	1.3

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Unknown	Average
12. The program responds to the needs of a growing industry.	1 (9)	2 (6)	3	4	5	U (1)	1.4
13. The program is limited by the lack of sufficient lab support personnel.	1 (5)	2 (2)	3 (3)	4 (2)	5	U (4)	2.2
14. The program is limited by lack of sufficient storage space.	1 (6)	2 (1)	3 (2)	4	5	U (7)	1.6

Please comment below on any of your responses. The PRP is most interested in identifying what you perceive as strengths, weaknesses and problems in the Biotechnology Program. Thank You.

1. Major strength—graduates are able to move right into industry/research jobs with little or no further training required. They have a good academic foundation that allows them to understand and perform new technologies in the field.
Major problem—attracting well-qualified students to the program. This has slowly improved over the years.
2. The program’s strong emphasis on “hands-on” experiences provides the students necessary skills to succeed in the job force.
3. Strengths: Hands-on experience; small class size allows considerable one-on-one experience. Great undergraduate program.
Weakness: Needs to be better marketed. Should be a waiting list to get into this program. I would think that small, relatively expensive programs would be in danger of being axed, when budgets are tight, especially if the “class” is not always filled.
4. The Program has one major problem—under-enrollment.
5. Q 5: I feel informed.
Q 9: This is an area that cannot be too strong.
Q.10: We must strive for maximum skills in this area.
Q. 13: We need to do all we can to improve lab support.
Q. 14: I assume remodeling solved this problem.

6. This is a truly unique program. No other university of which I am aware prepares students at the baccalaureate level for entry into this field with such a broad, hands-on training in biotechnology. (There are other programs in the U.S., but they are either at the Master's level or they train the students in one technical area while they serve as research assistants.) Ferris should promote this program more.

7. I believe that the biotechnology program has a tremendous potential but is hampered by a lack of effective leadership. There is a real need for people with this training in many different fields including the pharmaceutical industry, agriculture, and research laboratories. A basic problem that needs to be addressed is that the biotechnology program has been operated as an entity on its own and there has been little or no effort to keep the Biology Faculty informed concerning the program. There has also been little, if any, effort to integrate the biotechnology program and the biology program. For example, there are a number of projects that are being carried out by the Biology Faculty in which biotechnology students could participate but such cooperation has been resisted by the coordinator of the program. Perhaps this is due to an unrealistically narrow view of the field of Biotechnology. Many industries apply the techniques used in biotechnology for very diverse purposes. We need to make our students as flexible as possible to fit into this ever-changing field.

I also believe that the coordinator of the program has not done an effective job in promoting the program to prospective students. That was one of the primary responsibilities defined for the position when the coordinator was hired and, in my mind, an inadequate amount of effort has been expended in that regard.

SECTION 7:

STUDENT EVALUATION OF THE BIOTECHNOLOGY PROGRAM

Summary of Survey Results

Detailed Survey Results

STUDENT EVALUATION OF THE BIOTECHNOLOGY PROGRAM

Because of the academic rigor and the intensive laboratory training included in the program, students often feel that the program involves a considerable amount of stress. A member of our External Advisory Committee (Dr. Adrian VanderWielen, from Upjohn) once indicated to us that the ability to work under stress was an important attribute of "professional behavior". His employee, our graduate, responded that if a person could complete the Biotechnology Program successfully, that person was sufficiently capable of working under stress in industry. Two other graduates now employed in the industry have also indicated that "work is easier than school." Our collective opinion is that this is how it should be, since school involves intensive and on-going learning experiences, whereas work involves both learning experiences and routine, well-established and well-practiced procedures. Nevertheless, our students are under considerable stress, and we asked with some trepidation and hesitancy for their evaluations of the program.

For each of the first eleven questions on the survey, a response of "1" is considered the most desirable from the perspective of the biotechnology program. Any response less than "3" or "neutral" is considered an unfavorable response. The students "agreed" or "strongly agreed" with each of the following: The Biotechnology Program courses are based on realistic pre-requisites (1.6), are arranged in a logically progressive manner (1.7), meet their occupational needs and objectives (1.8), provide supervised training for developing lab skills (1.8), offer opportunities to develop critical thinking and problem solving skills (1.7), offer sufficient opportunities to learn and practice relevant calculations (1.7), offer opportunities to develop cooperative teamwork skills (1.7), offer sufficient opportunities to manipulate and interpret data (1.7), and are taught by faculty with expertise in their professional areas (1.6). The students also "agreed" that program courses offered sufficient opportunities to learn time management skills (2.1), to develop oral and written communication skills (2.1), offered sufficient opportunities to develop independent lab skills (2.2), and agreed that the lab facilities meet the needs of the group (2.2). They ranked the program between "agree" and "neutral" for each of the following: there are sufficient opportunities to understand experimental design (2.4), and the required communications courses are pertinent to their career goals (2.4). As with the graduates, the students split evenly in preferring COMM 105 or COMM 121. The students were "neutral" on the topic of computer usage, giving the rating of 3 to the statement that there are sufficient opportunities to develop computer skills. Most of our current students have not yet had the opportunity to train on the Power Mac or to use the computer lab in the science building. They primarily get this training in their senior year. The only overall disagreement from the students was in response to the statement "Career Placement Services meets their needs and interests" (3.5). Career Placement Services offers support in the writing of resumes and offers "practice" interviews. However, many students feel that the advice given is simply common sense. The biotechnology industry is a small niche in the overall employment market for the university community, and perhaps because of the small size of the program this is not a major focus for the placement services.

Under "comments" there was no one major criticism, but several varied remarks. One request was for a microbiology class separate from the class shared with pharmacy. We do not support this, since it would lead to duplication of classes, and the material is very much the same. There was a request for greater help in finding internships. Dr. Hoerter has this year instituted such a program, through his interactions with the Michigan Biotechnology Association. He has set up grants with several companies to institute internships. A mentor program from freshmen and sophomores was suggested. Delta Nu Alpha, the student Biotechnology Professional Association, had such a program, and will be asked to renew it. A physical chemistry class was suggested. It is not likely that this can be offered for so small a program. No External Advisor has requested it, or indicated it would be considered important. Two students indicated that they did not receive sufficient preparation to do well on the GRE exam. We feel that in order for students to complete this exam (in molecular biology and biochemistry) successfully, they must wait to take the exam until they have completed the major courses in that area. Unfortunately, the students who took this exam, did so in the middle of the first semester of the senior year, when they had not completed Advanced Cell and Molecular Biology, Tissue Culture, Molecular Genetics, Recombinant DNA Lab, Advanced Biochemistry, or Proteins Lab. The students did not ask the advice of their advisors before taking the exam. They did well on the written and math portions of the exam, but scored below average on the molecular biology and biochemistry portion. It is recommended that students do not take the exam until after the end of their senior year.

Three students indicated under comments that they felt the program was exceptional and offered great opportunity for success, compared to what was available at other schools. The students first have the opportunity to compare themselves to other undergraduates in the lab when they go away on internship, and this has been a positive experience for us, in that the students return with a greater appreciation of what they have learned.

Overall, students gave the program a rating of 1.7, between "excellent" and "above average".

These results will be reported to the Internal Advisory Committee, the Department Head, and the Department. The Internal Advisory Committee and the Department may want to re-consider ways in which computer usage can be increased in the program.

STUDENT EVALUATION OF THE BIOTECHNOLOGY PROGRAM

Dear Student: The Biotechnology Program is being reviewed this academic year, and the Program Review Panel would appreciate your candid responses to the following questions. Please circle your responses and return this form as soon as possible in the post paid envelope. Thank you very much.

***I will graduate with a BS in Biotechnology in 199* . (please fill in) '98-2 '99-1**

I entered Biotechnology as:

- a. a freshman? **(2)**
- b. from another program at Ferris? If so, which one? **Pre-Vet-1, Pre-Pharm-1**
- c. a transfer student? **(3)**

The courses in the Biotechnology Program:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Unknown	Average
1. Are based on realistic pre-requisites.	1 (3)	2 (5)	3	4	5	U	1.625
2. Are arranged logically in a progressive manner.	1 (2)	2 (6)	3	4	5	U	1.75
3. Meet your occupational needs and objectives.	1 (2)	2 (5)	3 (1)	4	5	U	1.875
4. Provide supervised training for developing lab skills.	1 (3)	2 (3)	3 (2)	4	5	U	1.875
5. Offer sufficient opportunities to develop critical thinking and problem-solving skills.	1 (2)	2 (6)	3	4	5	U	1.75
6. Offer sufficient opportunities to learn and practice relevant calculations.	1 (3)	2 (4)	3 (1)	4	5	U	1.75
7. Offer sufficient opportunities to develop cooperative teamwork skills.	1 (3)	2 (4)	3 (1)	4	5	U	1.75
8. Offer sufficient opportunities to develop independent lab skills.	1 (1)	2 (4)	3 (3)	4	5	U	2.25
9. Offer sufficient opportunities to manipulate and interpret data.	1 (3)	2 (4)	3 (1)	4	5	U	1.75
10. Offer sufficient opportunities to understand experimental design.	1 (2)	2 (2)	3 (3)	4 (1)	5	U	2.375
11. Offer sufficient opportunities to learn time management skills.	1 (2)	2 (3)	3 (3)	4	5	U	2.125
12. Offer sufficient opportunities to develop oral and written communication skills.	1 (2)	2 (3)	3 (3)	4	5	U	2.125
13. Offer sufficient opportunities to develop computer skills.	1 (2)	2	3 (3)	4 (2)	5 (1)	U	3.0
14. The laboratory facilities meet the needs of the group.	1 (2)	2 (3)	3 (2)	4 (1)	5	U	2.25

The courses in the Biotechnology Program:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Unknown	Average
15. Biotechnology classes are taught by faculty with expertise in their professional areas.	1 (3)	2 (5)	3	4	5	U	1.625
16. The required communications courses are pertinent to your career goals.	1 (1)	2 (3)	3 (4)	4	5	U	2.375
17. Is Public Speaking or Interpersonal Communications more relevant to your goals? (Circle one)	PS (3)	IP (4)	None (1)				
18. The Career Placement Services meets your needs and interests.	1	2 (1)	3 (2)	4 (2)	5 (1)	U (2)	3.5
19. My overall rating of the biotechnology program is...	Excellent 1 (2)	Above average 2 (6)	Average 3	Below Average 4	Poor 5	U	1.75

In this space please make any comments on the program which you feel would be helpful.

1. A microbiology class that is separate from pharmacy students. Biochem was that way—microbiol should be too. The class is too pharmacy-oriented.
2. Don't see much relevance with developmental biology.
3. More help from the school to find internships.

Our advisor doesn't seem all that approachable. I feel more comfortable going to Dr. Colvert or Dr. Boogaard about my questions and concerns than Dr. Mitchel because they know me on a personal basis and are more familiar with my goals. As it is, the junior class has a different advisor than we did last year and who knows for next year.

I think a mentor program would be beneficial also. Often, I see people join this program and drop out in their junior year because it is not what they expected. Perhaps a mentor can introduce incoming freshmen, as well as transfer students, to the facilities and familiarize them with a few of the things they do. This might better prepare students, as well as allow them to feel more comfortable with the upperclassmen.

The Biotechnology Program at Ferris State University is a valuable program. The program offers students the ability to learn about important topics in a wide range of fields. The students walk away with the options to work in difficult laboratory positions. Biotechnology students are required to know and understand the concepts of the most difficult Biology and Chemistry courses. The faculty that instructs the students are an

invaluable tool in our field. They allow us to explore on our own the how and why of science and a shoulder to fall on if we are unsure or unconfident of our abilities. They instill confidence and techniques in the Biological Chemistry fields. Leaving Ferris State University with a Biotechnology degree will be the smartest thing that I have ever done.

My internship experience allowed me to observe that this program ranks far above other undergraduate advanced molecular biology/biochemistry programs (this is in comparison with student colleagues from across the USA who are either in Grad. School or currently working as lab technicians). These students were very impressed with the quality and quantity of laboratory intensive classes we have in the Biotechnology program; wishing they had the same exposure before their work experiences.

This is the type of program that allows great success for students that are self-motivated. I have witnessed that truthfully one can reap many rewards through persistent hard work here.

The Biotechnology faculty and staff as advisors are excellent. They have great backgrounds and outside contacts that we benefit from.

One of the only disadvantages that this program has is in the Chemistry component: we lack any Physical Chemistry classes. Without these classes, it is disadvantageous for those of us who want to pursue more strict biochemistry careers and graduate programs.

The classes themselves are arranged in good order, but there is great potential for the junior and senior level classes to be intertwined in possibly more rewarding way. For example: It would be interesting if we could take Recombinant DNA lab before the Proteins lab and the Cell and Tissue Culture lab so that: (1) We isolate and manipulate DNA encoding a protein we are interested in and (2) from that point utilize the Tissue culture lab by transfecting this DNA into a cell line which could be grown over a semester with periodic freezing of "mature batches of cells" (carrying that protein). (3) These frozen cells are then utilized in the Proteins lab as a isolation and purification project with the protein product from the originally manipulated DNA. My fellow classmates and I all agree that this is very feasible (while learning the regular class material) and would be a great experience to *tie together the theoretical knowledge we obtain with a practical "real-world" example.*

I believe that overall, the program is exceptional. This year's seniors are somewhat different than in past years. The majority of us are considering graduate school. This option requires that we take the GRE (Graduate Record Exam). Our classes at FSU give us good background for taking the test. More preparation is needed however. Our group did rather poorly on the GRE, and I believe it was a direct result of FSU not preparing graduate students, but rather, students prepared to go straight into the working world. This has been acceptable in the past, and may be in the future, but as I look back on my undergraduate career, I wish I was more prepared for the GRE. Do not think that I am disappointed however, I did get into graduate school in no small part due to the experience I gained in attending FSU. Thank you.

Matthew D. Larson

I feel that the program does not offer the support needed to do well on the GRE Biochemistry subject test. The program would benefit from either a class devoted to helping students through the test or simply extra material placed into preexisting courses.

SECTION 8:

**EXTERNAL ADVISORY COMMITTEE PERCEPTIONS
OF THE BIOTECHNOLOGY PROGRAM**

The Members of the External Advisory Committee

Agenda of the Latest Meeting of the Committee

Minutes of the Meeting

Survey of the Committee:

Oral Comments from the Meeting

Written Survey of the Committee

BIOTECHNOLOGY EXTERNAL ADVISORY COMMITTEE

The Biotechnology External Advisory Committee is composed of members of the state-wide academic community, the industry, and those at Ferris who represent the program. The members of the committee are listed on page , and below:

Phil Andrews, Ph.D., Director, Protein and Carbohydrate Structure Facility, UM, Ann Arbor, MI

Robert Arking, Ph.D., Biotechnology Program Coordinator, Wayne State University, Detroit, MI.

Mohamed Abouzied, Ph.D., Manager, Immunodiagnostics R & D, Neogen Corporation, East Lansing, MI.

Vijay Baragi, Ph.D., Group Leader, Immunopathology & Pharmacology Laboratory Warner-Lambert/ Parke-Davis, Ann Arbor, MI

Connie Boogaard, Ph.D., Biotechnology Program Coordinator, FSU, Big Rapids, MI

Scott Bowen, B.Sc., graduate, FSU Biotechnology Program, Cayman Chemicals, Ann Arbor, MI

Russell Hart, Ph.D., President, Assay Designs Inc., Ann Arbor, MI.

Sue Hammersmith, Ph.D., Dean, College of Arts and Sciences, FSU, Big Rapids, MI

Jim Hoerter, Ph.D., Head, Biology Department, FSU, Big Rapids, MI

Wha Bin Im, Ph.D., Senior Research Scientist, Biology II, Pharmacia/Upjohn

John Linz, Ph.D., Department of Food Science and Human Nutrition, MSU, East Lansing, MI.

Sandra Rempel, Ph.D., Director, Molecular Neuro-Oncology Laboratories, Henry Ford Hospital/Case Western Reserve University, Detroit, MI

Doug Rivers, Ph.D., Vice President, Research and Operations, Michigan Biotechnology Institute, Lansing, MI

Barbara Scheuer, M.T. (ASCP), Director of Operations, Assay Designs Inc, Ann Arbor, MI.

These people were called to meet on December 19th, 1997, to review the program and offer their advice and opinions on program development. The agenda of the meeting is given on the next page, and the minutes of the meeting follow that.

BIOTECHNOLOGY EXTERNAL ADVISORY COMMITTEE

Friday, December 19th, 1997

ASC 2082

2 PM

AGENDA

- A. We will begin with **Introductions**, since some of you are new to the committee.

- B. We will glimpse a **Program Overview**, including:
 - 1. the **History** of the Biotechnology Program.
 - 2. the **Philosophy of Teaching** regarding laboratory-intensive instruction.
 - 3. the **Role and Mission** of the Program. (This Statement is appended).

- C. We will review the **Limitations** within which the Program must operate, including:
 - 1. There is an **upper limit** on the number of credits we can require of students.
 - 2. There is a **lower limit** on the number of courses students must take for general education.
 - 3. There is a financial limit to our **Supply and Expense Budget**.
 - 4. There is a limit to our **Equipment Resources**.
 - 5. There is a limit to the areas of our **Faculty Expertise**.

- D. Within these limits, we have attempted to accomplish the goals and objectives cited in the Role and Mission Statement (above), through our **Program Curriculum**: (appended)
 - 1. We will look at **Coursework** first,
 - 2. **Lab Training** second,
 - 3. and **Internships** last.

- E. We then ask your advice regarding our **Present Concerns** and **Future Directions**:
 - 1. What level of **computer skills** should graduates have?
 - 2. What expertise is needed in use of particular **items of equipment**?
 - 3. What level of **math skills** must graduates possess?
 - 4. What level of **oral and written communications** skills is needed?
 - 5. How important is **general education background**? Are there specific areas of Cultural Enrichment and Social Awareness that students should target?
 - 6. How important is "**Professional Behavior**" to you, in Bachelor's-level hiring? What aspects of Professional Behavior concern you?
 - 7. Would you prefer to hire **M.Sc.-level** personnel rather than **B.Sc.-level** personnel for entry laboratory positions?

We will give you a tour of our new facilities, and those who wish to join us for dinner at 5 pm are welcome. We realize that many of you may have to leave prior to dinner.

MEMO

TO: The FSU Biotechnology External Advisory Committee Members

FROM: Connie Boogaard, Chair

RE: Minutes of the Meeting, Dec. 19th, 1997

DATE: January 16, 1998

Boogaard opened the meeting with introductions, then described the following aspects of the program: the history, teaching philosophy, and role and mission of the program; the financial, technical, and human resources of the program; and the curriculum of the program, including the coursework and labwork. She then solicited the recommendations of the committee, who made the following suggestions:

The committee was unanimous in preferring COMM 105 over 121. However, many asked that student presentations and oral reports in classes be increased. Many employees must make presentations every month. Communications with customers or with others in the company are very important. This has also been reported by graduates. In addition, a seminar on data presentation was suggested to assist students in this aspect of reporting.

The committee was unanimous in reporting that calculus is not needed, but reinforced our earlier finding that statistics is very important. A "science math" class would be nice. One member suggested that students need more understanding of the effects of curve-fitting and smoothing principles.

It was suggested that for general education, students may benefit from two psychology classes, in which the higher level class is industrial/organization psychology. This would assist students in understanding how a company operates and the interactions and communications necessary between different parts of a company.

It was recommended that students have an increased understanding of data interpretation. When viewing data, what does it tell you about drug interactions? They need to be able to look at plotted data and realize what this indicates about the candidate drug. This may be included in Michaelis-Menton and drug ligand interactions sections of biochemistry lab.

It was recommended that students learn Excell, Sigmaplot, statistics software, and perhaps experimental design software, to enhance computer presentations of data.

All who have supervised interns or graduates agreed that they were well-equipped to work in a laboratory setting, and are good at taking direction in the lab.

One person indicated that his employee (one of our graduates) showed a lack of sufficient preparation in basic biochemistry such as the Krebs's cycle and other aspects of metabolism. The graduate was also unprepared in the area of cell fusion. He pointedly asked if the

biochemistry our students take is designed for biochemistry majors. It is not. It was recommended that students take a year-long biochemistry class for biochemistry majors, which includes a major section on metabolism. It was suggested that faculty de-emphasize R and D aspects of biotechnology, but instead stress other areas, such as careers in regulation, manufacturing, QC, technical support, sales and marketing, and patents and intellectual property.

Students should give career objectives more thought, reduce salary expectations and expectations of what can be accomplished, and realize that upward mobility needs an advanced degree.

Students should be exposed to greater opportunities for problem solving and failure analysis.

One member suggested that students learn *in situ* hybridization and immunocytochemistry with fluorescent antibodies. It may be possible to include this in the tissue culture class.

With regard to professional behavior, all students need to be aware of their place in the larger picture, and the importance of taking responsibility for their actions and mistakes. They must realize the importance of not hiding these (not "covering up" a mistake). They must be responsible to the group and to the project..

A series of seminars was suggested on the following:

- ISO 9000

- GMP

- Product transfer

- Documentation

- High-throughput screening

- Bioinformatics

- Getting databases through the world wide web

- Providing a business background to students

As you know, the program is under review. Please fill out and return the enclosed survey so that the review process may be carried out. Thank you all for your service.

Sincerely,

Connie Boogaard

Cboogaar@art01.ferris.edu

EXTERNAL ADVISORY COMMITTEE SURVEY

The information gained from the External Advisory Committee meeting was shared with the program faculty at the following meeting of the Internal Advisory Committee. The Internal Advisory Committee responded to the minutes of the meeting by pointing out that several comments made by the External members who were also employers, were describing the situation of graduates prior to the previous review. Thus, with the last curriculum review, we have already corrected these criticisms: the biochemistry class which our students take is now a year-long sequence, since we instituted the change to CHEM 364 plus CHEM 474 instead of PHRM 320. Further, the Proteins class has already been changed especially to emphasize data interpretation and manipulation, and "trouble-shooting" of procedures. Cell fusions, as pointed out by another member of the External Advisory Committee, are not something that belongs in an undergraduate curriculum. A greater emphasis on computer use is now incorporated into the labs, and we have purchased a Power Mac for training seniors. All members of the Committee were very pleased with the laboratory competence of our graduates.

In addition to soliciting the above comments directly from the external members of the External Advisory Committee, a written survey was also conducted. The results of the survey are summarized here:

The external members of the committee felt that our program was technologically strong, rating the program a 1.5, and academically strong (2.0), where 1 is "strongly agree" and 5 is "disagree". They also agreed (2.2) that the program included sufficient instruction in oral and written communication skills, and math skills. They gave the lowest rating (2.4) to computer skills. They strongly agreed (1.3) that the program offered quality laboratory instruction that is not available at most undergraduate institutions.

They also wrote the following comments:

"The intern I mentored was far advanced compared to other BS graduates, and equal to some masters graduates." "The student was technologically superior and equally academically strong."

"The program is very good to prepare graduates for the first job, but think 10 years later. The students need to know more about the scientific background."

"Increase student oral presentations and statistics."

The following uses will be made of this information:

The information has been made available to the internal advisory committee.
The information will be made available to the department and department head.

EXTERNAL ADVISORY COMMITTEE PERCEPTIONS OF THE BIOTECHNOLOGY PROGRAM

The Biotechnology Program Review Panel would appreciate your candid responses to the following questions. Please circle your responses and **return** this form **as soon as possible** to Ms. Laurie Daniels, Biology Dept., ASC 2004.

	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree	Unknown	Average
1. Compared to other BS-level programs, the Ferris State biotechnology program is technologically strong	1 (3)	2 (3)	3	4	5	U	1.5
2. Compared to other BS-level programs, the Ferris State biotechnology program is academically strong	1 (2)	2 (2)	3 (2)	4	5	U	2
3. Compared to other BS-level programs, the FSU biotechnology program includes sufficient instruction in oral and written communication skills.	1	2 (5)	3 (1)	4	5	U	2.2
4. Compared to other BS-level programs, the FSU biotechnology program includes sufficient math instruction.	1	2 (3)	3 (2)	4	5	U (1)	2
5. Compared to other BS-level programs, the FSU biotechnology program offers sufficient instruction in computer skills.	1 (1)	2 (2)	3 (1)	4 (1)	5	U (1)	2.4
6. Compared to other BS-level programs, the FSU biotechnology program offers quality laboratory instruction that is not available at most undergraduate institutions.	1 (6)	2 (1)	3	4	5	U	1.3

In this space and on the reverse side, please comment below on any of your responses. The PRP is most interested in identifying what you perceive as strengths, weaknesses and problems in the Biotechnology Program. Thank you very much!

I have had the opportunity to interact/mentor only one FSU intern to date. However, I was very impressed with her performance which was far advanced compared to other BS graduates and equal to that of some masters graduates in my lab. The student was technologically superior and equally academically strong.

Need more Macintosh exposure and less web exposure. Graduates are very strong in lab techniques, such as actual hands-on work that most programs do not get.

I think the program is more laboratory oriented. Your student need to know more about the scientific background behind all the experiments they carry out. In the future you need to prepare mind thinker not just operators or technicians. The program is very good to prepare graduates for their first job, but think 10 years later.

Student presentations and oral reports in classes could be increased slightly. In addition, the amount of statistics students are exposed to could also be increased.

SECTION 9

LABOR MARKET ANALYSIS

Labor Market Analysis

The Biotechnology Program has a record of 90% employment of its graduates in biotechnology-related positions. The biotechnology industry is a nation-wide and world-wide industry, so that our graduates are competing with others from very prestigious institutions. Nevertheless, they have done exceptionally well in finding employment. In one job search by Amgen, (in Thousand Oaks, California), a position was advertised to which there were over 1000 applicants. Ten of these were selected for phone interview, and two of them were our seniors. This speaks to the problem in the industry, of finding well-qualified and **LABORATORY-TRAINED** BS-level personnel. It also speaks to our success in the design of this program and the quality of the teaching in the labs.

Most laboratory positions at smaller firms are advertised only locally, in newspapers or by word-of-mouth. The major biotechnology companies, however, advertise primarily in such periodicals as *Science* or *Nature*. The fall issues of *Science* were scanned manually, and the ads torn out for inclusion here. The later months of *Science* were scanned electronically, and printed out. Two representative ads are included here, and a compilation of ads that appeared in *Science* in the past several months is being submitted under separate cover to verify the availability of positions for well-trained laboratory personnel at the BS-level. In some issues of *Science*, which comes out weekly, over one hundred ads for such positions can be found. In other issues, there are fewer (hiring tends to be concentrated in the fall), but there are always some. These vacant positions are only the tip of the iceberg, since the vast majority of companies rely on word of mouth, on active recruiting, and on speculation (keeping a store of resumes of hopeful job-seekers) for filling the positions.

The vast majority of job ads request a background in molecular biology or biochemistry, with lab experience in tissue culture, protein purification, recombinant DNA techniques, or immunology. (It was on this basis that the program was designed.)

The field of biomedical and pharmaceutical research, which our graduates serve, is expected to require increased assistance in labwork as our population ages. We as a civilization will always need this service.

In addition to the area of biomedical research, our graduates are also able to work in such molecularly-oriented areas as environmental protection and remediation, agricultural research, forensics labs, paternity-testing labs, etc. The Michigan Occupational Information Service (MOIS) reports that employment of biological scientists is expected to increase about as fast as the average for all occupations through the year 2005. The number of biological scientists in Michigan is expected to grow as a result of increased interest in preserving the natural environment and continuing interest in medical research.

Starting salaries for biotechnologists in major pharmaceutical industries such as Pharmacia & Upjohn or Parke-Davis/Warner-Lambert, or Eli Lilly, are in the range of \$30-35,000. At the smaller firms, starting salaries are in the range of \$20-25,000. The smaller firms usually also allow for faster promotion, and include stock options as a benefit.

INFECTIOUS DISEASES RESEARCH

*At Lilly, we are building on our past
and defining the future.*

Eli Lilly and Company's Division of Infectious Diseases Research is committed to the discovery and development of novel anti-infective molecules. Our programs include significant efforts in the bacterial, fungal, and viral areas. We are recruiting the best minds available to help us in this pursuit. We provide the environment and the tools for personal challenge and professional growth.

Infectious Diseases Research has a long and productive history of introducing innovative products for the treatment of human infections. With your participation we plan to continue and extend this tradition of innovation and excellence. Your efforts with Infectious Diseases Research will be supported by the strength of Eli Lilly and Company with sales greater than \$7 billion.

If you are a highly motivated scientist with strong cross-functional expertise hoping to apply your talents to the discovery and commercialization of products for the treatment of human infectious diseases, your future leads straight to Lilly's Division of Infectious Diseases Research.

Ph.D. and BS/MS

Biochemists

We are seeking scientists with proven expertise in biochemistry and molecular biology. Individuals with experience with microorganisms (bacteria, fungi, yeast and viruses) would be preferred. These individuals will become colleagues on multidisciplinary teams committed to identifying, characterizing, purifying and exploiting novel antimicrobial/antifungal targets. Experience purifying and characterizing proteins, developing functional assays for proteins, and study the kinetics and mechanisms of inhibition of enzymes and proteins is critical. Knowledge of microbiology, microbial physiology, and protein biochemistry is highly desirable.

Ph.D. and BS/MS

Microbiologists (Bacteriologists, Virologists)

We are seeking several Microbiologists to enhance our infectious disease efforts. Successful candidates will be involved in a multidisciplinary team effort directed at the discovery, characterization and exploitation of new antimicrobial targets. Positions available will be focused on bacteria or viruses. Significant efforts are ongoing into Hepatitis C virus and antibiotic resistant Gram-positive bacteria. Positions include opportunities for scientists with both in vitro and in vivo experience.

Ph.D. and BS/MS

Fungal Molecular Geneticist

We are seeking highly motivated scientists to enhance our fungal genetics effort. Successful candidates will join our interdisciplinary effort directed at the discovery, characterization and validation of novel antifungal targets. Background must include expertise in genetics of fungal pathogens or filamentous fungi model systems as well as a solid knowledge of current molecular biology and biochemical techniques (PCR, cloning, library construction, gene expression, mutant construction and analysis). Working knowledge in bioinformatics is an added asset. Demonstrated ability to work both independently and as an effective team member is critical.

Ph.D. Team Leader Bacterial Genomic Research

We are seeking a team leader to enhance and lead the antibacterial discovery effort to identify and exploit novel targets from Gram-positive bacteria. The candidate should have proven expertise in molecular biology, prokaryotic expression vectors, and biochemical assay development. An established publication record and significant scientific network is required. This individual is to provide scientific and technical leadership to a multidisciplinary team of motivated scientists who are taking a genomic approach to new target identification and validation. Experience with microbial databases and microbial sequencing projects would be very beneficial.

Post Doctoral Scientists

We are looking for creative individuals in a variety of scientific areas to explore emerging aspects of human infectious diseases. A Ph.D. in Biology, Virology, Mycology, Biochemistry, Microbiology or related field is required. Focus areas in Infectious Diseases Research include hepatitis viruses, important human fungal pathogens, and antibiotic-resistant Gram-positive bacteria. Lilly Postdoctoral scientists gain sound practical experience and focus training that will significantly expand their scientific knowledge and abilities in drug discovery.

We provide the salary, compensation and advancement opportunities you would expect from an industry leader. For confidential consideration, please send your resume and cover letter indicating the position of interest to: Eli Lilly and Company, Division of Infectious Diseases, US Recruiting and Staffing, Lilly Corporate Center, Indianapolis, IN 46285.

We are an equal opportunity employer dedicated to diversity and the strength it brings to the workplace. For other opportunities at Eli Lilly and Company, please access our Job Bank at: <http://www.lilly.com>.



Lilly
Eli Lilly and Company

KNOWLEDGE IS POWERFUL MEDICINE

Cadus Pharmaceutical Corporation, a leader in the discovery of drugs which regulate G protein-mediated signaling pathways, is expanding its discovery programs based upon its unique proprietary yeast and mammalian cell based screening technologies and has openings for motivated scientists in the following areas:

DRUG DISCOVERY/ CELL BIOLOGY

Code: S-DD BS/MS scientists with a minimum of 2 years laboratory experience with strong background in molecular biology, mammalian cell culture, and receptor signal transduction research. Previous experience in molecular target-based drug discovery is also desirable. Qualified individuals will work within the drug discovery group exploring cellular signaling pathways and designing/implementing secondary assay systems to analyze potential therapeutics.

AND

Code: S-DD2 BS/MS scientists with a minimum of 2 years experience in mammalian cell biology to join our drug discovery group. Experience with mammalian cell culture signal transduction analyses, biochemistry, molecular biology, flow cytometry and microscopy is desirable. Qualified individuals will work on projects focusing on the regulation of cell activation and growth by G protein-coupled receptors.

MAMMALIAN CELL BIOLOGY

Code: S-M BS/MS scientists with a minimum of 2 years experience or Ph.D. scientists with a minimum of 3 years postdoctoral research in mammalian cell biology and gene expression to join our assay development group. Expertise with mammalian cell culture, signal transduction analysis and strong molecular biology skills are essential. These individuals will be working with projects involving novel whole cell assay systems for G protein-coupled receptor signaling.

MOLECULAR/YEAST BIOLOGY

Code: S-MYB Ph.D. scientists with a minimum of 3 years postdoctoral research experience in molecular biology for a project expressing mammalian signal transduction proteins in yeast. Background in cellular and molecular biology or biochemistry is required. Experience with yeast and protein analysis is preferred.

NEW LEADS DISCOVERY

Code: S-NL BS/MS scientists with a minimum of 2 years experience in assay development or screening. Experience with yeast and/or mammalian cell culture techniques, cell-based screening assays and/or HTS robotics/automation is desirable. Responsibilities include pilot and implementation of novel cell-based screens for G protein-coupled receptor targets, performing selectivity assays and identifying lead compounds in support of internal drug discovery efforts.

Cadus offers competitive salaries and benefits as well as excellent opportunity for career growth in a stimulating collaborative environment. Send CV and List of References, indicating job code to: Cadus Pharmaceutical Corporation, 777 Old Saw Mill River Road, Tarrytown, NY 10591-6705; or email at: hr@cadus.com. Cadus is an Equal Opportunity Employer.

CADUS

PHARMACEUTICAL CORPORATION



AgrEvo USA Company

Leading American Agriculture into the Twenty-First Century.

As a result of rapid expansion, AgrEvo USA Company, a leader in crop production, plant protection and environmental health both in North America and the world, has an excellent opportunity for:

Regulatory Specialist, Biotechnology.

Coordinate submissions of transgenic plants and biologicals for US Government (USDA, EPA, FDA) and occasional outside US clearances. Participate within North America Biotech Regional Team to achieve global clearances as required by business plans.

Responsibilities include completing regulatory submissions in correct government approved format; responding to questions from government agencies; assisting in data development; assisting in preparation of written materials regarding the communication of biotech safety info to the public and establishing and maintaining positive working relationships with key government regulators to ensure timely acceptance, review and processing of submissions.

Position will report to Regulatory Manager, Biotechnology, AgrEvo USA Company. Requirements include a minimum of a Master's degree in biological science or biochemistry with established knowledge of basic central issues in the biotech regulatory arena. Strong written/verbal communications, interpersonal and organizational skills essential.



Submit resume to:

Human Resources Department
AgrEvo USA Company
Little Falls Centre One, 2711 Centerville Road
Wilmington, DE 19808
Fax: 302-892-3027



DIRECTOR OF BASIC RESEARCH, DEPUTY DIRECTOR

The University of California, Davis, Cancer Center is seeking a Director of Basic Research at the Professor level. This individual will also serve as the Deputy Director of the Cancer Center. Candidates must possess a doctoral degree and should have outstanding scientific accomplishments in the molecular and basic biology of cancer with demonstrated administrative ability to focus research programs in cancer biology. The University has committed substantial funds for the development of basic cancer research, including four new faculty positions. This program will be housed in the newly opened state-of-the-art Research Building. The Cancer Center, a priority program for UC Davis, intends to fulfill NCI requirements to become a designated cancer center. The candidate should have an outstanding record of publications and a substantial past and current level of extramural research funding. This position will be "Opened Until Filled"; however, for full consideration, applications should be received by October 31, 1997. Please forward the following: 1) letter describing research, teaching, and administrative background; 2) curriculum vitae; and 3) names and addresses of five references to:

Ralph W. deVere White, M.D.
Chair, Search Committee
UC Davis Cancer Center
4501 X Street, Room 3003
Sacramento, CA 95817

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SECTION 10:

FACILITIES AND EQUIPMENT

Facilities

Dedicated Floor Space

Shared Floor Space

Equipment

A. FACILITIES SURVEY:

FLOOR SPACE DEDICATED TO BIOTECHNOLOGY:

The program has space dedicated to teaching biochemistry and biotechnology in Sci 337 (Teaching Lab), Sci 343 (Instrument Room), and Sci 201A (Teaching Lab for Tissue Culture). The total floor space of these labs is 1615 ft².

There is a cold room dedicated to biotechnology, with an area of 64 ft².

There are no storage or preparation rooms dedicated to biotechnology.

FLOOR SPACE SHARED WITH OTHER CLASSES:

The program shares many additional teaching labs with biology and with chemistry. The total chemistry laboratory space is 5657 ft², and the total biology laboratory floor space is 9617 ft².

Lecture rooms are shared with other biology and physical sciences departmental courses. Total number of lecture rooms in biology is 2, with an area of 3885 ft² (including Str136), and in physical sciences is 6, with an area of 7663 ft². (including Str 233).

Other facilities that are available and used for some biotechnology classes are:

The animal-care facility:

PHR 314F: (rabbit room): 160 ft² (20 x 8)

PHR 314M: (rat room): 32 ft² (8 x 4)

PHR 314C: (surgery and lab): 200 ft² (25 x 8)

Sci animal care room: 940 ft²

The greenhouse: 595 ft²

The computer room, Sci 233: 277 ft²

Research laboratories:

Sci 234: (Drs. Mitchell, Adewusi, Buss & Boogaard): 527 ft²

Sci 338: (Dr. Colvert): 358 ft²

Sci 201: (Dr. Hoerter): 360 ft²

Sci 229: (Drs. Watson & Murnik): 374 ft²

Sci 313: (Dr. Shetty): 266 ft²

B. EQUIPMENT SURVEY:

ITEM	QUANTITY
TEMPERATURE CONTROL	
Incubator 4 cu ft.	2
hybridization incubator	1
Plant Tissue Incubator	1
Plant Cold storage	1
CO ₂ incubator	1
Large water bath	1
Small water baths	6
Freezer (-20° C)	3
Refrigerator (4 °C)	3
Freezer (-70° C)	1
SAMPLE ID AND SEPARATION	
FTIR Spectrometer	2
Atomic Absorption Spectrometer	1
Gas Chromatograph	4
Gas Chromatograph Detector, UV-vis	1
Gas Chromatograph Detector, UV	2
Gas Chromatograph Detector, Ion	1
Gas Chromatograph Detector, Refractometer	1
Gas Chromatograph Detector, Fluorescence	1
HPLC	4
ELECTROPHORESIS	
Large Horizontal Gel Apparatus	3
Medium Horizontal Gel Apparatus	3
Small Horizontal Gel Apparatus	15
Sequencing Gel Apparatus	1
Immunoelectrophoresis Gel Apparatus	1
Tube Gel Electrophoresis Apparatus	1
Large Vertical Gel Electrophoresis Apparatus	4
Small Vertical Gel Electrophoresis Apparatus	4
High Volt Power Supply	2
Small Power Supplies	6
BALANCES	
Large Capacity Balance	1
Medium Capacity Balance	1
Analytical Balance	2

CENTRIFUGES	
Microcentrifuges	3
Sorvall prep Centrifuge	1
Ultracentrifuge	2
Clinical Centrifuge	2
MISC.	
Orbital Shaker	2
Transluminator	1
Land Camera	1
Inverted Scope	2
Biohazard (Vertical) Laminar Flow Tissue Culture Hood	2
Horizontal Laminar Flow (Plant) Tissue Culture Hood	2
Spectrophotometers	3
Ice Maker	2
MilliQ Water Maker	1
Pipette Aids (12)	12
Small Light Box	1
Large Light Box	1
pH Meters(2)	2
Stir/Hot Plates (6)	6
Vortex Mixers (4)	4
Blender	1
Peristaltic Pumps	2
Microwave	1
Homogenization Motor	1
Lyophilizer	1
Gel Dryer	1
Fraction Collector	4
Autoclave	2
Dishwasher	2
X-Ray Film Cassette Large	1
X-Ray Film Cassette Small	4
X Ray Film Development Machine	1
Scintillation Counter	1
Hybridization Bag Sealer	2
Evaporating Centrifuge	1
ELISA Plate Reader	1
ELISA Plate Washer	1
PCR Thermal Cycler	1
IBM Compatible Computer	2
Macintosh Computer	1

C. FACILITIES AND EQUIPMENT EVALUATION:

The major problem regarding facilities and equipment has been the extensive leakage of the roof. This threatens the safety of electronic and laboratory equipment, and necessitates the neglect of important matters by faculty while the problem is addressed at each rain or snowfall. The roof is scheduled to be replaced this year.

While the renovation of the science building vastly improved the configuration of the lab, there still exist several items which need to be addressed. The benchwork was not replaced and in some cases was damaged by the construction. These matters are currently under review by the building renovation team.

The program review panel, in consultation with the internal advisory committee, believes that the current facility is adequate and the current supply of equipment is good, for the program to continue to function in its current capacity.

This is a rapidly changing field, and the program has no budget for repair of broken equipment or for the purchase of new equipment. The Biology Department, however, has received an allocation of \$10,000 for repair and replacement of obsolete and broken equipment. While this is clearly insufficient, it is hoped that this budget will be continued and increased.

SECTION 11

CURRICULUM EVALUATION

Curriculum Overview

Summary of Curriculum Concerns

Course Syllabi

FERRIS STATE UNIVERSITY BIOTECHNOLOGY CURRICULUM

FALL SEMESTER	CR.	WINTER SEMESTER	CR.	SUMMER SEMESTER
Year 1:				It is strongly recommended that students take some electives during the summer at FSU or at any community college. This will allow students to lighten the load during the year.
BIOL 121 Biology ^L	4	BIOL 122 Biology ^L	4	
CHEM 121 Chemistry ^L	5	CHEM 122 Chemistry ^L	5	
ENGL 150 English	3	MATH 130 Anal. Trig.	3	
COMM 105 Speech	3	Elective	3	
TOTAL	15	TOTAL	15	
Year 2:				We again strongly recommend that the student take some Cultural Enrichment or Social Awareness electives at any community college or at FSU during the summer.
BIOL 231 Anat/Phys ^L	4	BIOL 232 Anat/Phys ^L	4	
CHEM 221 Organic ^L	5	CHEM 222 Organic ^L	5	
CHEM 231 Quant ^L	4	PHYS 211 Physics ^L	4	
Elective	3	ENGL 250 English	3	
TOTAL	16	TOTAL	17	
Year 3:				BIOL 491 Internship or BIOL 496 or CHEM or PHSV 497: Indep. Project TOTAL 3-6 credits
CHEM 364 Biochem	4	BIOL 472 Proteins	3	
CHEM 332 Biochem lab ^L	2	CHEM 333 Biochem lab ^L	2	
PHYS 212 Physics ^L	4	BIOL 370 Developmental ^L	4	
BIOL 375 Genetics	3	MATH 250 Statistics	2	
Elective	3	BIOL 386 Micro/Immuno ^L	5	
TOTAL	16	TOTAL	16	
Year 4:				
BIOL 379 Tissue Culture ^L	2	BIOL 470 Molecular Gen	4	
BIOL 388 Adv Immun. lab ^L	2	BIOL 471 Recombin DNA ^L	3	
BIOL 473 Proteins lab ^L	3	CHEM 474 Adv. Biochem	3	
BIOL 474 Adv Cell/Molec	3	Elective	3	
ENGL 311 Tech. Writing	3	Elective	3	
Elective	3			
TOTAL	16	TOTAL	16	

Social Awareness electives must include nine credits from two different areas and include at least one "Foundations" course and one course at the 300-400 level. Cultural Enrichment electives must include nine credits from two different areas, including one at the 200-level or above. At least one of these electives must also satisfy the global consciousness requirement, and one the race/ethnicity/gender requirement.

Students wishing to enter industry are strongly advised to be computer-literate by graduation.

c:\boogaard\biotechcur

CURRICULUM EVALUATION

The Biotechnology Program curriculum has undergone revision three times in the eleven years of its' existence. This is due to the tentative nature of the initial design, and comes in response to the recommendations made by the External and Internal Advisory Committees. As a result of these changes, we have moved to including a year-long biochemistry sequence instead of a one-semester course. We have instituted the internship as a requirement, the writing of a paper based on the scientific literature (CHEM 474), troubleshooting and data analysis in Proteins and in the laboratory classes, increased computer usage in the labs, and other less major changes too numerous to mention.

The curriculum now stands at 130 hours required for graduation. Inclusion of anything more would require that something be deleted. When this was made clear to the External Advisory Committee, they had no recommendations for changes. Minor changes may be considered: making official the unofficial policy of allowing students to choose between COMM 121 or COMM 105; and between MATH 250 or STQM 260. We may also recommend (but will not likely require) that students take PSYC 326 (Industrial and Organizational Psychology) if they wish to enter industry. There are no major areas of concern regarding the curriculum.

The Biotechnology Program faculty are members of the Departments of Biology and Physical Sciences. Those who are primary teachers in the Program all have earned the PhD in their fields. The faculty of the Biology Department are listed on the following page, with their credentials and areas of interest. Course syllabi for the courses required by the Biotechnology Program are included.

BIOLOGY FACULTY ACADEMIC CREDENTIALS

<u>NAME</u>	<u>DEGREE</u>	<u>RECEIVED FROM</u>	<u>DEGREE AREA</u>
Adewusi, Kemi	Ph.D.	North Texas State	Parasitology
Boogaard, Connie	Ph.D.	Calgary	Biochemistry
Beetley, Bruce	M.S.	Michigan State	Ornithology/Wildlife Biology
Buss, Jack	Ph.D.	Minnesota	Developmental Biology
Fonner, Douglas	Ph.D.	Michigan State	Physiology
Friar, Robert	Ph.D.	Purdue	Physiology
Gogolin, Luanne	Ph.D.	Michigan State	Anatomy
Hoeksema, Walt	Ph.D.	Michigan State	Microbiology/Public Health
Hoerter, James	Ph.D.	Penn State	Genetics
Mitchell, Roger	Ph.D.	Minnesota	Genetics
Murnik, Mary	Ph.D.	Michigan State	Genetics
Palmer, Robert	Ph.D.	Utah State	Physiology
Ryan, Michael	Ph.D.	SUNY-Buffalo	Microbiology/Immunology
Stewart, David	M.S. (2)	Central Michigan, University of Michigan	Water Quality Control
Vanderploeg, John	M.S.	Delaware	Ornamental Horticulture
Watson, Phillip	Ph.D.	Illinois-Urbana	Entomology/Ecology

BIOL 121
Course Perspectus
Winter Semester - 1998

I. How do I contact my teacher, Professor David A. Stewart?

- A. Phone: 592-2543, Extension 2543
- B. My office is ASC 2117. My office hours this semester are:
 - Monday 9-10
 - Tuesday 1-2
 - Wednesday 2-4
 - Thursday 10-11
- C. You can also make appointments with me or through my answering service. I'll get back to you. You may step into my office anytime the door is open.

II. Do we need books?

- A. Yes, the textbook is BIOLOGY, by Raven and Johnson, 4th Edition. You also need a lab manual, BIOLOGY 121 LAB MANUAL.
- B. You will also need six unwrinkled 882-ES Scantron answer sheets.

III. How will I be graded?

- A. You will be graded fairly.
- B. There will be five announced, written lecture exams, each assigned a maximum of 50 points. They will consist of questions from lecture plus any handouts. The final examination serves one function: You may use it to make-up one or two lecture exams you may have missed during the semester,
- C. Each lab period has a 10 point quiz over the material of that lab.
- D. Your total points, converted to a percentage, will determine your final grade based on the following scale:
 - A = 93-100 B- = 80-82 D+ = 67-69
 - A- = 90-92 C+ = 77-79 D = 63-66
 - B+ = 87-89 C = 77-79 D- = 60-62
 - B = 83-86 C- = 70-72 F = Below 60

IV. What are the objectives of the course?

- A. I want my students to be able to apply the basic themes of biology in various situations.
- B. Students will become more proficient microscopists and will learn various other laboratory techniques.
- C. Students will learn the scientific method and how it is applied.
- D. Students will learn of recent and past discoveries in biology which have greatly impacted humans on earth.
- E. Students will gain a better appreciation of the living world.

V. Is there an attendance policy?

A. Yes, and it is strict.

B. I have tried to deal with "phantom" students (those that rarely attend and/or attend late), but without success.

C. Prompt attendance to all lectures and labs is expected, required, and reasonable.

D.If you miss more than five lectures or more than three labs, automatic course failure results. Three tardinesses are equivalent to one absence, both in lecture and lab.

VI. Do not present the work of another as your own. Do not give your work product to another to represent as his/her own. If so, you get zero for that project. A second offense results in course failure

BIOL 121
Laboratory Schedule
Winter Semester - 1998

DATE		LAB
January	12	The Microscope
January	26	Predation
February	2	Population Growth
February	9	Genetics: Monohybrid Crossing
February	16	Genetics: Blood Typing
February	23	Yeast Mutations
March	2	Biochemical Evidence for Evolution
March	16	Monera
March	23	Protista
March	30	Taxonomy and Fungi
April	6	Plant Survey
April	13	Plant Anatomy
April	20	Plant Physiology I
April	27	Plant Physiology II

Monday, March 23, is the last day for dropping with an approved "W".
Be sure to read your lab exercise before you come to lab. This makes for less confusion.

**BIOL 121
Lecture Schedule
Winter Semester - 1998**

DATE	LECTURE TOPIC	CHAPTER
January 13	Introductions and the Scientific Method	1
15	Populations and Intraspecific Competition	24
20	Interspecific Competition	25
22	Ecosystems	26
27	Biological Communities	27
29	Exam #1	
February 3	Cellular Fission and Mitosis	11
5	Sex and Meiosis	12
10	Mendelian Crosses	13
12	Chromosomes and how they Function	13
17	Human Genetic Disorders	13
19	Exam #2	
February 24	Dynamics of Gene Frequencies in Populations	20
26	Evidence for Evolution	21
March 3	Species Formation I	22
5	Species Formation II	22
17	Theories of Human Evolution	23
19	Exam #3	
March 24	Taxonomy	29
26	Viruses and Bacteria	30
31	Protista I	31
April 2	Protista II	31
7	Fungi	32
14	Exam #4	
April 16	Plant Diversity	33
21	Evolution of Flower and Fruit	34
23	Seed Development and Embryology	35
28	Plant Cytology, Histology, and Circulation	35
April 30	Hormones and Plant Growth	36
May 1	Exam #5	

Note: Monday 23 March is the last day to drop with a "W" grade.

Note: Some of the above chapter reading assignments are longer than others. You should focus your study on those topics brought up in lecture and/or labs.

Biology 122, general biology II

Instructor: Dr. Roger Mitchell

Lab instructors: Your lab instructor will give you contact information

Office hours: ASC (Commons) 2118: Monday and Friday 10:00 - 11:30 AM and Tuesday 9:00-10:00 AM. Make an appointment, or drop by to see if I am available at some other time. Knock if the door is closed! You may call my office at any time: 591-5879

Materials you are required to have:

text: Biology, 4th ed., Raven and Johnson

lab manual: Biology, Vodopich and Moore (4th edition)

#2 pencils for the lecture exams

your student ID for each exam

additional materials for lab, including gloves.

Exams and the total percentage. 25% lab grade, 65% for lecture exams (including the final exam), and 10% for lecture attendance. Part of the final will be based on the lectures after the third exam, and the remainder will be comprehensive. The first lecture exam will be worth 25 points, the second and third 50, and the final 75.

Exams can only be made up with a legitimate excuse, with a 5% deduction per day. Students who schedule makeup exams in advance will normally take the same test as the rest of the class, or something similar. Makeup exams that are not taken before the tests are turned back will be penalized 20%. Late make-ups may either be essay tests or use the student's grade on the corresponding part of the final. I reserve the right to make additional assignments as a condition of giving makeup exams. There is no "extra credit." All of these components will be added to get a final total percentage, which will not be adjusted in any way.

Grades. The final total percentages will be curved against a normal grade distribution or modified normal grade distribution at the end of the course.

Dropping with the "W" grade must be done on or before **March 23**.

Incompletes will be given only at my discretion and will require proof of exceptional need. Consistent with university policy, the student must have passed 75% of the class prior to being forced to stop attending due to circumstances beyond their control. The "I" grade must be cleared or it will become an "F."

Attendance will be taken in both lab and lecture. If you miss a lab, you may get a "0" for that day's score. Labs cannot be made up for any reason. Missing more than two labs for any reason will result in failing the class. Excessive tardiness may count as an absence. Attendance will also be taken in lecture, counting for 10% of your overall grade. Assigned seating will be used to aid in attendance taking in both lab and lecture.

Cheating will result in course failure. Additional action may be taken by the university.

Disruption of class. I will take whatever action is necessary to maintain a lecture atmosphere conducive to learning. I reserve the right to force involuntary withdrawal or make additional assignments in response to tardiness or disruptive behavior.

Biotechnology

APRC 1998-1999

section 2 of 6

Studying is the responsibility of each student, and strategies differ. The following is a minimal approach:

1. Read the text material for both lab and lecture before attending.
2. Attend every lecture and take careful notes.
3. Within a day of each lecture and lab, review your notes to make sure you understand everything. Do the problems at the end of each chapter and lab.
4. If you have trouble understanding anything, get help at once. I am always happy to help students, and the university also has a tutoring service.
5. Review the material again before each exam. You should plan to have done all of the things listed above before you study for the exam.
6. If you still have difficulties, you may need to take notes from your book before lecture, and/or rewrite your lecture notes to improve your understanding.

The keys to doing well are to do all of the reading, go to every lecture, and not fall behind on studying.

Exam material will come from both the text and lecture, and may not be covered in both. Questions will test both your retention of the material presented, as well as your understanding of underlying concepts.

Your most important resource will be yourself. You will choose your own grade, by choosing how hard you work in the course, and how effectively you study. The actual grades assigned by the instructor is just a reflection of your performance.

TENTATIVE LECTURE SCHEDULE

DATE	TOPIC	CHAPTER
Jan. 12	life and chemistry	2
14	biochemicals	3
16		
20	cells	5
22		
26		
28	EXAM 1	
30	membranes	6
Feb. 2		
4	energy and metabolism	8
6		
9	respiration	9
11		
13	photosynthesis	10
16		
18	DNA	14
20		
23	genes	15, 16
25	EXAM 2	
27		
Mar. 2	mutation	18
4		
6	gene technology	19
16		
18	animal introduction	38
20	noncoelomate animals	39
23	Mollusca and Annelida	40
25	Arthropoda and Echinodermata	41
27	Chordata	42
30		
Ap. 1	EXAM 3	
3	animal anatomy: general	43
6		
8	nervous system	47, 48
13		
15	homeostasis	<i>chapters not required</i>
17		<i>(46, 45, 51)</i>
20		
22		
24	immunity	50
27		
29	development	53
May 1		

TENTATIVE LAB SCHEDULE. you should read your lab exercises before attending lab.

Week of	TOPIC
Jan. 12	Macromolecules
20	NO LABS
26	Osmosis
Feb. 2	Enzymes I
9	Enzymes II
16	Energy
23	DNA isolation and bacterial transformation I
Mar. 2	DNA isolation and bacterial transformation II
9	NO LABS
16	Primitive vertebrates and worms
23	Mollusks, Arthropods, and echinoderms
30	Vertebrate anatomy I
Ap. 6	Vertebrate anatomy II
13	Vertebrate anatomy III
20	Kinesis in pill bugs
27	Environmental factors and macroinvertebrates

Human Physiology and Anatomy

Biology 231

Fall 1997

Credits: 4

Prerequisites: Biol 121-122 and Chem 121-122.

GOALS AND OBJECTIVES

The goal of Biology 231 and 232 is to increase student understanding of the structures and functions of the human body and its components and of the chemical and physical processes involved.

Objectives:

1. Identify the cells, tissues, and organs that form the human body.
2. Describe the organization of organs at the cell and tissue level.
3. Explain the function of organ systems at the molecular, cellular, and organ level.
4. Explain the expected effect (predict) on homeostasis of organ damage and of internal and external environmental disturbances.
5. Use the scientific approach to understanding of how the human body functions. (observation, measurement of entities that can be quantified, the accumulation of data, and analysis of the findings)
6. Propose and defend novel solutions to anatomy and physiology related problems.

Instructor: Douglas Fonner

Office: ASC 2011

Phone: 592-2554

Email: dfonner@art01.ferris.edu

OFFICE HOURS

Monday	3:00 -- 4:00
Tuesday	3:00 -- 4:30
Wednesday	1:00 -- 2:30
Friday	10:00 -- 11:00

I'm also available throughout most of the day. Stop in any time you have questions. If you phone and I'm away from my desk, please leave a message and I will return your call as soon as possible.

COURSE MATERIALS

Concepts of Human Anatomy and Physiology, 4th. Ed., Van De Graaff and Fox.

Medical Physiology, 8th or 9th Ed., Guyton.

Lecture and lab handouts and other materials are available online.

EVALUATION AND GRADES

<u>Percentage</u>	<u>Grade</u>
93%	A
90%	A-
87%	B+
83%	B
80%	B-
77%	C+
73%	C
70%	C-
67%	D+
63%	D
60%	D-

	<u>Points</u>
Lecture Exams (4)	300
Comprehensive Final Exam	150
Quizzes (1-5)	10-50
Anatomy Lab Exams (2)	75
Seminars (2)	35
Physiology Reports (4)	40
Total	600-650

Lecture exams cover lecture material and reading assignments. They may include multiple choice, matching, diagram, and short answer questions. If you miss an exam because of an instructor approved excused absence, it is your responsibility to schedule a make-up as soon as possible. The *Comprehensive Final* will replace the missed exam, if you do not make it up before it is returned to the class.

Students with a 75% or higher on each of the four lecture exams can elect not to take the final. If you do not take the final, your lecture exam scores will be adjusted to a 450-point basis (multiply the four exam scores by 1.5).

Sorry: There are no exceptions to the 75% cutoff. You need a minimum of 56 on a 75-point exam to meet this requirement.

POSTING EXAM SCORES

Exam scores will be posted by the last four digits of your student number. If you don't want your scores posted by student number, see me and we will make other arrangements.

ATTENDANCE

Labs are an integral component of the course and attendance is required. If you miss a lab because of an excused absence, see me immediately to reschedule the lab. Certain labs (those involving the use of animals) cannot be made up after the last scheduled lab for the week. Failure to make up a lab will result in the loss of points for the lab.

Students are required to attend lecture at any time during the semester in which their cumulative lecture test and quiz grade falls below 75%. Students are responsible to check the posted grades to determine if their attendance at lecture is required. Exam and quiz scores will usually be posted before the start of the next scheduled lecture.

No more than 3 absences from lecture will be permitted prior to the University's final class withdrawal date. And no more than 4 absences from lecture will be permitted for the semester. Students who exceed this number of absences will receive a failing grade in the course, or may withdraw if this occurs during the University's class withdrawal time period.

Exceptions to Attendance Policy (see next page)

Exceptions to Attendance Policy

1. University sponsored events
2. Death in the family
3. Extended hospitalization
4. Dangerous weather conditions (as considered by local authorities)
5. Being called to testify in a court case

Reminder: The lecture attendance policy applies if your cumulative lecture exam and quiz score falls below 75%.

LECTURE HANDOUTS

Lecture handouts are available online. They are not a substitute for lecture, however. Their purpose is to prepare you for lecture, help you organize your notes after lecture, and to fill in details. Many students prefer to take their own complete set of notes, because it helps them to focus on the lecture and they remember things better when they write it down. Other students prefer to listen and take only supplemental notes on the handouts. I personally recommend the first approach (if nothing else, it's hard to daydream or fall asleep when you're writing). If you prefer to do "just listen", that's fine, but you will have to pay attention, so that you know what's on the handouts and what's not, in order to fill in any missing information.

YOUR BRAIN IS NOT A SPONGE

Unfortunately, your brain is not a sponge that soaks up information that you can wring out later. To do well in anatomy and physiology, you have to assimilate a large vocabulary, learn new concepts, and apply the concepts to meaningful situations. If you are a passive listener or if you measure your preparedness by the number of hours you study, you will probably not do well on the exams. It takes work to understand new concepts, and you have to practice using them. I recommend that you:

1. Organize the material in a way that makes sense to you. You may even have to rewrite your notes if they don't make much sense to you.
2. Devise ways to remember terms and other jargon and concepts. For example, come up with good analogies to help you remember new concepts.
3. Practice using the information. Discuss the material with other students in the class, take the practice quizzes, and do the problems.
4. Analyze your mistakes. For example, look at the exam questions you missed to see why you missed them. Was it because you were weak in one area, weak on details, or miss-read questions?

PRACTICE QUIZZES

Practice quizzes are available for the lecture material and for the first two lab units. You may take these quizzes online at any time and as many times as you want. Although results will be recorded, they will be used for diagnostic purposes only and not for determining grades.

The purpose of these quizzes is for you to assess your understanding of the material and for you to practice using the information. Don't wait until the last minute to take these, don't divulge the answers to your friends, and don't ask for the answers. It defeats their purpose.

Reminder: The quizzes are diagnostic tools that allow you to practice using the information. They are not study guides.

BIOLOGY 231 LABS

The Biology 231 labs are organized into three units.

1. Introduction, Tissues and Integument (Skin)
2. Nervous, Skeletal, and Muscle System Anatomy
3. Nerve and Muscle Physiology

Each unit consists of a core of anatomy studies or physiology experiments that are largely self-paced. Instructional materials, which are available online, will introduce the subject and explain what you need to know or do, and how you will be tested or evaluated. Additionally, computer-based presentations are available for the certain subjects.

Most of the work in lab will be done in teams of 3 to 4 members. I will meet with your team on a weekly basis for the first several weeks or until completion of the first unit. These meetings are to discuss your progress and any difficulties you might be encountering.

LAB SEMINARS

In addition to the core of anatomy studies and physiology experiments, units 1 and 3 will include a problem. The problem's solution will require an understanding of the unit's material and information from additional sources (e.g., scientific literature and experts in the field). Your team will propose a solution, and report and defend it in a seminar at the end of the unit.

LAB ASSESSMENT

Student performance in the lab will be assessed in the following ways:

1. Individual oral or written tests on the anatomy material in units 1 and 2.
2. Written reports on the physiology experiments in unit 3.
3. Oral or written evidence of understanding of the problems posed for the seminars and the work team's solutions to them.

HUMAN PHYSIOLOGY & ANATOMY

BIOLOGY 232 Winter 1997

Dr. Douglas Fonner	Office Hours:	
Office: ASC 2011	Tuesday	9:00 - 11:00
Phone: 592-2554	Wednesday	1:00 - 2:00
Email: dfonner@art01.ferris.edu	Thursday	9:00 - 11:00

Above are my official office hours. I am also available throughout the day. Stop in any time you have questions. If you phone and I'm away from my desk, please leave a message on my phone mail and I will return your call as soon as possible.

Goals and objectives

The goal of this human physiology and anatomy course is to increase your understanding of how science works and how cells and organs function in the human body. Specific objectives:

1. To learn the major ideas, theories, principles and paradigms (models) that form the foundation of physiology and anatomy.
2. To improve rational thinking by applying the above knowledge to solve problems.
3. To promote critical thinking by examining the observations that led to several of the major paradigms of cell and organ function.
4. To develop the ability to understand published information by reading and analyzing articles from relevant science publications.
5. To promote the interchange and discussion of ideas by using a team approach to solve problems and prepare assignments.

EVALUATION SYSTEM

Lecture exams will cover lecture material, reading assignments, and physiology labs. They will consist of multiple choice, matching, diagram, and essay questions. If you miss an exam

Lecture Exams	400
Comprehensive Final	100
WWW Project	50
Physiology Worksheets	75
Anatomy Quizzes	75
Investigative Lab Project	50
Total	750

because of an excused absence, you must contact me within one class day to schedule a make-up exam. Make-up exams are for excused absences only.

The final exam is optional if you score 75% or higher on each of the four lecture exams.

If you don't take the final, your four lecture exams (possible 400 points) will be prorated to 500 points (multiply the sum of the four lecture exams by 1.25 or substitute the average of your four lecture exams for the final exam).

GRADES	87% B+	77% C+	67% D+
	93% A	83% B	73% C
	90% A-	80% B-	70% C-
			63% D
			60% D-

MATERIALS NEEDED FOR COURSE

- *Concepts of Human Anatomy and Physiology*, 4th. Ed., Van De Graaff and Fox.
- *Medical Physiology*, 9th Ed., Guyton.

- *Biology 231-232 Lab Manual*
- *Lecture Notes Available on the WWW*

SCHEDULE

Week	Topic	Lab
January 13	Digestive System	Visceral organ anatomy
January 20	Digestive System	Martin Luther King Day
January 27	Metabolism	Visceral organ microanatomy
February 3	Exam (Date to be determined)	Smooth muscle physiology
	Respiration	
February 10	Respiration	Skeletal system
February 17	Respiration and Heart	Respiratory physiology
February 24	Heart	Anatomy of the heart
	Exam Friday Feb. 28	
March 3	Spring Recess	
March 10	Cardiovascular system	Electrocardiogram
March 17	Cardiovascular system	Cardiac physiology
March 24	Cardiovascular system	Cardiac physiology
March 31	Blood	Blood Pressure
	Exam (Date to be determined)	Investigative lab
April 7	Inflammation and Renal system	Investigative lab
April 14	Renal system	Investigative lab
April 21	Reproductive system	Renal and reproductive system anatomy
April 28	Reproductive system	Investigative lab presentations
Thursday May 1	Exam	

READING ASSIGNMENTS

Topic	<i>Concepts of Human A&P</i>	<i>Medical Physiology</i>
Digestive system	Chapter 26	Chapter 26
Metabolism	Chapter 27	Pages 865-871 and Chapter 78
Respiratory system	Chapter 24	
Heart	Chapter 21	Chapters 9, 10 and 11
Circulatory system	Chapter 22	
Blood	Chapter 20	
Inflammation		Chapter 33
Urinary system and fluid, electrolyte and acid-base balance	Chapter 25	
Male reproductive system	Chapters 28	Chapter 80
Female reproductive system	Chapter 29	Chapter 81
Pregnancy	Chapter 30	Chapter 82

**COURSE SYLLABUS
DEVELOPMENTAL BIOLOGY
BIOL 370
WINTER SEMESTER 1998**

CATALOGUE LISTING:

A study of the fundamental principles of development and the mechanisms responsible. An examination of the morphological changes which occur during development in vertebrates. Designed for students in science bachelor's degree programs. Prerequisite:BIOL 122
Semester offered: W

FACULTY INFORMATION:

Instructor: Dr. Jack Buss
Office: 2009 Arts and Sciences Commons
Telephone: 592-5639
e-mail JACK BUSS@FERRIS.EDU
Office hours: **Monday:** 1:00 pm – 1:50 pm
Tuesday: 12:00 n –12:50 pm
Wednesday: 1:00 pm – 1:50 pm
Thursday: 12:00 n –12:50 pm

MAJOR OBJECTIVES OF THE COURSE:

Upon completion of this course:

01. The student will demonstrate a knowledge of anatomical terminology and of vertebrate anatomical structure.
02. The student will demonstrate knowledge concerning the relationships between developmental events and the definitive adult structure.
03. The student will demonstrate a knowledge of experimental design.
04. The student will demonstrate an understanding of the basic concepts regarding the control of developmental events and be able to describe and explain these concepts in writing..
05. The student will demonstrate skills and attitudes (such as promptness, meeting deadlines, working in groups toward a common goal, and the use of e-mail) that will facilitate adaptation to a work environment

COURSE FORMAT:

The study of development not only attempts to answer the question "Where did I come from?" but also, "Why am I like I am?" The members of the class will be organized into discussion groups which, using the text as a basis, will explore the basic concepts of embryonic development. These discussion groups will explore not only the morphological changes that occur during development, but also the mechanisms

responsible for these changes. Particular emphasis will be placed on the experimental framework upon which our understanding of developmental processes is based. The laboratory will focus primarily on the morphological changes that take place during development. On occasion, living materials will be used to observe these processes.

It is important that you attend every class session, read the textbook and laboratory manual assignments in advance, and review course material on a daily basis. Many studies have shown that class attendance is one of the most important factors in obtaining academic success.

As a student in this course, you should recognize that embryonic development is complex and that numerous new terms and concepts will be introduced during this semester. If for some reason you find that you are having problems with the material covered in discussions or in the laboratory, please do not hesitate to ask your instructor for assistance. It is not uncommon for a student to feel overwhelmed by the volume of information presented in this course, however, with diligent effort, the seemingly unrelated concepts will fall together into a coherent pattern and the study of development will become a fascinating and rewarding endeavor.

TEXTS:

Carlson, B.M., Patten's Foundations of Embryology, McGraw-Hill, Inc., 1996
Schoenwolf, G.C., Laboratory Studies of Vertebrae and Invertebrate Embryos, 7th ed., Prentice Hall, 1995.

EXAMINATIONS AND QUIZZES:

Weekly quizzes based on the discussion topics and **three laboratory examinations** will be given during the course of the semester. The dates of these exams are listed in the course schedule. A written **final examination** will be given during finals week.

Quizzes will be given on Fridays of each **week**. These will normally account for 20 points each for a total of approximately **300** points. The quiz will consist of two parts. The **individual quiz** will focus on terminology and definitions. The individual quizzes will typically consist of 10 questions that require one or two word answers and will be worth **10 points**. The **group quiz** will focus on concepts, relationships, mechanisms, and developmental implications of the material presented in the reading. Group quizzes will consist of 3 to 6 questions and will be in the short essay or diagram format. The group quiz will be worth **10 points**. For each quiz the student will receive a score that is equal to the sum of the his or her individual quiz score and the group quiz score. However, the group quiz score for an individual **may be lowered** if the other members of the group and/or the instructor determine that the contribution of that individual to the group effort is not adequate.

Laboratory practical examinations will consist primarily of identification of embryonic structures and demonstration of a knowledge of their function and relationship to adult structures. Each laboratory exam score will be **converted to percentage** and will account for **100 points**.

The **final exam** will consist primarily of questions taken from previous quizzes. The score on the final examination will be **converted to a percentage** and account for **100 points**.

If a student has an **unexcused absence**, the student will receive a 0 for the quiz that day. If the student must miss class for a reason acceptable to the instructor, the quiz may be taken ahead of time. The student will take the both the individual and group quizzes as an individual. A copy of that students' group quiz answers will given to the other members of the group during the time they take the group quiz.

Points may be awarded for other activities such as outside written assignments and evaluation of individual performance in group discussions. The points for such activities will be added to the total possible for the course.

All points accumulated during the semester will be **totaled**, converted to **percentage** and the course grade assigned will be based on the **scale listed below**. The instructor will not raise the following standards but retains the option to lower the standard required to achieve a particular grade.

The total possible points for discussion quizzes, discussion final exam, laboratory exams, is approximately **700 points**.

GRADING SCALE:

92 - 100 = A	72 - 77.9 = C
90 - 91.9 = A-	70 - 71.9 = C-
88 - 89.9 = B+	68 - 70.9 = D+
82 - 87.9 = B	62 - 67.9 = D
78 - 80.9 = B-	60 - 61.9 = D-
78 - 80.9 = C+	Below 60 = F

OTHER POLICIES:

Students are responsible for any assignments made during the class session whether they are in attendance or not. If you must miss a class, please notify the instructor in advance if possible.

Unexcused absences will result in the loss of points.

For an absence to be excused, the student's name must appear on a memo from the office of the Vice-President of Academic Affairs (e.g. field trip, sporting event, concert tour) or on a memo from the Associate Dean of Students of the College of Arts and Sciences explaining the reason for the absence. The instructor reserves the right to excuse an absence if the reason is justified.

Only in cases of extreme emergency will a student be allowed to make up a **laboratory examination**. In cases in which the absence from a laboratory exam is considered justified by the instructor, a different exam, typically more difficult and in the form of an oral examination will be given.

Discussion group quizzes and in-class assignments may not be made up unless the absence is excused.

It is expected that each student will come to the **laboratory session** prepared to maximize his/her learning experience. This can only be accomplished by reading the laboratory materials and studying the appropriate illustrations in the laboratory text prior to the start of the laboratory session.

Out of class **writing assignments** must be submitted on the due date. Failure to do so may result a zero on the assignment or a significant point deduction from the total achieved.

It is a University policy that children are not permitted in the laboratories.

Month	Date	Topic	Text	Pages
Jan	12	Introduction; 33 hour chick embryo whole mount	S*	027-030
	14	33 hour chick embryo serial x.s.	S	020-041
	16	Historical Background; The Cell and Its Environment	C**	001-020
	19	No Class - Martin Luther King Birthday		
	21	33 hour chick embryo serial x.s.	S	034-037
	23	Fundamental Concepts in Development	C	020-041
	26	Methods in the Study of Embryonic Development; 33 hour chick embryo serial x.s.	C S	041-056 034-037
	28	33 hour chick embryo serial sag.s.; Embryo recovery - 33 hour chick	S	037-039 053-054
	30	Reproductive Organs and the Sexual Cycle	C	057-073
	Feb	02	Gametogenesis; Grasshopper testis;	C
04		Frog ovary; 4 mm frog embryo sections		
06		Spermatogenesis; Oogenesis		085-103
09		Gene Expression; Laboratory Review	C	103-113
11		LABORATORY EXAMINATION I		
13		Accessory Membranes	C	113-120
Feb	16	Invertebrate Fertilization; Ascaris fertilization	C	121-131
	18	Sea Urchin cleavage and gastrulation		
	20	Mammalian Fertilization; Sex Determination and Polarity	C	131-149

*Schoenwolf, G.C., Laboratory Studies of Vertebrate and Invertebrate Embryos, 7th ed., Prentice-Hall, 1995

**Carlson, B.M., Patten's Foundations of Embryology, 6th edition, McGraw-Hill, Inc, 1996

Month	Date	Topic	Text	Pages
	23	Invertebrate Cleavage; 18 hour chick embryo	C S	151-161 039-049
	25	24-hour chick embryo; 48-hour chick embryo whole mount	S	050-053 067-069
	27	Amphibian and Mammalian Cleavage; Sex Determination and Polarity	C	161-188
Mar	03	Gastrulation; 48 hour chick embryo serial x.s.	C S	189-204 072-078
	05	48 hour chick embryo serial x.s.	S	072-078
	07	Gastrulation in Birds; Germ Layer Origin; Neural Induction	C	204-232
	16	Neurulation in Amphibians; 48 hour chick embryo serial x.s.	C S	232-240 072-078
	18	48 hour chick embryo serial x.s.	S	072-078
	20	Mesoderm and Axial Structures; The Mammalian Body Plan	C	240-254 291-310
	23	Cell diversity 48 hour chick embryo serial x.s.	C S	311-320 072-078
	25	Embryo recovery - 48 hour chick. 48 hour chick embryo serial x.s.	S S	072-078 072-078
	27	Gene Expression; Muscle Formation	C	320-338
	30	Formation of Skeletal Tissue 48 hour chick embryo serial sag.s.	C S	339-353 078-079
Apr	02	48 hour chick embryo serial sag.s.	S	078-079
	04	Skin Formation	C	355-375
Apr	06	Epidermal Differentiation and Pigmentation	C	375-391
	08	LABORATORY EXAMINATION II		
	10	Easter Break		
Apr	13	Establishment of the Nervous System 72 hour chick embryo whole mount	C S	427-438 082-083
	15	72 hour chick embryo serial x.s.	S	085-089
	17	Organization of the Nervous System; Peripheral Nerves	C	438-467

Month	Date	Topic	Text	Pages
	20	The Neural Crest;	C	469-484
		72 hour chick embryo serial x.s.	S	085-089
	22	72 hour chick embryo serial x.s.	S	085-089
	24	The Eye	C	485-505
	27	The Eye;	C	496-505
		72 hour chick embryo serial sag.s.	S	089-090
	29	LABORATORY EXAMINATION III	S	
	30	The Ear; Development of the Face and Jaws	C	505-519
May	05	FINAL EXAMINATION		

BIOL 375 Principles of Genetics
Winter 1998

Instructor: Dr. Mary R. Murnik *Office:* ASC 2120 *Phone:* x2546
e-mail: mary r murnik@ferris.edu *Office Hours:* W-F 8:00-8:50am, 11:00am-noon

Course Objectives: BIOL 375 introduces genetics to students who are science majors. The purpose of this course is to increase your understanding of the mechanisms of the transmission and expression of genetic information. You will gain factual knowledge about genetics and learn to apply genetic concepts and principles. After completion of this course, you should have a good understanding of inheritance patterns and the molecular mechanisms by which genes control cell metabolism, growth and differentiation, and the evolutionary implications of genes in populations. Problem solving and critical thinking are emphasized.

Prerequisites: Biology 122 or equivalent and a course in biological chemistry

Attendance and Participation: Attendance and participation at all lectures is expected. If you miss a lecture, it is your responsibility to obtain information which was presented. You are expected to read relevant text material before class and to do related problems in the lecture guide. Lectures will not repeat all text and problem material.

Text: *Genetics*, Weaver and Hedrick, Wm. C. Brown, Publishers, third edition, 1997

Lecture Guide: *Genetics: A Lecture Guide for BIOL 375*, Mary R. Murnik, 1997
(Available only at Great Lakes Book and Supply)

Grades: There will be 10 unannounced quizzes, four scheduled tests and a final examination. The final is optional for those who have earned at least 70% on the four scheduled tests. The grading scale is:

A	93% and above	C	73-76%
A-	90-92%	C-	70-72%
B+	87-89%	D+	67-69%
B	83-86%	D	63-66%
B-	80-82%	D-	60-62%
C+	77-79%	F	below 60%

Make-Up Tests: Make-up tests will be offered only to students with documentation for valid reasons for missing the regular exam (e.g. illness, death in the family.) There are no make-up quizzes. Any quiz grade may be replaced by a four page review paper with considers a genetics topic assigned by the instructor. The required format is described below. These papers must be turned in by April 22. None will be accepted after that date.

A Quiz Replacement Paper should be typewritten (font-size 12), double-spaced, and contain:

1. A title page with title, course, name and date
2. A body of at least four pages with three sections: introduction, discussion and summary
3. References (at least two) cited by superscript numbers within the body of the paper, and a numbered reference list after the summary of the paper. (If all the information in a paragraph can be attributed to one reference, you may just give that reference number at the end of the paragraph.)

Cheating: The FSU policy on cheating is described in the Student Handbook. Cheating on a test or quiz usually results in automatic failure in the course. If a grade of zero is given as a penalty or cheating on a quiz, this grade may not be replaced by a paper, nor dropped from the calculation of the grade average.

Help: Dr. Murnik will be happy to help you during regular office hours or during any other available time. You are also encouraged to attend the scheduled *tutoring sessions*, which will be announced in class.

BIOL 375 Lecture Schedule

<i>Date</i>	<i>Topic</i>	<i>Chapter/Pages in Text</i>
Jan. 12	Introduction to Mendelian Genetics	1
Jan. 14, 16	Probability and the Chi-Square Test	2
Jan. 21, 23	Independent Assortment and Modification of Mendelian Ratios	3:42-50; 67-69 54-56
Jan. 26, 28	Sex Linkage and Pedigree Analysis	3:50-54
Jan. 30, Feb. 2	Polygenic Inheritance and Quantitative Traits	3:56-67
Feb. 4	Mitosis and Meiosis (on Test 2)	4: 73-85
Feb. 6	Test 1	
Feb. 9, 11	Chromosomal Changes: Aneuploidy and Polyploidy	4:93-100
Feb. 13, 16	Chromosomal Rearrangements	4:85-95
Feb. 18, 20	Linkage	5
Feb. 23, 27	Population Genetics: genetic equilibrium	19
Mar. 2, 4	Population Genetics and Evolution	20
Mar. 6	Test 2	
Mar. 16, 18	DNA	6,7
Mar. 20	Genes and Proteins	10:256-275
Mar. 23, 25	Transcription and Translation	10:277-290
Mar. 27, 30	Transcription and its control in Prokaryotes	8
April 1, 3	Gene Structure and Expression in Eukaryotes	9
April 6	Mutations	11
April 8	Test 3	

April 13, 15	Genetics of Bacteria and Viruses	13	
April 17, 20	Transposable Elements; Genetic Engineering	12, 15	
April 22	Extranuclear Inheritance		18
April 27, 29	Genes and Cancer	17	

May 1 Test 4

May 5 (Tuesday) 10:00-11:40am Final Exam SCI 120 (regular classroom)

BIOLOGY 379: CELL AND TISSUE CULTURE LABORATORY

FALL SEMESTER, 1997

Mrs. Mary K. Bacon, Instructor

ASC 3019 Phone-2586

Office Hours Monday 4:00-4:50; Tuesday, Thursday 1:30-3:00

Prerequisites: Enrollment in the Biotechnology Program

Co-requisites: Biology 474

Textbook:

Tissue Culture Techniques by Bernice M. Martin

Objectives:

To master the techniques needed to culture mammalian and plant cells in vitro; to perform routine cell manipulations such as subculturing, cryopreservation, retrieval from frozen storage, growth kinetic assays, and plant cloning. Selected cell biology experiments will also be performed that utilize a variety of lab techniques to understand the biology of living cells.

Underlying these topics will be the skills necessary for students to learn professional laboratory behavior. Such topics will be addressed when appropriate.

Grading:

Laboratory notebooks will be required to record all observations, experimental notes, lab questions, etc. and may be collected at any time. Also incorporated into the final course grade will be laboratory behavior, work in the lab, punctuality, pre-lab preparation, etc. Professional, mature behavior is expected and required at all times. Tardiness, poor work habits, and inadequate notebooks will NOT be tolerated and will negatively affect your grade. All grades will be averaged for a final course grade.

Experiments:

Work with living cells requires a flexible lab schedule. The following experiments will be presented during the course of the semester.

- L5178Y Growth Assay
- African violet cloning
- Growth and maintenance of CHO, WI-38, LLC-PK1 cells
- Quality control in the tissue culture lab
- Troubleshooting tissue culture contamination
- Media preparations
- Supplies and equipment ordering
- Cryopreserving animal cell cultures
- Explants of rat embryos

MICROBIOLOGY AND IMMUNOLOGY

Biol 386
5 CR. (4+3)

Winter, 1998

**PREREQUISITES: BIOL 232 AND PREVIOUS OR CONCURRENT
BIOCHEMISTRY**

COURSE SYLLABUS

<u>DATE</u>	<u>TOPIC</u>	<u>REFERENCE</u>
1. Mon. 1/12	Introduction and History	<u>Zinsser</u> ch. 1
2. Tues. 1/13	Prokaryotic and Eukaryotic Cells	Z. ch 2
3. Wed. 1/14	Bacterial Structure and Function	Z. ch. 3 & 6
4. Thrs. 1/15	Bacterial Structure and Function	Z. ch. 3 & 6
5. Mon. 1/19	M.L.K. DAY--NO CLASSES	
6. Tues. 1/20	Bacterial Structure and Function	Z. ch. 3 & 6
7. Wed. 1/21	Bacterial Growth and Sporulation	Z. ch. 3 & 5
8. Thrs. 1/22	Bacterial Taxonomy	Z. ch. 2
9. Mon. 1/26	Viral Structure and Replication	Z. ch. 52 & 53
10. Tues. 1/27	Viral Structure and Replication	Z. ch. 52 & 53
11. Wed. 1/28	Fungal Structure and Taxonomy	Z. ch. 80
12. Thrs. 1/29	EXAM I	
13. Mon. 2/2	Microbial Metabolism	Z. ch. 4 & 6
14. Tues. 2/3	Microbial Metabolism	Z. ch. 4 & 6
15. Wed. 2/4	Microbial Metabolism	Z. ch. 4 & 6
16. Thrs. 2/5	Microbial Genetics	Z. ch. 7 & 8
17. Mon. 2/9	Microbial Genetics	Z. ch. 7 & 8
18. Tues. 2/10	Microbial Genetics	Z. ch. 7 & 8
19. Wed. 2/11	Antibacterial Agents	Z. ch. 9
20. Thrs. 2/12	Antiviral Agents	Z. ch. 58
21. Mon. 2/16	Sterilization and Disinfection	Z. ch. 10
22. Tues. 2/17	Host Parasite Interactions	Z. ch. 21 & 22
23. Wed. 2/18	Mech. of Bacterial Pathogenicity	Z. ch. 21
24. Thrs. 2/19	Mech. of Bacterial Pathogenicity	Z. ch. 21
25. Mon. 2/23	Mech. of Viral Pathogenicity	Z. ch. 61
26. Tues. 2/24	Mech. of Viral Pathogenicity	Z. ch. 61
27. Wed. 2/25	EXAM II	
28. Thrs. 2/26	Respiratory Tract Infections	Z. ch. 25 & 27

29. Mon. 3/2	Respiratory Tract Infections	Z. ch. 25 & 27
30. Tues. 3/3	Respiratory Tract Infections	Z. ch. 25 & 27
31. Wed. 3/4	Skin & Mucous Membrane Infections	Z. ch. 23
32. Thurs. 3/5	Oral Cavity Infections	Z. ch. 47
33. 3/9 - 3/13	SPRING RECESS NO CLASSES	
34. Mon. 3/16	G.I. Tract Infections	Z. ch. 33-36
35. Tues. 3/17	G.I. Tract Infections	Z. ch. 44 & 68
36. Wed. 3/18	Wound Infections	Z. ch 37 & 44
37. Thurs. 3/19	Wound Infections	Z. ch. 74

LAST DAY FOR A "W" GRADE IS MONDAY MARCH 23RD

38. Mon. 3/23	Viral Hepatitis	Z. ch. 76
39. Tues. 3/24	STD's - Bacterial	Z. ch. 26 & 50
40. Wed. 3/25	STD's - Viral	Z. ch. 64 & 66
41. Thurs. 3/26	AIDS	Z. ch. 77
42. Mon. 3/30	Childhood Infections	Z. ch. 63, 72, & 74
43. Tues. 3/31	Nosocomial Infections	Z. ch. 22 & 34
45. Wed. 4/1	EXAM III	
46. Thurs. 4/2	Immune System, Innate Immunity	<u>K</u> uby ch. 1 & 3
47. Mon. 4/6	Phagocytosis, Humoral Immunity	K. ch. 4-6,8-13
48. Tues. 4/7	Humoral Immunity, Acute Inflammation	K. ch. 4-6,8-13,15
48. Wed. 4/8	Humoral Immunity, Acute Inflammation	K. ch. 4-6,8-13,15
49. 4/9 - 4/10	NO CLASSES - EASTER RECESS	
50. Mon. 4/13	Complement	K. ch. 14
51. Tues. 4/14	Cellular Immunity/Chronic Inflamm.	K. ch. 15-16
52. Wed. 4/15	Cellular Immunity/Chronic Inflamm.	K. ch. 15-16
53. Thurs. 4/16	Cellular Immunity/Chronic Inflamm.	K. ch. 15-16
54. Mon. 4/20	Hypersensitivity	K. ch. 17,20,21
55. Tues. 4/21	EXAM IV	
56. Wed. 4/22	Hypersensitivity	K. ch. 17,20,21
57. Thurs. 4/23	Hypersensitivity	K. ch. 17,20,21
58. Mon. 4/27	Hypersensitivity	K. ch. 17,20,21
59. Tues. 4/28	Immunological Diseases	K. ch. 18-22
60. Wed. 4/29	Autoimmunity	K. ch. 20
61. Thurs. 4/30	Transplantation Immunity	K. ch. 23

62. TUES. 5/5 ♪ **FINAL EXAMINATION - COMPREHENSIVE** ♪
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**TEXTS:** 1) Zinsser **MICROBIOLOGY**, 20<sup>TH</sup> edition, 1992, by Joklik et. al.

2) **IMMUNOLOGY**, 3<sup>RD</sup> EDITION, 1997, by Kuby (Glossary p. 597-609)

3) **LIFE, DEATH, AND THE IMMUNE SYSTEM**, SCIENTIFIC AMERICAN, September, 1993  
**RECOMMENDED**

**EXAMS:** There will be 4 regularly scheduled exams plus a **comprehensive final**. Each of these exams are worth 100 points and **will be individually curved**, if necessary, to 75%. In addition laboratory will be worth 100 points for a total of 600 points in the course. Exam format may include multiple choice, matching, essay, and problem solving. **Make up exams**, for valid and documented absences, are essay.

**SCALE:** 100-93 = A, 92-90 = A-, 89-87 = B+, 86-83 = B, 82-80 = B-, 79-77 = C+, 76-73 = C, 72-70 = C-, 69-67 = D+, 66-63 = D, 62-60 = D, 59- = F

**ATTENDANCE:** You are **REQUIRED** to attend every lecture and to explain any absence. Attendance will be taken at our option and unexcused absences may result in a loss of points.

**INSTRUCTORS:** M. Ryan, Ph.D., ASC-2115, extension #5892. Office hours are 12:15 - 1:50 PM on M and W. or by appointment. e-mail: [mryan@art01.ferris.edu](mailto:mryan@art01.ferris.edu)

W. Hoeksema, Ph.D., ASC-2013, extension #2555. Office hours are 11:00 AM 11:50 AM on M, W & F and 9:30 - 10:50 on M and W or by appointment. e-mail: [whoeksem@art01.ferris.edu](mailto:whoeksem@art01.ferris.edu)

If the instructor is not available, please leave a message on his telephone answering machine.

**LEARNING OBJECTIVES:**

- 1) To learn how professionals in microbiology and immunology use the scientific method to gain new knowledge and modify or eliminate existing paradigms.
- 2) To learn collaborative skills by working in groups for some assignments.
- 3) To learn how to apply certain course material to develop problem solving and critical thinking skills in microbiology.
- 4) To learn the language/terminology of microbiology.
- 5) To learn the fundamental principles of microbial structure and function, microbial metabolism, microbial growth and reproduction, microbial genetics, and the use of antimicrobial drugs.
- 6) To learn the principles, mechanisms, and theories of microbial pathogenicity in humans.
- 7) To learn the structure, function, and control of the immune system and the mechanisms of hypersensitivity.

**PLEASE SEE REVERSE SIDE**

**World Wide Web Sites Related To Microbiology and Immunology**

1. Microbiology <http://www.ch.ic.ac.uk/medbact/microbio.html>
2. Virology <http://www.tulane.edu/~dmsander/garryfavweb.html>
3. Hepatitis <http://cpmcnet.columbia.edu/dept/gi/disliv.html>
4. AIDS/HIV [http://www.yahoo.com/Health/Diseases\\_and\\_Conditions/AIDS\\_HIV/](http://www.yahoo.com/Health/Diseases_and_Conditions/AIDS_HIV/)
5. AIDS/Treat. <http://carebase2.jri.org/infoweb/treatment/library/beta/beta26.htm>  
<http://www.yamanashi-med.ac.jp/~microbio/microbiology.html>
6. Herpes <http://raccoon.com/newhpx.html>
7. Influenza(WHO) <http://www.who.ch/programmes/emc/flu/flu.htm>
8. CDC Home Page <http://www.cdc.gov/>
9. WHO Home Page <http://www.who.ch/Welcome.html>
10. Medical News <http://www.pslgroup.com/mednews.htm>  
also see Infect. Diseases web site below for medical news
11. Infect.Disease <http://www.medscape.com/> (NOTE:you will have to register,it's free)
12. Infect.Disease [gopher://gopher.health.state.ny.us/11/.consumer/.factsheets](http://gopher.health.state.ny.us/11/.consumer/.factsheets)
13. Clinical Med. <http://www.avicenna.com/>  
(NOTE:you will have to register, it's free)
14. Immunology <http://www.primenet.com/~vohnout/immunology.html>
15. Immunology <http://www.cc.emory.edu/WHSC/medweb.immunology.html>
16. Immunology <http://www-micro.msb.le.ac.uk/immunology.html>
17. Antibody Page <http://www-chem.ucsd.edu/Faculty/goodman/antibody.html/abpage.html>
18. Cytokines [http://www.ocms.ox.ac.uk/~smb/cyt\\_web/](http://www.ocms.ox.ac.uk/~smb/cyt_web/)
19. Autoimmunity <http://web.cps.msu.edu/~keyesdav/ms/>
20. Vaccines <http://www.eden.com/~via/>
21. Vaccine Weekly <http://www.holonet.net/homepage/1v.htm>
22. Test Banks <http://fiona.umsmc.edu/~yar/tests.html>  
(mainly virology questions)
23. Case Studies [http://edcenter.med.cornell.edu/Pathophysiology\\_Cases/Pulmonary/Pulm\\_TOCs.html](http://edcenter.med.cornell.edu/Pathophysiology_Cases/Pulmonary/Pulm_TOCs.html)  
(lower respiratory tract infections)
24. Search Program <http://altavista.digital.com/>

**If you need help in accessing these sites, please check with us for instructions  
Remember to capitalize where ever you see capital letters in a web address**

### Biol 388 Fall 1997 Laboratory Schedule

Mr. Frank Hartley  
ASC 2018 / Sci 211A  
ext. 2549

Ms. Carol Bluhm  
Phr 314A  
ext. 2246

| <i>Date</i> | <i>Description</i>                                                                          |
|-------------|---------------------------------------------------------------------------------------------|
| T 8/26      | Introduction (Sci 337)                                                                      |
| R 8/28      | Rabbit Blood Collection (Phr 314A), Serum Preparation (SCI 337)                             |
| T 9/2       | Bactericidal Effects of Normal Serum                                                        |
| R 9/4       | Bactericidal Effects Follow-up, Serum Proteins and Western Press Blot                       |
| T 9/9       | Development of the Immune System                                                            |
| R 9/11      | Fundamentals of Antigen Preparation and Immunization, ELISA<br><b>Quiz # 1 (20 pts)</b>     |
| T 9/16      | Primary Immunization and Antigen Challenge (Phr 314)                                        |
| R 9/18      | Ammonium Sulfate Precipitation of IgG                                                       |
| T 9/23      | Desalting Precipitate via Gel Filtration                                                    |
| R 9/25      | Affinity Chromatography (protein A column), <b>Notebooks Due</b>                            |
| T 9/30      | Precipitation Reactions (Ascoli Ring Test and Ouchterlony)                                  |
| R 10/2      | Single Radial Immunodiffusion (SRID) - <b>Quiz # 2 (20 pts)</b>                             |
| T 10/7      | Completion of Ouchterlony and SRID                                                          |
| R 10/9      | Quantitative Precipitin Assay                                                               |
| T 10/14     | Completion of Quantitative Precipitin Assay                                                 |
| R 10/16     | Blood Collection, Bacteriophage Assay Media Preparation                                     |
| T 10/21     | Bacteriophage Assay - <b>Quiz # 3 (20 pts)</b>                                              |
| R 10/23     | Completion of Bacteriophage Assay, Bacteriophage Neutralization                             |
| T 10/28     | Completion of Bacteriophage Neutralization, ELISA (part 1)                                  |
| R 10/30     | ELISA (part 2), <b>Notebooks Due</b>                                                        |
| T 11/4      | Passive Hemagglutination Assay                                                              |
| W 11/5      | Read Agglutination Plates                                                                   |
| R 11/6      | Sheep Cell Preparation for the Jerne Plaque Assay, 7-day immunization of mouse              |
| F 11/7      | 6-day immunization of mouse                                                                 |
| Sa 11/8     | 5-day immunization of mouse                                                                 |
| Su 11/9     | 4-day immunization of mouse                                                                 |
| M 11/10     | 3-day immunization of mouse                                                                 |
| T 11/11     | 2-day immunization of mouse, Overview of the Jerne Plaque Assay<br><b>Quiz # 4 (20 pts)</b> |

| <i>Date</i> | <i>Description</i>                                                |
|-------------|-------------------------------------------------------------------|
| W 11/12     | 1-day immunization of mouse                                       |
| R 11/13     | Jerne Plaque Assay                                                |
| T 11/18     | Completion of Jerne Plaque Assay                                  |
| R 11/20     | Analysis of Antigens by Immunodiffusion and Immunoelectrophoresis |
| T 11/25     | Completion of Immunodiffusion and Immunoelectrophoresis           |
| R 11/27     | No Class                                                          |
| T 12/2      | <b>Notebooks Due, Quiz # 5 (20 pts)</b>                           |
| R 12/4      | Clean-up and Laboratory Evaluation                                |

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Laboratory Objectives: The student will learn

1. the conceptual basis and practical application of laboratory techniques fundamental to the study of immunology
2. the proper set-up and operation of equipment and instrumentation used in the immunology laboratory
3. the proper care and handling of animals ( rabbits and mice)
4. animal immunization and blood collection techniques
5. appropriate health and safety procedures for the immunology laboratory
6. effective collection, recording, and analysis of experimental data via maintenance of a laboratory notebook

Grading:

Five quizzes will be given, each worth 20 points = 100 points

Laboratory notebooks will be evaluated three times during the semester. Each student begins with 500 points for her/his notebook; points will be deducted from the 500 initial points according to the format outlined in the handout, "Your Laboratory Notebook". Each student will be given an opportunity to make corrections to the notebook after each evaluation to recover up to one half of the points deducted. A final grade based on the 600 points possible will be assigned as follows:

540 - 600 = A    480 - 539 = B    420 - 479 = C    360 - 419 = D    < 360 = F

Attendance:

The lab is scheduled to meet on Tuesdays and Thursdays from 1:30PM until 5:30PM. On Wednesday, Nov. 5, it will be necessary to meet briefly to complete one of the lab exercises. In addition, some students will be required to immunize mice at times other than the scheduled lab times. The complex nature of immunology lab exercises precludes "make-up" labs..

**Unexcused absence will result in failure of the course.**

Text:

*Immunological Investigations-A Laboratory Manual*; Batina, Loreli A., Star Publishing Co., 1997

Handouts will given for certain of the lab exercises.

Note: This laboratory syllabus is subject to revision at any time as may be required to accommodate the vagaries of biological systems.

Winter, 1998

## **BIOL 470: Molecular Genetics**

Instructor: Dr. C. Boogaard

**Course Objectives:** To understand genetic phenomena at the molecular level, including replication, recombination, mutation and repair, structures of the DNA, the genome and the chromatin; and the control of gene activity through transcription and splicing of RNA; to understand the experimental basis of scientific discovery as it applies to molecular genetics.

**Text:** Benjamin Lewin, GENES VI, 1997, Oxford, N.Y.

**Grading:** 4 lecture exams; exam format: short-answer essay, problems.

**Pre- or Co-requisite:** BIOL 375, PHCH 320 or CHM 364

**Office:** ASC 2116; X2544;

This class is scheduled to meet Tuesdays and Thursdays, from 9:00 to 10:50 in STR136. However, there may also be out-of-scheduled-class time activities such as seminars, which students will be required to attend.

In addition to seminars, students will be encouraged to attend the tours of industry, which will include Upjohn and Parke-Davis. The dates of these tours will be announced as soon as they are scheduled. Biotechnology classes will be dismissed during the days students are on tour, and students will be excused from all other classes as well.

### **Grading:**

Grading is based on four exams, each contributing 25% of the mark. The final exam will not be comprehensive. In addition, extra credit points may be given for especially insightful classroom participation and discussions. (This does not apply to simple "please clarify" type questions.) Optional extra credit quizzes may be given without warning.

At the end of the term, the students total (out of 400 points) will be calculated, and grades will be assigned on a curve. The curve average will be not less than the average of the gpa's of the class participants for their last year of study. This measure, based on the assumption of professional behavior, is being taken to ensure that students are not penalized for being part of an exceptional class.

The following is a tentative outline. The instructor reserves the right to vary the outline, including the right to change the order of topics, and the right to insert new experiences.

| Week                                  | Day | Date | Topic                                  | Chapter in Text |
|---------------------------------------|-----|------|----------------------------------------|-----------------|
| <b>DNA as a Store of Information</b>  |     |      |                                        |                 |
| 1                                     | T   | 1/13 | Genes are Mutable Units                | 3               |
|                                       | R   | 1/15 | DNA is the Genetic Material            | 4               |
| 2                                     | T   | 1/20 | Nucleic Acid Topology                  | 5               |
|                                       | R   | 1/22 | Isolating the Gene                     | 6               |
| <b>Translation</b>                    |     |      |                                        |                 |
| 3                                     | T   | 1/27 | Translation, tRNA,                     | 7, 8            |
|                                       | R   | 1/29 | mRNA and rRNA                          | 9               |
| 4                                     | T   | 2/3  | EXAM                                   |                 |
| <b>Prokaryotic Gene Expression</b>    |     |      |                                        |                 |
|                                       | R   | 2/5  | Transcription Initiation               | 11              |
| 5                                     | T   | 2/10 | The Bacterial Operon                   | 12              |
|                                       | R   | 2/12 | Termination and Anti-termination       | 13              |
| 6                                     | T   | 2/17 | Lysis and Lysogeny                     | 13              |
| <b>Perpetuation of DNA</b>            |     |      |                                        |                 |
|                                       | R   | 2/19 | The Replicon                           | 14              |
| 7                                     | T   | 2/24 | DNA Replication                        | 15              |
|                                       | R   | 2/26 | EXAM                                   |                 |
| 8                                     | T   | 3/3  | Repair and Stability                   | 16              |
| <b>Eukaryotic Genome Organization</b> |     |      |                                        |                 |
|                                       | R   | 3/5  | Gene Technology                        | 20              |
|                                       | T   | 3/10 | recess                                 |                 |
|                                       | R   | 3/12 | recess                                 |                 |
| 9                                     | T   | 3/17 | Genome Content                         | 21              |
|                                       | R   | 3/19 | Eukaryotic Gene Structure              | 22              |
| 10                                    | T   | 3/24 | Gene Numbers                           | 23              |
|                                       | R   | 3/26 | Satellite DNA                          | 25              |
| 11                                    | T   | 3/31 | EXAM                                   |                 |
|                                       | R   | 4/2  | Chromosome Structure                   | 26              |
| 12                                    | T   | 4/7  | Nucleosome Structure                   | 27              |
|                                       | R   | 4/9  | Easter recess                          |                 |
| <b>Eukaryotic Gene Expression</b>     |     |      |                                        |                 |
| 13                                    | T   | 4/14 | Transcription Complex                  | 29              |
|                                       | R   | 4/16 | Regulation of Transcription            | 30              |
| 14                                    | T   | 4/21 | Nuclear Splicing and RNA as a Catalyst | 31,32           |
| <b>DNA in Flux</b>                    |     |      |                                        |                 |
|                                       | R   | 4/23 | Recombination                          | 17              |
| 15                                    | T   | 4/28 | Rearrangement and Amplification        | 18              |
|                                       | R   | 4/30 | Transposons and Retroviruses           | 19              |
| 16                                    | T   | 5/5  | Exam Week                              |                 |

## **BIOLOGY 471: RECOMBINANT DNA LAB**

**Instructor:** Dr. Roger Mitchell

**Office hours:** ASC (Commons) 2118: Monday and Friday 10:00 - 11:30 AM and Tuesday 9:00-10:00 AM. Make an appointment, or drop by to see if I am available at some other time. Knock if the door is closed! You may call my office at any time: 591-5879

**Materials** you are required to have:

lab manual: "Laboratory DNA Science" by Bloom, Freyer, and Micklos

additional materials purchase a lab notebook, a three-ring binder, lab coat and other materials as necessary.

**Final exam** time and place will be announced

lab reports will be assigned that will be prepared by computer.

**Dropping** with the "W" grade must be done on or before **March 23**.

**Incompletes** will be given only at my discretion and will require proof of exceptional need. Consistent with university policy, the student must have passed 75% of the class prior to being forced to stop attending due to circumstances beyond their control. The "I" grade must be cleared or it will become an "F."

**Attendance** is mandatory. Missing more than 2 labs may result in course failure. I reserve the right to treat tardiness as an absence, or require additional work from tardy, disruptive, or absent students.

Due to the nature of these labs you will occasionally need to come in at additional times for brief periods. This will be partially compensated for by not meeting Jan. 28.

**Grades** will be 50% from your lab notebooks and reports, which may be collected at any time, 25% subjective (including following directions, time management, preparation, effort, lab safety, professional attitude, etc.), and approximately 25% for quizzes and other assignments. Poor lab safety will lead to lower grades.



**THE FOLLOWING SCHEDULE IS HIGHLY TENTATIVE:**

| DATE    | TOPIC                                                                                   | CHAPTER     |
|---------|-----------------------------------------------------------------------------------------|-------------|
| Jan. 12 | lecture: safety and introduction                                                        |             |
| 13      | transformation: CaCl <sub>2</sub><br>plant DNA preparation                              | 2           |
| 14      | transformation: frozen cells<br>plant DNA extraction                                    | handout     |
| 20      | bacterial DNA purification: inoculation PCR 1                                           | handout     |
| 21      | bacterial DNA purification: harvest. PCR 2. computer training:<br>photoshop             | handout     |
| 26      | lecture: computer training: word                                                        |             |
| 27      | bacterial DNA purification: centrifugation. PCR 3                                       | handout     |
| 28      | NO LAB                                                                                  | handout     |
| Feb. 2  | lecture: computer training: excel                                                       |             |
| 3       | bacterial DNA purification: precipitation. recombination: digests                       | Handout, 7  |
| 4       | bacterial DNA purification: characterization. recombination:<br>ligation transformation | 7, 8        |
| 9       | lecture: working with DNA libraries                                                     |             |
| 10      | recombination: replica plate. λ library: digests                                        | 9, 14       |
| 11      | recombination: miniprep. λ library: transformation                                      | 10, 15      |
| 16      | lecture: restriction mapping and RFLP analysis                                          |             |
| 17      | recombination: clone identification continued. λ library: replica<br>transfer           | 16          |
| 18      | λ library: hybridization. RFLP 1                                                        | 16          |
| 23      | lecture: computer training: drawing                                                     |             |
| 24      | gel purification, making probes. RFLP 2                                                 | handout     |
| 26      | λ library: probing. RFLP 3                                                              | 16          |
| Mar. 2  | lecture: computer training: first paper                                                 |             |
| 3       | λ library: minipreps. RFLP 4                                                            | 17          |
| 4       | λ library: restriction analysis. RFLP 5                                                 | 17          |
| 16      | lecture: sequencing I                                                                   |             |
| 17      | sequencing: setup. RFLP 6                                                               | NEB manuals |
| 18      | sequencing: setup                                                                       | NEB manuals |
| 23      | lecture: sequencing II                                                                  |             |
| 24      | sequencing: gel practice                                                                | NEB manuals |
| 25      | sequencing: gel pouring                                                                 | NEB manuals |
| 30      | lecture: computer training: second paper                                                |             |
| 31      | sequencing: reactions                                                                   | NEB manuals |
| Ap. 1   | sequencing: run gels                                                                    | NEB manuals |
| 6       | lecture: the final report                                                               |             |
| 7       | sequencing: run gels                                                                    | NEB manuals |
| 8       | sequencing: data analysis                                                               | NEB manuals |
| 13      | lecture: working in a lab                                                               |             |
| 14      | RNA isolation                                                                           | handout     |
| 15      | use of RNA isolate                                                                      | handout     |
| 20      | lecture: computer training: final paper                                                 |             |
| 21      | RNA continued                                                                           | handout     |
| 22      | characterization of RNA product                                                         | handout     |
| 27      | lecture: a DNA overview                                                                 |             |
| 28      | cloning RNA                                                                             | handout     |
| 29      | use of RNA                                                                              | handout     |

**BIOLOGY 472**  
**PROTEINS**

INSTRUCTOR: Dr. C. Boogaard

OFFICE: ASC 2116; X2544;

**COURSE OBJECTIVES:**

1. To increase the students understanding of the theoretical basis of various techniques used in protein purification and isolation, and
  1. the basic structural elements of proteins.
2. To increase the students ability to interpret graphical representations of data
3. To increase the students ability to understand equations describing experimental phenomena

**PRE-REQUISITES:** completion of PHCH 320, or of CHEM 364.

**TEXT:** Scopes, Protein Purification, Principles and Practice, Third Edition. Springer Verlag, NY, 1994. A lecture notes booklet and a study guide may be purchased from Great Lakes.

**MEETING TIME:** This class is scheduled to meet Mondays, Wednesdays, and Fridays, from 9:00 to 10:00 am in STR 136. However, there may also be out-of-scheduled-class time activities such as seminars, which students will be required to attend.

**GRADING:**

Grading is based on four quizzes, worth 50 points each, and a final exam worth 100 points. The final exam will not be comprehensive. However, some topics apply to the entire course and can and will be represented on every quiz and exam. These topics include: calculating a purification table, interpreting a purification table, Beer's Law calculations, extinction coefficient calculations, and buffer design. In addition, extra credit points may be given for especially insightful classroom participation and discussions. (This does not apply to simple "please clarify" type questions.) Optional extra credit quizzes may be given without warning.

At the end of the term, the students total (out of 300 points) will be calculated, and grades will be assigned on a curve. The curve average will be not less than the average of the gpa's of the class participants for their last year of study. This measure, based on the assumption of professional behavior, is being taken to ensure that students are not penalized for being part of an exceptional class.

The following is a tentative outline. The instructor reserves the right to vary the outline, including the right to change the order of topics, and the right to insert new experiences.

| Week | Day | Date     | Topic                                                            | Chapter |
|------|-----|----------|------------------------------------------------------------------|---------|
| 1    | M   | 1/12     | Amino Acid biochemistry                                          |         |
|      | W   | 1/14     | Basic Structure: Alpha Helices, beta-Sheets; beta turns          |         |
|      | F   | 1/16     | Extinction Coefficients & General Considerations                 | 1       |
| 2    | M   | 1/19     | pH; Henderson-Hasselbach; buffers                                | 12      |
|      | W   | 1/21     | Overview of Purification; Assays of General and Specific Protein | 3       |
|      | F   | 1/23     | Following Purification: Calculations and Purification Tables     | 3       |
| 3    | M   | 1/26     | Martin Luther King Jr. Day                                       |         |
|      | W   | 1/28     | Designing Buffers: Assay, Technique and Storage Buffers          | 3       |
|      | F   | 1/30     | Cell Characteristics and Research Uses                           | 2       |
| 4    | M   | 2/02     | QUIZ                                                             |         |
|      | W   | 2/04     | Cell Rupture: Liquid Shear, Solid Shear, and Osmotic Shock       | 2       |
|      | F   | 2/06     | Chemical and Enzymatic Techniques; Estimating Success            | 2       |
| 5    | M   | 2/09     | Protein Concentration Techniques                                 |         |
|      | W   | 2/11     | Salting In and Salting Out; Calculating Ionic Strength           | 4       |
|      | F   | 2/13     | Differential Solubility: Varying pH, Temperature, and Salt       | 4       |
| 6    | M   | 2/16     | Differential Solubility: Precipitation Zones; Back-Extraction    | 4       |
|      | W   | 2/18     | Calculating Salt Additions; Representative Data                  | 4       |
|      | F   | 2/20     | Review                                                           |         |
| 7    | M   | 2/23     | QUIZ                                                             |         |
|      | W   | 2/25     | Ion Exchange Chromatography: Principles; Step-Columns            | 5       |
|      | F   | 2/27     | Ion Exchange: Gradient Columns; Interpreting Data                | 6       |
| 8    | M   | 3/02     | Troubleshooting Ion Exchange Procedures                          | 6       |
|      | W   | 3/04     | Gel Permeation: Principles and Formulae                          | 8       |
|      | F   | 3/06     | Gel Permeation: Practical Techniques; Interpreting Data          | 8       |
|      | M-F | 3/9-3/13 | SPRING RECESS                                                    |         |
| 9    | M   | 3/16     | Gel Permeation: Troubleshooting                                  | 8       |
|      | W   | 3/18     | Ultracentrifugation: Principles and Formulae                     |         |
|      | F   | 3/20     | Centrifugation: Sedimentation Coefficients; Rotor Conversions    |         |
| 10   | M   | 3/23     | Ultracentrifugation: Density Gradients; Data Interpretation      |         |
|      | W   | 3/25     | Troubleshooting Centrifugation Procedures                        |         |
|      | F   | 3/27     | review                                                           |         |
| 11   | M   | 3/30     | QUIZ                                                             |         |
|      | W   | 4/01     | Affinity Chromatography                                          | 7       |
|      | F   | 4/03     | Hydrophobic and Covalent Chromatography                          | 6       |
| 12   | M   | 4/06     | Chromatofocusing                                                 |         |
|      | W   | 4/08     | Electrophoresis: Principles, Movement Rates; Constituents        | 11      |
|      | F   | 4/10     | GOOD FRIDAY                                                      |         |
| 13   | M   | 4/13     | Electrophoresis: Buffer systems; Discontinuous Gels              | 11      |
|      | W   | 4/15     | Electrophoresis: Zonal, Denaturing, and Isoelectric Focusing     | 11      |
|      | F   | 4/17     | review                                                           |         |
| 14   | M   | 4/20     | QUIZ                                                             |         |
|      | W   | 4/22     | Radioactivity and Radioisotopes                                  |         |
|      | F   | 4/24     | Protein Synthesis                                                |         |
| 15   | M   | 4/27     | Protein Synthesis                                                |         |
|      | W   | 4/27     | Secondary Protein Structure                                      |         |
|      | F   | 4/29     | Supersecondary Protein Structure                                 |         |
| 16   | M   | 5/4      | FINAL EXAM, 12-2 pm                                              |         |

**BIOL 473 Proteins Laboratory Fall '97 Wed 9:00-6:00**

**Dr. Kim Colvert**

Office: ASC 3098 MTF 9:00-9:50 R 1-1:50 Other hours by appt.  
Ext 5851 Home Phone 592-1539

**Text:** Protein Methods, Bollag and Edelstein, Wiley-Liss 1991

**Supplies:** Approved eye protection, notebook.

**Objectives:**

To provide direct and hands-on experience in

- 1) *methods of protein analysis and purification*
- 2) *researching methods in the biochemical literature*
- 3) *designing and adapting purification and analysis protocols from the literature*
- 4) *maintaining accurate and complete records of work*

Your task this semester is to isolate and purify a protein. You will be directed to a protein then you must go to the literature to find a method to purify that protein that is 'feasible' given the resources of the lab, the availability of source material and, unfortunately, the cost of isolation. Once a method has been approved you must develop a list of materials needed, check supplies and submit a list of materials to be purchased. You will then develop a procedure and carry out the isolation. You will also wish to assay the protein and determine as much information about its physical properties as possible. You may need to go to several literature sources to complete your project. All facets of your work must be documented in an orderly and legible fashion in your notebook, including your sources, your exact actions, where you deviated from published methodology and why, etc. 85% of your grade will be based on this notebook.

The other 15% of your grade will be based on the 'final'. The final will be a semi-formal presentation of your work to the class that will be jointly presented by you and your partner. Transparencies will be expected that include a flow chart, data and results tables where appropriate and a transparency of your bibliography. The 'semi-formal' part refers to the fact that it will be a discussion and you will be asked questions and encouraged to explain in detail or ask questions of your own. This will take place during the last lab period of the semester. The final exam period will be devoted to lab clean-up.

Fall, 1997

## **BIOL 474: Advanced Cell and Molecular Biology**

Instructor: Dr. C. Boogaard

Office hours: M 2-4; T 2:30-4; R 1:30-3.

Office: ASC 2116; phone: 592-2544.

**Course Objectives:** To increase the students' knowledge and understanding of:

1. the basic principles of cellular processes, organization, and growth
2. the nature and genesis of cell structures and organelles
3. the means by which cells interact with each other
4. the theoretical basis of the techniques of cell culture

**Pre-requisite:** a minimum grade of C- in PHCH 320 or CHEM 364, or consent of instructor.

**Textbook:** Molecular Biology of the Cell, third edition; Alberts et al., Garland, 1994

**Optional Material:** A study guide containing questions from old exams may be purchased from Great Lakes Books, or downloaded onto a disc. Lecture notes are available for downloading from the Ferris Website.

### **Examinations and grading:**

1. There will be 3 exams, each covering one third of the material.
2. The exam format is usually short-answer essay. However, problems will be introduced where appropriate. Some problems may be handed out before the exams to be completed as a take-home assignment and turned in at the exam time. Work turned in late will be docked a certain percentage per day.
3. There may be unannounced pop quizzes. These may be given on an extra-credit basis. There will be no make-up quizzes.
4. Extra-credit points may be assigned for insightful classroom participation.

### **Lecture and Exam schedule:**

The following is a tentative schedule of topics to be included in the lectures, and of the exams. This is a tentative schedule only. The instructor reserves the right to change the order or length of time spent on each topic, as need arises.

The dates of the exams may be changed according to the wishes of the class, subject to the approval of the instructor. However, no exam will be delayed longer than two weeks.

**Cell Evolution:**

|              |                       |           |
|--------------|-----------------------|-----------|
| Mon. Aug. 25 | Evolution of the Cell | Chapter 1 |
| Fri. Aug. 29 | Cell Culture          | Chapter 4 |
| Mon. Sept. 1 | Holiday               |           |

**Basic Genetic Mechanisms:**

|             |                                                |           |
|-------------|------------------------------------------------|-----------|
| Fri. Sep. 5 | Transcription, Processing and Splicing         | Chapter 6 |
| Mon. Sep. 8 | Translation, mRNA, tRNA and Ribosome Structure | Chapter 6 |

**Techniques:**

|              |                                       |              |
|--------------|---------------------------------------|--------------|
| Fri. Sep. 12 | RFLP, Sequencing, PCR, and hybridomas | Chapter 7    |
| Mon. Sep. 15 | Fusion Proteins, In vitro mutagenesis | Chapter 7    |
| Fri. Sep. 19 | Transgenics, Membrane Lipids          | Chapter 7,10 |

**Membranes:**

|              |                                                     |            |
|--------------|-----------------------------------------------------|------------|
| Mon. Sep. 22 | Membrane Proteins; Membrane sidedness, fluidity     | Chapter 10 |
| Fri. Sep. 26 | Mechanisms of Transport                             | Chapter 10 |
| Mon. Sep. 29 | Exam (Chapters 1,4,6,7)                             |            |
| Fri. Oct. 3  | Gated Channels and the Neuromuscular Junction       | Chapter 11 |
| Mon. Oct. 6  | Grand Synaptic Potential and Long-Term Potentiation | Chapter 11 |
| Fri. Oct. 10 | Receptors, Cell Markers, and Cell Junctions         | Chapter 19 |

**Identity and Maintenance of Cellular Compartments:**

|              |                                        |            |
|--------------|----------------------------------------|------------|
| Mon. Oct 13  | Protein Sorting & Compartmentalization | Chapter 12 |
| Fri. Oct 17  | Nuclear and Mitochondrial Transport    | Chapter 12 |
| Mon. Oct. 20 | The Endoplasmic Reticulum              | Chapter 13 |
| Fri. Oct 24  | Golgi, Lysosomes, and Cell Surface     | Chapter 13 |
| Mon. Oct. 27 | Vesicle Targeting                      | Chapter 13 |

**Energy Conversions:**

|              |              |            |
|--------------|--------------|------------|
| Fri. Oct. 31 | Mitochondria | Chapter 14 |
| Mon. Nov. 3  | Chloroplasts | Chapter 14 |

**Cell Signaling:**

|              |                                                    |            |
|--------------|----------------------------------------------------|------------|
| Fri. Nov. 7  | Types of Signaling; Steroids                       | Chapter 15 |
| Mon. Nov. 10 | Test (Chapters 10, 11, 12, 13, 19)                 |            |
| Fri. Nov. 14 | Second messenger-based signaling: cAMP, IP3 and DG | Chapter 15 |
| Mon. Nov. 17 | Coordination of Signaling Mechanisms               | Chapter 15 |

**The Cytoskeleton:**

|              |                                         |            |
|--------------|-----------------------------------------|------------|
| Fri. Nov. 21 | Intermediate Filaments; Actin Filaments | Chapter 16 |
| Mon. Nov. 24 | Tubulin-based microtubules              | Chapter 16 |
| Fri. Nov. 28 | Thanksgiving Recess                     | Chapter 16 |

**The Cell Cycle and Oncogenes:**

|             |                                       |            |
|-------------|---------------------------------------|------------|
| Mon. Dec. 1 | Cell Cycle and Oncogenes              | Chapter 17 |
| Fri. Dec. 5 | Review                                |            |
| Dec. 8      | Final exam. (Chapters 14, 15, 16, 17) |            |

# *Winter 1998 PHYS 211 Introductory Physics I*

## *(Mechanics, Heat and Sound)*

**LECTURES:** Mondays, Wednesdays, and Fridays 11:00 – 11:50 AM in SCI 102.

### **LABORATORIES and SLA WORKSHOPS:**

Section 211 Lab: Mondays 12:00 – 2:50 PM in SCI 114; SLA: Tuesdays and Thursdays 6:00 – 7:50 PM in SCI 117.

Section 212 Lab: Tuesdays 3:00 – 5:50 PM in SCI 114; SLA: Mondays and Wednesdays 6:00 – 7:50 PM in SCI 117.

Section 213 Lab: Thursdays 3:00 – 5:50 PM in SCI 114; SLA: Tuesdays and Thursdays 6:00 – 7:50 PM in SCI 117.

Section 214 Lab: Fridays 12:00 – 2:50 PM in SCI 114; SLA: Mondays and Wednesdays 6:00 – 7:50 PM in SCI 117.

**INSTRUCTOR:** Dr. Bo Lou, ASC 3018, Ext. 5874, Bo\_Lou@FERRIS.EDU

World Wide Web:

<http://www.ferris.edu/htmls/academics/course.offerings/physbo>

Office hours: Mondays, Tuesdays, and Fridays 10:00 – 10:50, Wednesdays

12:00 - 12:50, or by appointment.

### **REQUIRED MATERIALS:**

1. Text: “College Physics”, 3rd edition by Jerry D. Wilson and Anthony J. Buffa.  
“Study Guide and Student Solutions Manual” by Bo Lou.
2. Lab Manual: “Physics 211 Lab Manual” by Bo Lou.
3. Others: Scientific calculator, ruler, and protractor.

### **COURSE OBJECTIVES:**

1. To introduce students basic concepts and principles in mechanics, heat and sound ranging from Newton's laws to standing waves, at the introductory level.
2. To help students become adept in logic thinking and problem solving within the framework of this course.
3. To enlighten students with mathematical and physical concepts and to help students use those concepts to explain their significance to mankind.

**PREREQUISITE:** MATH 115 (C- or better).

**GRADING SYSTEM:**

|               |                      |
|---------------|----------------------|
| Four Tests    | $4 \times 10 = 40$   |
| One Exam      | $1 \times 16 = 16$   |
| Thirteen Labs | $13 \times 1.7 = 22$ |
| Ten Quizzes   | $11 \times 2 = 22$   |
| Total         | 100                  |

|              |    |
|--------------|----|
| 90 and above | A  |
| 88 - 90      | A- |
| 85 - 88      | B+ |
| 80 - 85      | B  |
| 78 - 80      | B- |
| 75 - 78      | C+ |
| 70 - 75      | C  |
| 68 - 70      | C- |
| 65 - 68      | D+ |
| 60 - 65      | D  |
| 58 - 60      | D- |
| Below 58     | F  |

**Notes:**

1. The four tests and the final exam are all close book (no formulas are given and no formula sheets are allowed), and multiple-choice tests. Some questions and problems may involve the experiments in laboratories. The tests are tentatively scheduled on **February 2, February 23, March 23, and April 13**. The final exam is scheduled on **May 7, 10:00 - 11:40 in SCI 102**.
2. The grading scale is *exactly* as the above tables.
3. In each quiz you will be asked to answer/solve questions/problems which are very similar or identical, to the assigned homework questions and problems. You must work out the details to get full credit. Partial credits are allowed.
4. Zeros will be recorded for each missed test, quiz, and lab. Two tardiness to labs (within 15 minutes after the bell) count as one missed lab. If you are late more than 15 minutes to a lab, a missed lab will be recorded. You could make up missed work only if you have an official or a medical excuse and let the instructor know in advance.
5. Make-up tests are also written and must be completed before the next test. Otherwise a zero will be scored. The degree of difficulty of the make-up tests will not be guaranteed to be the same as the regular tests. To make up a missed quiz or lab, you are expected to write a paper addressing any physical phenomena. The minimum length of the paper is two double spaced pages. The paper also needs a minimum of three references. The paper must be typed and is due before the next quiz or lab.



## HOMEWORK:

Several homework questions and problems will be assigned for each chapter. You **MUST** finish and know how to do all those assigned questions and problems to get good scores on tests and quizzes in this course. You are expected to answer additional questions and do additional problems as well. To use your time more efficiently, you are advised to read the text book and lecture notes and understand the concepts before you try to solve problems. Your hard work will be recognized and rewarded.

|            |                                                                                                                        |
|------------|------------------------------------------------------------------------------------------------------------------------|
| Chapter 1  | Units and Problem Solving<br>7, 11, 15, 25, 31, 39, 41, 47, 49, 71, 75.                                                |
| Chapter 2  | Kinematics: Description of Motion<br>1, 5, 11, 13, 19, 27, 31, 35, 43, 45, 49, 69, 75.                                 |
| Chapter 3  | Motion in Two Dimensions<br>19, 27, 31, 35, 39, 47, 59, 63, 65, 71.                                                    |
| Chapter 4  | Force and Motion<br>2, 113, 17, 23, 25, 27, 37, 51, 53, 59, 63, 69, 97.                                                |
| Chapter 5  | Work and Energy<br>3, 7, 9, 13, 21, 35, 39, 47, 53, 59, 65, 77, 81, 99.                                                |
| Chapter 6  | Momentum and Collisions<br>5, 11, 15, 25, 27, 33, 47, 51, 81, 99, 103.                                                 |
| Chapter 7  | Circular Motion and Gravitation<br>5, 7, 23, 27, 29, 37, 43, 47, 59, 61, 63, 65.                                       |
| Chapter 8  | Rotational Motion and Equilibrium<br>21, 25, 35, 37, 39, 43, 53, 59, 67, 71, 83, 94, 106 (0.87 m from feet).           |
| Chapter 9  | Solids and Fluids<br>1, 9, 13, 31, 35, 41, 47, 51, 55, 57, 79, 87, 88 [(a) $3.5 \text{ cm}^3/\text{s}$ (b) 0.031%].    |
| Chapter 10 | Temperature<br>1, 7, 9, 13, 15, 21, 29, 33, 34 [(a) $2.68 \times 10^{22}$ (b) $2.68 \times 10^{19}$ ], 45, 51, 67, 69. |
| Chapter 11 | Heat<br>1, 9, 11, 15, 17, 23, 25, 27, 35, 37, 39, 47, 57.                                                              |
| Chapter 12 | Thermodynamics<br>9, 13, 15, 17, 31, 33, 41, 51, 53, 55, 79, 81, 83, 87.                                               |
| Chapter 13 | Vibrations and Waves<br>5, 7, 11, 15, 17, 33, 37, 43, 55, 57, 59, 63, 73, 77, 81.                                      |
| Chapter 14 | Sound<br>3, 11, 15, 17, 25, 29, 33, 43, 55, 59.                                                                        |

## LABORATORY/RECITATION:

1. A ruler, a protractor, a scientific calculator, the lab instruction material, the study guide, and the PHYSICS BOOK are required for every laboratory.
2. You will be working in groups of no more than three for most of the experiments. Each one of you should turn in a report for each experiment. The report must be finished during the three-hour lab period.
3. To get full credit, you keep working until the instructor is satisfied with your work and a complete report without mistakes is turned in. Then you need to clean up your work space and return the equipment to the moving cart.

## TENTATIVE LECTURE SCHEDULE:

|              |                          |
|--------------|--------------------------|
| January 12   | Introduction & Ch. 1     |
| January 14   | Ch. 1                    |
| January 16   | Ch. 1 & Ch. 2            |
| January 19   | No Class (MLK Holiday)   |
| January 21   | Ch. 2                    |
| January 23   | Ch. 2                    |
| January 26   | Ch. 3                    |
| January 28   | Ch. 3                    |
| January 30   | Ch. 3                    |
| February 2   | Test 1 (Ch. 1, 2, and 3) |
| February 4   | Ch. 4                    |
| February 6   | Ch. 4                    |
| February 9   | Ch. 4                    |
| February 11  | Ch. 5                    |
| February 13  | Ch. 5                    |
| February 16  | Ch. 5 & Ch. 6            |
| February 18  | Ch. 6                    |
| February 20  | Ch. 6                    |
| February 23  | Test 2 (Ch. 4, 5, and 6) |
| February 25  | Ch. 7                    |
| February 27  | Ch. 7                    |
| March 2      | Ch. 7 & Ch. 8            |
| March 4      | Ch. 8                    |
| March 6      | Ch. 8                    |
| March 9 – 13 | Spring Break             |
| March 16     | Ch. 9                    |
| March 18     | Ch. 9                    |
| March 20     | Ch. 9                    |
| March 23     | Test 3 (Ch. 7, 8, and 9) |
| March 25     | Ch. 10                   |
| March 27     | Ch. 10                   |

|          |                                     |
|----------|-------------------------------------|
| March 30 | Ch. 10 & Ch. 11                     |
| April 1  | Ch. 11                              |
| April 3  | Ch. 11                              |
| April 6  | Ch. 12                              |
| April 8  | Ch. 12                              |
| April 10 | No Class (Easter Recess)            |
| April 13 | Test 4 (Ch. 10, 11, and parts of 9) |
| April 15 | Ch. 12                              |
| April 17 | Ch. 13                              |
| April 20 | Ch. 13                              |

## TENTATIVE LECTURE SCHEDULE: (continued)

|          |                                 |
|----------|---------------------------------|
| April 22 | Ch. 13                          |
| April 24 | Ch. 14                          |
| April 27 | Ch. 14                          |
| April 29 | Ch. 14                          |
| May 1    | Quiz                            |
| May 7    | Exam (10 - 11:40 AM in SCI 102) |

## **TENTATIVE LABORATORY SCHEDULE:**

|          |                         |
|----------|-------------------------|
| Week 1   | Math Exercise and Data  |
| Analysis | (in second SLA Session) |
| Week 2   | No lab (MLK Holiday)    |
| Week 3   | Free Fall               |
| Week 4   | Vector                  |
| Week 5   | Projectile Motion       |
| Week 6   | Atwood Machine          |
| Week 7   | To be announced         |
| Week 8   | Ballistic Pendulum      |
| Week 9   | No Lab (Spring Break)   |
| Week 10  | Equilibrium             |
| Week 11  | Buoyancy                |
| Week 12  | Linear Expansion        |
| Week 13  | No Lab (Easter Recess)  |
| Week 14  | Calorimetry             |
| Week 15  | Simple Harmonic Motion  |
| Week 16  | Speed of Sound          |

| Hours         | Monday                         | Tuesday                        | Wednesday                      | Thursday                       | Friday                         |
|---------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 8:00 - 8:50   |                                |                                |                                |                                |                                |
| 9:00 - 9:50   |                                |                                |                                |                                |                                |
| 10:00 - 10:50 | Office                         |                                | Office                         |                                | Office                         |
| 11:00 - 11:50 | PHYS 211<br>Lecture<br>SCI 102 | Meeting                        | PHYS 211<br>Lecture<br>SCI 102 | Meeting                        | PHYS 211<br>Lecture<br>SCI 102 |
| 12:00 - 12:50 | PHYS 211<br>Lab                |                                | Office                         |                                | PHYS 211<br>Lab                |
| 1:00 - 1:50   | Section 211                    |                                |                                |                                | Section 214                    |
| 2:00 - 2:50   | SCI 114                        |                                |                                |                                | SCI 114                        |
| 3:00 - 3:50   |                                | PHYS 211<br>Lab                |                                | PHYS 211<br>Lab                |                                |
| 4:00 - 4:50   |                                | Section 212                    |                                | Section 213                    |                                |
| 5:00 - 5:50   |                                | SCI 114                        |                                | SCI 114                        |                                |
| 6:00 - 6:50   | SLA<br>Sections<br>212 and 214 | SLA<br>Sections<br>211 and 213 | SLA<br>Sections<br>212 and 214 | SLA<br>Sections<br>211 and 213 |                                |
| 7:00 - 7:50   | SCI 117                        | SCI 117                        | SCI 117                        | SCI 117                        |                                |

## PHYS 212 - Introductory Physics 2, Winter 1998

**Instructor:** Dr. Ali Abbasabadi, 3017 Arts & Sciences Commons Building, 592-3571.

**Office Hours:** M, W, F 2:00 - 2:50; F 3:00 - 3:50; or by appointment.

**Lecture:** M, W, F 1:00 - 1:50; 102 Science Building.

**Lab:** Section 211: M 3:00 - 5:50; 110 Science Building.

Section 214: W 8:00 - 10:50; 110 Science Building. This section is closed.

Section 212: Th 12:00 - 2:50; 110 Science Building.

Section 213: Th 3:00 - 5:50; 110 Science Building.

### WORLD WIDE WEB:

To access some of the information provided here and other materials related to this course, you may visit my homepage at the following URL:

<http://www.ferris.edu/htmls/academics/facultyinstructionalpages.htm>

You may also access my homepage by using the following: On the Ferris homepage, click on Academics, then click on Faculty Instructional Pages, then click on my name.

### REQUIRED MATERIALS:

1. Textbook: College Physics, by Wilson & Buffa, 3rd Ed. 1997.
2. Laboratory Manual: PHYSICS 212 LAB MANUAL, by Ali Abbasabadi.
3. Simple graph papers (or engineering papers), 8-1/2" X 11", 10 pages.
4. Scientific calculator, ruler, protractor, pencil #2, soft eraser, and course syllabus.
5. The Ferris State University Class Schedule. Please read and be aware of all the *General Information*. In particular, pay attention to the *Calendar* (such as the last day to drop the class), the *Academic Policy*, regarding the grades I (Incomplete) and W (Withdraw).

### COURSE OBJECTIVE:

Through lectures, laboratory experiments, and homework, to understand basic principles of physics, and be able to apply these principles to problems concerning physical phenomena.

### COURSE DESCRIPTION:

**Credit Hours:** 4 (3 Lecture; 3 Lab).

**Prerequisite:** PHYS 211.

Continuation of PHYS 211. Basic concepts and applications of electricity, magnetism, light, and modern physics.

This course meets General Education requirements: *Scientific Understanding Lab*.

### ATTENDANCE POLICY:

You are required to attend all sessions of class and lab. Any absenteeism, no matter what the reason, shall result in under-performance in exams.

### FINAL EXAM AND MIDTERM EXAMS LOCATION AND TIME:

All midterm exams will be in the same room and at the same time as the lectures. The final exam will be in the same room but at a time that is printed in the School Bulletin for the current term. For the current term, the final exam is on **Wednesday, May 6, between 12:00 - 1:40 p.m.**

### GRADING PROCEDURE:

Your grade will be determined, exclusively (no extra credit for any extra work), by the total points earned from exams, quizzes, homework, and lab reports. The grades will be computed, **exactly** (no rounding), from the following grading scale. The final grades, at the discretion of instructor, **may** be curved, resulting in a slight lowering of the grade boundaries. The decision, regarding all aspects of the curve, will be made by the instructor only **after** the final exam. The average grade for the class is expected to be between C and B-, depending on the class performance.

|                 |     |                         |
|-----------------|-----|-------------------------|
| 4 midterm exams | 84  | points (each 21 points) |
| 1 final exam    | 27  | points                  |
| 8 quizzes       | 16  | points (each 2 points)  |
| 13 homework     | 13  | points (each 1 point)   |
| 13 lab reports  | 39  | points (each 3 points)  |
| Total           | 179 | points                  |

| x = % of Total Score     | Grade |
|--------------------------|-------|
| $90\% \leq x \leq 100\%$ | A     |
| $87\% \leq x < 90\%$     | A-    |
| $83\% \leq x < 87\%$     | B+    |
| $80\% \leq x < 83\%$     | B     |
| $77\% \leq x < 80\%$     | B-    |
| $73\% \leq x < 77\%$     | C+    |
| $70\% \leq x < 73\%$     | C     |
| $67\% \leq x < 70\%$     | C-    |
| $63\% \leq x < 67\%$     | D+    |
| $60\% \leq x < 63\%$     | D     |
| $50\% \leq x < 60\%$     | D-    |
| $0\% \leq x < 50\%$      | F     |

### HOMEWORK AND STUDY GUIDE:

Several problems from the Textbook are assigned (see the attached problem sets). Some of the homework problems will be collected in the lab (see the lab's instruction), but you must work on all of them. The problem sets, by no means, are complete. Those of you that are interested to learn more and increase the possibility of getting higher grades, may need to work on additional problems from the Textbook. The amount of extra work depends on the individual. You need to keep working on the extra problems until you are confident that you understand the basic principles and are able to apply them to **new problems** concerning physical phenomena. This is a judgment that you need to make on your own. However, be forewarned that you should not deceive yourself into false confidence that you understand the problems by seeing their solutions in the Textbook, in class, or during office hours. You must be able to do problems on your own. You must develop problem-solving ability, not memorization of the solutions. The best way to learn how to do problems is to understand the materials and to do lots of problems. If you have any difficulty in doing the Textbook problems (assigned or unassigned) on your own, you will have difficulty in doing the exams' problems.

## **EXAMS AND QUIZZES:**

The final and the midterm exams are closed book and will consist of multiple choice problems (no formulas will be given to you and you are not allowed to bring any formula sheet). Some of the exam problems may be based upon the materials from the lab, the examples and problems in the Textbook (assigned and unassigned), quizzes, or examples from the lectures. (Some of the final exam problems may be based upon the midterm exams' problems.) The rest of the exam problems will be **new problems** and they will be based on the materials in the Textbook and the lectures. These new problems may not resemble and may not be at the same level of difficulty as the problems and examples in the Textbook and lectures. Many of the exam problems will involve calculations, but some may not involve any calculations. There will be **21** problems for each midterm exam and **27** problems for the final exam. Each problem is worth 1 point (no partial credit). Your exams' grades will be based, **solely**, on what you mark on the answer sheets, not what you write on exams' papers. The exam papers will be returned to you, but not the answer sheets.

Quizzes are closed book and **unannounced** (the instructor will not tell you in advance when the quizzes are). No formulas will be given to you and you are not allowed to bring any formula sheet. There will be one multiple choice problem per quiz, and it worths **2** points. To get credit or partial credit, all your work must be shown on your paper. The quizzes may not resemble the homework or lecture problems.

You should bring to the exams and quizzes a calculator that you know how to use (no sharing is allowed). You also need a #2 pencil (and a soft eraser) to work out the problems and to mark answer sheets.

## **MAKE-UPS FOR EXAMS AND QUIZZES:**

If you are absent from an exam and, within 24 hours after the exam, present a valid official or medical excuse, you will be given a make-up exam. (Make-up will be given **after** the regularly scheduled exam, **not** before.) The make-up will be given as soon as possible, during an office hour. The degree of difficulty, the distribution of questions among the chapters, the format, and the number of questions of the make-up exams will not be guaranteed to be the same as the regular exams. In addition, for the final exam, the make-up not only will be given **after** the regularly scheduled final exam, but it will be on one of the dates that is specified in the School Bulletin for the make-ups. A zero will be recorded for each missing exam. No make-up exam paper will be returned to you. However, a copy of the regular exam will be given to you.

If you are absent from a quiz and present a valid official or medical excuse, you may make up the quiz by writing a typed one-page paper to summarize a chapter (any chapter) in the Textbook, and solve 10 problems from the end of a chapter (any chapter) and attach the complete solutions (not just the answers) to the paper. The paper must be presented to the instructor **before** the next exam, otherwise, a zero will be recorded for each missing quiz. **No** special make-up quizzes will be arranged.

## **INSTRUCTIONS FOR LABORATORY:**

Labs begin according to the attached schedule. Working in group of four, you will perform experiments. Never form a group more than four, unless the instructor tell you so. If you form a group more than four, each one of you in that group will lose 1/2 point for that lab period. The instructor, at any time in lab, may rearrange the groups.

You must be quiet in lab at all times. If the instructor finds you loud or disruptive, you will be asked to leave the lab, and a zero will be recorded for that lab period. In lab, you are not allowed to consume food, tobacco, etc. You are also expected, during the lab session, to stay in the lab at all times, except for couple of minutes.

For each lab session, there are **10** assigned problems (see the Lab Manual). You must solve these problems during the lab period and attach the complete solutions (not just the answers) to the end of your lab reports. After the experiment, you should write a half-page summary paper about the experiment and its results. You must write the summary during the lab period and attach it to the end of your lab reports. A maximum of **4** points will be given for each complete lab work (**3** points for lab report and summary, **1** point for homework problems). Although there is no quiz or final exam for lab, some of the questions in the final and midterm exams may be based upon the materials in the lab.

The lab reports and the complete solution to the assigned problems will be prepared by each group (one lab report and solutions to the problems for each student) during the lab period and submitted **before** leaving the lab. You must leave the lab promptly at the end of the lab period. The graded lab reports will be returned to you at the next session of the lab.

You should bring to the lab your Textbook, Lab Manual, calculator, ruler, protractor, pencil, and the course syllabus.

## **MAKE-UPS FOR LABS:**

If a lab period is missed and you present a valid official or medical excuse, you may make up the lab by attending another lab session (during the same week). If this is not possible, you may make up the lab by writing a typed two-page paper to summarize a chapter (any chapter) in the Textbook, and solve 10 problems from the end of a chapter (any chapter) and attach the complete solutions (not just the answers) to the paper. The paper must be presented to the instructor **before** the next exam, otherwise, a zero will be recorded for each missing lab. **No** special make-up labs will be arranged. A maximum of three lab make ups (with valid excuses) will be accepted.



| LAB SCHEDULE |                   |                                                  |
|--------------|-------------------|--------------------------------------------------|
| LAB          | Week Beginning    | Experiment                                       |
| 1            | January 12        | Computer Graphics and Data Analysis              |
| *            | <b>January 19</b> | <b>NO LAB THIS WEEK</b>                          |
| 2            | January 26        | Ohm's Law                                        |
| 3            | February 2        | Resistivity                                      |
| 4            | February 9        | Series and Parallel Resistors                    |
| 5            | February 16       | Heating Effect of Electric Current               |
| 6            | February 23       | Measurement of e/m and Electromagnetic Induction |
| 7            | March 2           | Reflection and Refraction                        |
| *            | <b>March 9</b>    | <b>NO LAB THIS WEEK</b>                          |
| 8            | March 16          | Mirrors and Lenses                               |
| 9            | March 23          | Lens and Laser                                   |
| 10           | March 30          | Diffraction                                      |
| *            | <b>April 6</b>    | <b>NO LAB THIS WEEK</b>                          |
| 11           | April 13          | Interference                                     |
| 12           | April 20          | Diffraction Grating                              |
| 13           | April 27          | Atomic Spectra                                   |
| *            | <b>May 4</b>      | <b>NO LAB THIS WEEK</b>                          |

### LECTURE AND EXAM SCHEDULE

|         | DATE     | CHAPTERS                                                    |
|---------|----------|-------------------------------------------------------------|
| January | 12       | Course Syllabus & 15                                        |
|         | 14       | 15                                                          |
|         | 16       | 15                                                          |
|         | 19       | NO CLASS                                                    |
|         | 21       | 16                                                          |
|         | 23       | 16                                                          |
|         | 26       | 16 & 17                                                     |
|         | 28       | 17                                                          |
|         | 30       | 17 & Review                                                 |
|         | February | 2                                                           |
| 4       |          | 18                                                          |
| 6       |          | 18                                                          |
| 9       |          | 18 & 19                                                     |
| 11      |          | 19                                                          |
| 13      |          | 19                                                          |
| 16      |          | 20                                                          |
| 18      |          | 20                                                          |
| 20      |          | 20 & Review                                                 |
| 23      |          | <b>EXAM 2: Chapters 18, 19, 20 (7 problems per chapter)</b> |
|         | 25       | 22                                                          |
|         | 27       | 22                                                          |
| March   | 2        | 22                                                          |
|         | 4        | 23                                                          |

|       |    |                                                                           |
|-------|----|---------------------------------------------------------------------------|
|       | 6  | 23                                                                        |
|       | 9  | NO CLASS                                                                  |
|       | 11 | NO CLASS                                                                  |
|       | 13 | NO CLASS                                                                  |
|       | 16 | 23 & 24                                                                   |
|       | 18 | 24                                                                        |
|       | 20 | 24 & Review                                                               |
|       | 23 | <b>EXAM 3: Chapters 22, 23, 24 (7 problems per chapter)</b>               |
|       | 25 | 25                                                                        |
|       | 27 | 25                                                                        |
|       | 30 | 26                                                                        |
| April | 1  | 26                                                                        |
|       | 3  | 26 & 27                                                                   |
|       | 6  | 27                                                                        |
|       | 8  | 27 & Review                                                               |
|       | 10 | NO CLASS                                                                  |
|       | 13 | <b>EXAM 4: Chapters 25, 26, 27 (7 problems per chapter)</b>               |
|       | 15 | 28                                                                        |
|       | 17 | 28                                                                        |
|       | 20 | 29                                                                        |
|       | 22 | 29                                                                        |
|       | 24 | 29                                                                        |
|       | 27 | 30                                                                        |
|       | 29 | 30                                                                        |
| May   | 1  | 30 & Review                                                               |
|       | 4  | NO CLASS                                                                  |
|       | 6  | <b>FINAL EXAM: Chapters 15 - 20 &amp; 22 - 27 (1 problem per chapter)</b> |
|       |    | <b>Chapters 28, 29, 30 (5 problems per chapter)</b>                       |
|       | 8  | NO CLASS                                                                  |

**NOTE:**

After each exam, grades and correct answers to exams' problems will be posted outside the lab, on the date that will be printed on the cover page of the exams. All questions regarding exams, quizzes, and your grades, will be discussed and answered during office hours, **not** in class **nor** in lab.

In class and lab, you are not allowed to consume food, tobacco, etc. You must be quiet in class at all times. If the instructor finds you loud, talking to other students, or disruptive, you will be asked to leave the class for that session, and a zero will be recorded for a quiz. During class sessions, the questions must be referred to the instructor, not to other students. You are encouraged to discuss the course materials with other students, during the lab sessions or outside the class.

Syllabus will be followed exactly. No deviation from the syllabus will be allowed.

**WHAT SECTIONS OF THE CHAPTERS TO STUDY FOR EXAMS AND QUIZZES:**

Although few of the following sections may not be covered in the class, and those that are covered may not be presented in their entirety, you are still responsible for studying all the Insights and Demonstrations of the following chapters and the entire content (including examples) of **all** of the following sections for the exams and quizzes:

| Chapter | Section              |
|---------|----------------------|
| 15      | 1, 2, 3, 4, 5        |
| 16      | 1,3,5                |
| 17      | 1, 2, 3, 4           |
| 18      | 1, 2, 5              |
| 19      | 1, 2, 5, 6           |
| 20      | 1, 2 (no formula), 4 |
| 22      | 1, 2, 3, 4, 5        |
| 23      | 1, 2, 3              |
| 24      | 1, 3, 4, 5           |
| 25      | 1, 2, 3              |
| 26      | 1, 2, 3, 4, 5        |
| 27      | 1, 2, 4, 5           |
| 28      | 1, 2, 4, 5           |
| 29      | 1, 2, 3, 4, 5        |
| 30      | 1, 2, 3, 4, 5, 6     |

In addition to the above sections, you are also responsible for studying **all** materials presented in class and lab.

**PROBLEM SETS:**

| Chapter | Problem                                                  |
|---------|----------------------------------------------------------|
| 15      | 1,4,5,6,7,9,13,17,19,23,27,35,37,45,47,59,75,77          |
| 16      | 1,3,9,33(a),67,71,72,73(a),86,87,93,95,107,109           |
| 17      | 1,3,9,11,13,14,15,16,19,23,29,31,33,35,37,55,59,63,69    |
| 18      | 1,2,3,5,7,10,13,15,19,20,21,25,27,78,79,81,83,85,89      |
| 19      | 2,3,5,6,7,11,15,19,21,23,25,27,31,33,35,37,41,93,95,97   |
| 20      | 1,3,5,6,7,9,11,13,14,15,21,23,65,67,69,71,87,89          |
| 22      | 3,6,7,9,13,18,19,21,25,27,29,31,33,45,47,57,69,71        |
| 23      | 1,3,7,9,11,17,23,26,31,32,33,35,37,41,47,49,53,57,59     |
| 24      | 1,3,5,9,12,14,15,19,37,39,41(a),43,49,53,55,59,63,69     |
| 25      | 2,3,5,6,7,9,11,13,33,35,37,45,49,51(a),73,75,84          |
| 26      | 9,10,11,16,17,23,25,29,33(a),35(a),43,45,49,51,53,55,77  |
| 27      | 1,3,4,6,7,9,13,15,17,19,21,23,27,31,33,41,51,53,55,63    |
| 28      | 1,3,4,5,7,9,15,17,36,37,38,39,43,45,47,49,51,54,55       |
| 29      | 1,2,3,5,7,9,11,12,13,15,17,21,25,27,29(a),31,49,51,57,59 |
| 30      | 4,5,6,7,25,28,29,31,34,35,37,46,51,56,57,61,67           |

**ANSWERS TO ASSIGNED EVEN-NUMBERED PROBLEMS:**

(Answers to odd-numbered problems are given at the end of Textbook)

- 15.4: no  
15.6: a.  $-8.0 \times 10^{-10}$  C, b.  $5.0 \times 10^9$  electrons  
16.72:  $1.6 \times 10^{-9}$  F  
16.86: b  
17.14: 0.25 A  
17.16: a. 0.30 C, b. 0.90 J  
18.2: b  
18.10: a.  $30 \Omega$ , b. 0.30 A, c. 1.4 W  
18.20:  $6.9 \Omega$   
18.78: a  
19.2: b  
19.6: b  
20.6: 2.7 V  
20.14: 0.30 s  
22.6: 76 degrees  
22.18: c  
23.26: -18 cm  
24.12: a.  $9.6 \times 10^{-4}$  m; b.  $6.4 \times 10^{-4}$  m  
24.14:  $1.2 \times 10^{-2}$  m  
25.2: c  
25.6: diverging, -300 cm  
25.84: 500  
26.10: a. 165 km/h, b. 225 km/h  
26.16: a  
27.4:  $1.06 \times 10^{-5}$  m,  $2.83 \times 10^{13}$  Hz  
27.6:  $4.1 \times 10^3$  K  
28.4: a.  $7.28 \times 10^{-6}$  m; b.  $3.97 \times 10^{-9}$  m  
28.36: b  
29.2: d  
29.12: d  
30.4: a.  $^{41}\text{K}$ ; b.  $^{135}\text{Te}$ ; c. 4 n; d.  $^{14}\text{N}$ ; e. n  
30.6: a.  $^{14}\text{N}$ ; b.  $^2\text{H}$ ; c.  $^{30}\text{P}$ ; d.  $^{17}\text{O}$ ; e.  $^{10}\text{B}$   
30.28: d  
30.46: b  
30.56: b

## I. INSTRUCTOR

L. Jacobs Office: ASC-3007  
Office Hours: 1:00 MTWF  
Other hours by appointment)  
Phone: 592-2596

## II. TEXT / REQUIRED MATERIALS

General Chemistry, fifth edition, by Ebbing

Lab Workbook for Chemistry 121 & 122

by FSU Chemistry Faculty

Lab Handbook for Gen Chem by Griswold, et. al.

Chem 121 Lect/Lab Notes by Jacobs

Scientific Calculator

**Eye protection.** Glasses or goggles (meeting current OSHA standards) **MUST** be worn in the lab **AT ALL TIMES. Noncompliance will result in dismissal from the lab w/ an unexcused absence.** Safety glasses and/or goggles are available at the bookstore.

Contact lenses should NOT be worn in the lab.

## III. COURSE OBJECTIVES

CHEM 121 is a study of the fundamental principles, laws and theories of general chemistry, including Nomenclature, stoichiometry, gas laws, thermochemistry, atomic structure, chemical bonding, periodicity, liquids and solids, solution chemistry and theories of acids and bases.

## IV. COURSE PREREQUISITES

Successful completion of one year of high school chemistry (or CHEM 103 - Prep Chem) and algebra (or MATH 110 - Fundamentals of Algebra) are prerequisites to CHEM 121. Also, completion of, or concurrent enrollment in MATH 115 - Intermediate Algebra. **Reading, writing, and algebra at the college level are required.**

## V. COURSE REQUIREMENTS

**Lecture:** The lecture part of this course meets 4 hours each week (12:00 MTWF) in SCI - 102. **Attendance is required for every lecture!** For each unexcused absence, five (5) points will be DEDUCTED from your next test score. **Participation is required for every lecture.** For each unresponsive answer, five (5) points will be DEDUCTED from your next test score. I may occasionally give a bonus quiz.

There are NO MAKE-UPS for these bonus quizzes regardless of the reason for missing.

Tests are scheduled for the regular lect/lab periods and you are expected to take the tests at the scheduled times. If you have an acceptable reason for missing a test (e.g., illness or authorized school function), you **MUST** let me know **BEFORE** the test so that a make-up can be arranged.

The **FINAL EXAM** is scheduled for **Mon, Dec. 8 at 12:00 p.m. in SCI - 102.** This will be an ACS First Term General Chem Exam. It **WILL COUNT** towards your grade in CHEM 121. **Do NOT make any plans that would prevent you from being present for this test!!!**

**Lab:** The lab part of this course meets 3 hours each week. All lab sections meet in SCI - 335.

Sect. 221 M 8-11

Sect. 222 T 3-6,

Sect. 223 W 3-6

Sect. 224 Th 12-3.

**ATTENDANCE IN LAB IS MANDATORY !**

If you have an acceptable excuse for missing lab (e.g., illness) you must let me know **BEFORE** the lab period so that make-up time can be arranged.

The lab week runs from Mon to Fri.

**If you have unexcused absences for TWO or more labs you will AUTOMATICALLY FAIL the course.**

PRE-LAB REPORTS are due at lecture on FRIDAY PRIOR to your lab and POST-LAB REPORTS are due at the END of the lab period. Lab reports are graded on accuracy, precision, sig. figs, units, clarity, set-ups, neatness, etc.

There may also be quizzes in the lab.

**Homework:** Homework consists of the questions and problems at the end of each textbook chapter plus any ques/prob handouts. Doing the homework represents one of the **MOST IMPORTANT PARTS** of the learning process in this course and therefore it is **ESSENTIAL** that you do the homework. To gain the most advantage from the homework ques/probs, be sure that you **TRY THEM BEFORE CLASS.** It will also be necessary for you to **PRACTICE** the various types of problems encountered in this course so that you can recognize them immediately on a test. **PRACTICE** on the homework problems (doing them over & over & over) is your best opportunity for **LEARNING** the material. It will also be advantageous for you to **REWRITE** your class notes and **REWORK** the problems done in class **ASAP** after class.

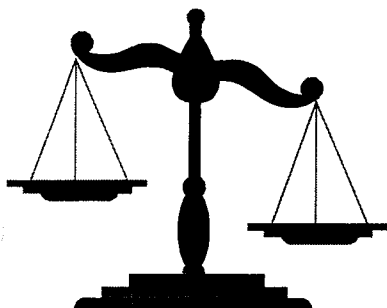
## VI. GRADING

|                                |                                      |
|--------------------------------|--------------------------------------|
| 6 (1 hr) exams @ 100 pts each  | = 600 pts                            |
| 1 (2 hr) final exam on M Dec 8 | = 200                                |
| lab                            | = 150                                |
| non - bonus quizzes            | = <u>50</u> (most likely on Fridays) |
| <b>total</b>                   | <b>= 1000 pts</b>                    |

A word of advice on taking tests Read (skim) all of the questions and problems first, quickly, before answering any of them. Then go back and **DO THE EASY ONES FIRST**. Do not waste time on the hard ones until you have all the easy ones finished.

Your final grade will be based on the following tentative scale:

|        |        |        |        |       |
|--------|--------|--------|--------|-------|
|        | 88% B+ | 76% C+ | 63% D+ |       |
| 94% A  | 83% B  | 70% C  | 58% D  | 55% F |
| 90% A- | 80% B- | 65% C- | 55% D- |       |



L. JACOBS  
CHEMISTRY

OFFICE ASC-3007  
PHONE EXT 2596

### FALL SEMESTER 1997

|       | SUNDAY              | MONDAY              | TUESDAY             | WEDNESDAY           | THURSDAY            | FRIDAY              |
|-------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 8:00  | Chem 121            |                     |                     |                     |                     |                     |
| 9:00  | lab                 |                     |                     |                     |                     |                     |
| 10:00 | Sci 221<br>SCI-102  |                     |                     |                     |                     |                     |
| 11:00 |                     | MEETINGS            |                     |                     | MEETINGS            |                     |
| 12:00 | Chem 121<br>SCI-102 | Chem 121<br>SCI-102 | Chem 121<br>SCI-102 | Chem 121<br>SCI-102 | Chem 121<br>SCI-102 | Chem 121<br>SCI-102 |
| 1:00  | OFFICE              | OFFICE              | OFFICE              | OFFICE              | lab                 | OFFICE              |
| 2:00  |                     |                     |                     |                     | Sci 221<br>SCI-102  |                     |
| 3:00  |                     | Chem 121            | Chem 121            | Chem 121            |                     |                     |
| 4:00  |                     | lab                 | lab                 |                     |                     |                     |
| 5:00  |                     | Sci 221<br>SCI-102  | Sci 221<br>SCI-102  |                     |                     |                     |

**CHEMISTRY 121**  
**Fall Semester 1997**

| Monday                                                                             | Tuesday                                              | Wednesday                                                        | Friday                                            |
|------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------|
|                                                                                    | <u>Sept 2</u><br>Seating Chart<br>Chap 1 Chem & Meas | <u>Sept 3</u><br>ACS<br>HS Chem TEST                             | <u>Sept 5</u><br>Chap 1                           |
| <u>Sept 8</u><br>Lab - Math Ck Up                                                  | <u>Sept 9</u><br>Chap 1                              | <u>Sept 10</u><br>Chap 1                                         | <u>Sept 12</u><br>Chap 1                          |
| <u>Sept 15</u><br>Chap 2 Atoms, Molecules,<br>and Ions<br>Lab # 2 Meas of Phy Prop | <u>Sept 16</u><br>Chap 2                             | <u>Sept 17</u><br>Chap 2                                         | <u>Sept 19</u><br>Chap 2                          |
| <u>Sept 22</u><br><b>TEST No. 1</b><br>Chap 1 & 2<br>Lab # 3 Form. of a Hydrate    | <u>Sept 23</u><br>Chap 3 Chem Rx:<br>An Intro.       | <u>Sept 24</u><br>Chap 3                                         | <u>Sept 26</u><br>Chap 3                          |
| <u>Sept 29</u><br>Chap 3<br>Lab # 4 Inorg. Nomen.                                  | <u>Sept 30</u><br>Chap 4 Chem Calc.                  | <u>Oct 1</u><br>Chap 4                                           | <u>Oct 3</u><br>Chap 4                            |
| <u>Oct 6</u><br>Chap 4<br>Lab # 5 Stoichiometry                                    | <u>Oct 7</u><br><b>TEST No. 2</b><br>Chap 3 & 4      | <u>Oct 8</u><br>Chap 5 Gaseous State                             | <u>Oct 10</u><br>Chap 5                           |
| <u>Oct 13</u><br>Chap 5<br>Lab # 7 Mol Wt Vol Liq                                  | <u>Oct 14</u><br>Chap 5                              | <u>Oct 15</u><br>Chap 6 Thermochem                               | <u>Oct 17</u><br>Chap 6                           |
| <u>Oct 20</u><br>Chap 6<br>Lab # 8 Heat of Neutral.                                | <u>Oct 21</u><br>Chap 6                              | Mid-Term <u>Oct 22</u> Warn's<br><b>TEST No. 3</b><br>Chap 5 & 6 | <u>Oct 24</u><br>Chap 7 Quantum Theory            |
| <u>Oct 27</u><br>Chap 7<br>Lab # 6 Iron Analysis                                   | <u>Oct 28</u><br>Chap 7                              | <u>Oct 29</u><br>Chap 8 Electron Config<br>& Periodicity         | <u>Oct 31</u><br>Chap 8                           |
| Last Day <u>Nov 3</u> for "W"<br>Chap 8<br>Lab # 9 Alum                            | <u>Nov 4</u><br>Chap 8                               | <u>Nov 5</u><br>Chap 8                                           | <u>Nov 7</u><br><b>TEST No. 4</b><br>Chap 7 & 8   |
| <u>Nov 10</u><br>Chap 9 Ionic/Coval Bond<br>Lab # 10 Lewis Formulas                | <u>Nov 11</u><br>Chap 9                              | <u>Nov 12</u><br>Chap 9                                          | <u>Nov 14</u><br>Chap 9                           |
| <u>Nov 17</u><br>Chap 10 Mol Geo/Bond<br>Lab # 12 Acid/Base Tit'n                  | <u>Nov 18</u><br>Chap 10                             | <u>Nov 19</u><br>Chap 10                                         | <u>Nov 21</u><br><b>TEST No. 5</b><br>Chap 9 & 10 |
| <u>Nov 24</u><br>Chap 11 Liqs & Solids<br>Lab - No Lab                             | <u>Nov 25</u><br>Chap 11                             | <u>Nov 26</u><br>Chap 11                                         |                                                   |
| <u>Dec 1</u><br>Chap 12 Solutions<br>Lab# 13 Mol Vol of N <sub>2</sub>             | <u>Dec 2</u><br>Chap 12                              | <u>Dec 3</u><br>Chap 12                                          | <u>Dec 5</u><br><b>TEST No. 6</b><br>Chap 11 & 12 |
| <u>Dec 8</u><br>Chap 15 Acids/Bases<br>Lab - Check Out                             | <u>Dec 9</u><br>Chap 15                              | <u>Dec 10</u><br>Review                                          | Last Day <u>Dec 12</u> of Class<br>Final Exam     |

## I. INSTRUCTOR

L. Jacobs      Office:      ASC - 3007  
Office Hours: 1:00 MTWF  
(other hours by appointment)  
Phone: 592-2596

## II. TEXT/REQUIRED MATERIALS

General Chemistry, fifth edition, by Ebbing  
Lab Workbook for Chemistry 121 & 122,  
by FSU Chemistry Faculty  
Lab Manual for Qualitative Analysis Chem 122  
by Wiest & Jacobs  
Lab Handbook for Gen Chem by Griswold, et. al.  
Chem 122 Lect/Lab Notes by Jacobs  
**Scientific Calculator**  
**Eye Protection.** Glasses or goggles (meeting current  
OSHA standards) **MUST** be worn in the lab **AT ALL**  
**TIMES. Noncompliance will result in dismissal from**  
**the lab w/ an unexcused absence.**  
Safety glasses and/or goggles are available at the  
bookstore. Contact lenses should NOT be worn in the lab.

## III. COURSE OBJECTIVES

CHEM 122 is a continuation of CHEM 121. The primary objectives are the study of: Redox Rxns, Chem Kinetics, Chem Equilibrium, Thermodynamics, Electrochemistry, Nuclear Chem, Introduction to Organic Chemistry, and certain chemical families. The lab will include Qualitative Analysis of Unknowns.

## IV. COURSE PRE-REQUISITES

**Successful** completion of CHEM 121 and MATH 115 (or higher) are pre-requisites to CHEM 122.

If you do not have the proper pre-requisites, you must drop the course.

If you received an "F" in CHEM 121, you are NOT eligible for CHEM 122.

If you received a "D-" in CHEM 121, you are NOT prepared for CHEM 122.

If you received a "D", "D+", or "C-" in CHEM 121, then you must plan to spend EXTRA time on CHEM 122.

**Reading, writing, and algebra at the college level are required.**

## V. COURSE REQUIREMENTS

**Lecture:** The lecture part of this course meets 4 hrs each week (12-1:00 MTWF) in SCI 102.

**Attendance is required for every lecture!**

For each unexcused absence, five (5) points will be DEDUCTED from your next test score.

**Participation is required for every lecture.**

For each unresponsive answer, five (5) points will be DEDUCTED from your next test score.

I may occasionally give a bonus quiz.

There are NO MAKE-UPS for these quizzes regardless of the reason for missing. Tests are scheduled for the regular lect/lab periods and you are expected to take the tests at the scheduled times. If you have an acceptable reason for missing a test (e.g., illness), you **MUST** let me know **BEFORE** the test so that a make-up can be arranged.

The FINAL EXAM is scheduled for Mon, May 4 at 12:00 p.m. in SCI - 102. This will be an ACS comprehensive General Chemistry Exam. It **WILL COUNT** towards your grade in CHEM 122.

**Do NOT make any plans that would prevent you from being present for this test.**

There will be some text material that you will be responsible for studying essentially on your own. Be sure that you do NOT neglect this responsibility.

**Lab:** The lab part of this course meets 3 hrs each week: Sect 221 on M 3-6    Sect 222 on W 3-6  
Sect 223 on Th 12-3    Sect 224 on F 8-11  
Sect 225 on Th 3-6

All lab sections meet in SCI-333.

**ATTENDANCE IN LAB IS MANDATORY.** If you have an acceptable excuse for missing lab (e.g., illness), you must let me know **BEFORE** the lab period so that make-up time can be arranged. **If you have unexcused absences for TWO or more labs, you will automatically FAIL the course.** Pre-lab reports are due at the **MON LECT PRIOR** to your assigned lab period and post-lab reports are due at the **END** of the lab period. Failure to turn in a Pre-lab report is an automatic - 10 points. Lab reports are graded on accuracy, precision, sig. figs., units, clarity, set-ups, neatness, etc. There may also be quizzes in lab.



The first seven (7) lab experiments will be from the Lab Workbook for CHEM 121 & 122. The last six (6) lab experiments will be from the Lab Manual for Qual Analysis Chem 122 by Wiest & Jacobs. The lab work for this part of the semester will be considerably different from previous lab work. It consists of the qualitative analysis of various cations and anions. You will be working on your own most of the time. In order to do your lab work efficiently and accurately you will need to spend time preparing for lab by studying the lab book and doing the pre-lab exercises for each analysis group. Checking the integrity of the reagents for qualitative analysis is also your responsibility.

**Homework:** Homework consists of the questions and problems at the end of each textbook chapter plus any ques/prob handouts. Although I will not be collecting the homework, it represents one of the **MOST IMPORTANT PARTS** of the learning process in this course and therefore it is **ESSENTIAL** that you do the homework. To gain the most advantage from the homework questions and problems, be sure that you **TRY THEM BEFORE CLASS**. It will also be necessary for you to **PRACTICE** the various types of problems encountered in this course so that you can recognize them immediately on a test. **PRACTICE** on the homework problems (doing them over & over & over) is your best opportunity for **LEARNING** the material. It will also be advantageous for you to **REWRITE** your class notes and **REWORK** the problems done in class **ASAP** after class.

A word of advice on taking tests: Read (skim) all of the questions and problems first, quickly, before answering any of them. Then go back and **DO THE EASY ONES FIRST**. Do not waste time on the hard ones until you have all the easy ones finished.

**VI. GRADING**

|                                   |                 |
|-----------------------------------|-----------------|
| 5 (1 hr) exams @ 100 pts each     | .....500 pts    |
| 1 (2 hr) final (ACS) exam.....    | 200             |
| 12 lab grades @ 15 pts each ..... | 180             |
| 2 lab quizzes @ 10 pts each.....  | 20              |
| non-bonus quizzes .....           | <u>100</u>      |
|                                   | <u>1000 pts</u> |

Your final grade will be based on the following tentative scale:

|  |        |        |        |        |
|--|--------|--------|--------|--------|
|  | 88% B  | 76% C+ | 63% D+ |        |
|  | 83% B- | 71% C  | 58% D  | 53% D- |
|  | 78% B- | 66% C- | 53% D- |        |

**CHEMISTRY 122**  
**Winter Sem 1998**

| Monday                                                                             | Tuesday                                            | Wednesday                                                  | Friday                                                              |
|------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------|
| First Day <u>Jan 12</u> of Class<br>Intro/Chem121 Review<br>Lab # 18 Bal Redox Eqs | <u>Jan 13</u><br>Metal Act. Series<br>Test No. 0   | <u>Jan 14</u><br>Seating Chart<br>Chap 3 Ox-Red Concepts   | <u>Jan 16</u><br>Chap 3<br>(Sects 3.5 & 3.6)                        |
| <u>Jan 19</u><br>M. L. King Day<br>No Classes                                      | <u>Jan 20</u><br>Chap 13<br>Rates of Reaction      | <u>Jan 21</u><br>Chap 13                                   | <u>Jan 23</u><br>Chap 13                                            |
| <u>Jan 26</u><br>Chap 13<br>Lab # 20 Iodine Clock                                  | <u>Jan 27</u><br>Chap 13                           | <u>Jan 28</u><br>Chap 21 Metallurgy &<br>Main Group Metals | <u>Jan 30</u><br>TEST No. 1<br>Chap 3, 13, 21                       |
| <u>Feb 2</u><br>Chap 14 Chem Equil<br>Lab # 19 Cu Sequence                         | <u>Feb 3</u><br>Chap 14                            | <u>Feb 4</u><br>Chap 14                                    | <u>Feb 6</u><br>Chap 15<br>Acids and Bases<br>(pH)                  |
| <u>Feb 9</u><br>Chap 15<br>Lab # 17 Graph GlassBead                                | <u>Feb 10</u><br>Chap 16<br>Acid - Base Equilibria | <u>Feb 11</u><br>Chap 16                                   | <u>Feb 13</u><br>Chap 16                                            |
| <u>Feb 16</u><br>Chap 16<br>Lab # 21 $K_a$                                         | <u>Feb 17</u><br>Chap 16                           | <u>Feb 18</u><br>Chap 16                                   | <u>Feb 20</u><br>TEST No. 2<br>Chap 14, 15 & 16                     |
| <u>Feb 23</u><br>Chap 17 Solubility &<br>Complex Ion Equilibria<br>Lab # 23 $K_f$  | <u>Feb 24</u><br>Chap 17                           | <u>Feb 25</u><br>Chap 17                                   | <u>Feb 27</u><br>Chap 17<br>Chap 18 Thermodynamics<br>& Equilibrium |
| <u>Mar 2</u><br>Chap 18<br>Lab # 17 Graphing BB's                                  | <u>Mar 3</u><br>Chap 18                            | Mid-Term <u>Mar 4</u> Warn's<br>Chap 18<br>Qual Scheme     | <u>Mar 6</u><br>TEST No. 3<br>Chap 17 & 18                          |
| <b>SPRING BREAK    MARCH 7 THRU MARCH 15    SPRING BREAK</b>                       |                                                    |                                                            |                                                                     |
| <u>Mar 16</u><br>Qual Scheme<br>Lab: Group I Anal/Unk                              | <u>Mar 17</u><br>Chap 21<br>Main Group Metals      | <u>Mar 18</u><br>Chap 19<br>Electrochemistry               | <u>Mar 20</u><br>Chap 19<br>Qual Scheme                             |
| Last Day <u>Mar 23</u> for "W"<br>Chap 19<br>Lab: Group II Analysis                | <u>Mar 24</u><br>Chap 19                           | <u>Mar 25</u><br>Chap 19                                   | <u>Mar 27</u><br>Chap 19<br>Qual Scheme                             |
| <u>Mar 30</u><br>Chap 19<br>Lab: Grp II Unk<br>Grp III Analysis                    | <u>Mar 31</u><br>Chap 19                           | <u>Apr 1</u><br>Chap 22<br>Nonmetals                       | <u>Apr 3</u><br>Test No. 4<br>Chap 19, 21, 22                       |
| <u>Apr 6</u><br>Chap 20<br>Nuclear Chemistry                                       | <u>Apr 7</u><br>Chap 20                            | <u>Apr 8</u><br>Chap 20                                    | <u>Apr 10</u><br>GOOD FRIDAY<br>No Classes                          |
| <u>Apr 13</u><br>Chap 20<br>Lab: Grp III Unk                                       | <u>Apr 14</u><br>Chap 20                           | <u>Apr 15</u><br>Chap 20                                   | <u>Apr 17</u><br>Chap 22<br>Nonmetals                               |
| <u>Apr 20</u><br>Qual Scheme<br>Chap 22<br>Lab: General Cation Unk                 | <u>Apr 21</u><br>Chap 23<br>Transition Elements    | <u>Apr 22</u><br>Chap 20<br>Chap 24<br>Organic Chemistry   | <u>Apr 24</u><br>Test No. 5<br>Chap 20, 22, 23                      |
| <u>Apr 27</u><br>Qual Scheme<br>Chap 24<br>Lab: Anion Anal/Unk                     | <u>Apr 28</u><br>Chap 24                           | <u>Apr 29</u><br>Chap 24                                   | Last Day <u>May 1</u> of Class<br><br>Review                        |

FINAL EXAM on MONDAY, May 4 at 12:00 (noon) in SCI - 102

# ORGANIC CHEMISTRY 221

FALL 1996

(5 credits, 4+3)

Dr. P. Di Raddo 592-2584 (office)

Commons 3011

Office hours: MWF 9:00-10:00

Texts: "Organic Chemistry" McMurry Fourth Edition (Lecture)

(Reqd) "Microscale and Macroscale Organic Chemistry"

Williamson Second Edition (Lab)

**Course Content** Modern bonding theory in organic molecules; group functions; chemistry and stereochemistry of alkanes; cycloalkanes, alkenes and alkyl halides with special emphasis on reaction mechanisms in aliphatic systems. Study of aromatic compounds, dienes, alkynes, alcohols, ethers and organometallic compounds with emphasis on substitution-elimination and electrophilic aromatic substitution reactions. Concurrent laboratory includes basic laboratory techniques such as TLC and GC, synthesis, stereochemistry workshops, UV, IR, NMR and MS theory and analyses, and an introduction to qualitative analysis. Prerequisite CHEM 121 and 122.

## POINT DISTRIBUTION AND GRADING

|                                                                           |     |
|---------------------------------------------------------------------------|-----|
| EXAMS (100 points each X 3)                                               | 300 |
| LABS (Reports, Workshops, Preparation)<br>(no late makeup labs available) | 150 |
| FINAL (comprehensive; no makeup possible)                                 | 200 |
| EXAM                                                                      |     |

A : 92-100% B+: 82-91% C+: 68-81% D+: 53-67% F: Below 53%

## EXAM SCHEDULE

| <u>EXAM</u> | <u>DATES</u> |
|-------------|--------------|
| One         | JUNE         |
| Two         | JULY         |
| Three       | JULY         |
| Final       | AUGUST       |

**If you miss an exam because of an excused absence you must contact me within one class day in order to schedule a makeup exam. Makeups are for excused absences only (deaths and sickness with doctor's note)**

## READING ASSIGNMENTS AND SUGGESTED PROBLEMS

- Chapter 1    Structure and Bonding  
Problems:    19, 23, 24, 26, 27, 33, 35, 42
- Chapter 2    Bonding and Molecular Properties  
Problems:    22, 25, 27, 32, 33, 34, 36, 39, 41, 45, 50, 51
- Chapter 3    Alkanes and Cycloalkanes  
Problems:    18, 19, 21, 22, 28, 29, 32, 33, 35, 46, 40,
- Chapter 4    Stereochemistry of Alkanes and Cycloalkanes  
Problems: 21, 25, 27, 28, 29, 37, 48, 50
- Chapter 5    Overview of Organic Reactions  
Problems:    15, 17, 19, 20,
- Chapter 6    Alkenes:        Structure and Reactivity  
Problems:    18, 22, 23, 24, 26, 36, 37-41, 43, 44
- Chapter 7    Alkenes:        Reactions and Synthesis  
Problems: 20-27, 30, 33, 35, 37, 38, 44, 46,
- Chapter 8    Alkynes  
Problems:    14, 15, 18, 20-22, 25, 27-31, 33, 34
- Chapter 9    Stereochemistry  
Problems:    28-30, 33, 35, 41, 42, 45-48, 50, 59, 62
- Chapter10    Alkyl Halides  
Problems:    16, 18-22, 26, 30a,
- Chapter11    Nucleophilic Substitution and Elimination Reactions  
Problems:    18, 20-24, 28, 30, 34, 37
- Chapter12,13 Problems:    TBA
- Chapter14    Conjugated Dienes and UV Spectroscopy  
Problems:    17, 18, 21, 25, 30, 34, 38
- Chapter15    Benzene and Aromaticity  
Problems:    17, 18, 27, 33, 43

The lecture part of this course meets 4 hours per week and labs last up to 3 hours per week. A diligent student is expected to study a minimum of 2-3 hours per hour of lecture. Attendance and participation is expected for every lecture and may be factored into your final grade. The suggested problems provided in this syllabus have been selected to reinforce an understanding of the topics covered in class. Remember that the organic textbooks cited in this syllabus are not to be read as novels. Rather as you read and study you ought to in addition attempt as many problems as possible with pencil and paper close at hand. The use of notecards is particularly effective in condensing for you the key points of the material covered and can facilitate your studies. Don't hesitate to write in your book- it is not the Bible- or to rewrite your class notes if you find this useful in understanding the material.

# ORGANIC CHEMISTRY 222

Summer 1997  
(5 credits, 4+3)

Instructor: Dr. P. Di RADDO (592-2584)  
ASC 3011

Office hours: M,W,F 1:00- 2:00

Texts: "Organic Chemistry" McMurry Fourth Edition (Lecture)  
(Reqd) "Microscale and Macroscale Organic Chemistry"

Williamson Second Edition (Lab)

**Course Content** Modern bonding theory in organic molecules; group functions; chemistry and stereochemistry of alkanes; cycloalkanes, alkenes and alkyl halides with special emphasis on reaction mechanisms in aliphatic systems. Study of aromatic compounds, dienes, alkynes, alcohols, ethers and organometallic compounds with emphasis on substitution-elimination and electrophilic aromatic substitution reactions. Concurrent laboratory includes basic laboratory techniques such as TLC and GC, synthesis, stereochemistry workshops, UV, IR, NMR and MS theory and analyses, and an introduction to qualitative analysis. Prerequisite CHEM 121 and 122.

## POINT DISTRIBUTION AND GRADING

|                                                                           |     |
|---------------------------------------------------------------------------|-----|
| EXAMS (100 points each X 3)                                               | 300 |
| LABS (Reports, Workshops, Preparation)<br>(no late makeup labs available) | 100 |
| FINAL (comprehensive; no makeup possible)<br>EXAM                         | 200 |

A : 92-100% B+ : 82-91% C+ : 68-81% D+ : 53-67% F: Below 53%

## EXAM SCHEDULE

| <u>EXAM</u> | <u>DATES</u> |
|-------------|--------------|
| One         | JULY         |
| Two         | JULY         |
| Three       | JULY         |
| Final       | AUGUST       |

If you miss an exam because of an excused absence you must contact me within one class day in order to schedule a makeup exam. Makeups are for excused absences only (deaths and sickness with doctor's note)

## READING ASSIGNMENTS AND SUGGESTED PROBLEMS

### Chapter 16 Electrophilic Aromatic Substitution Reactions of Benzene

Problems: 28, 30, 32, 33, 43, 44, 47, 50, 59

### Chapter 17 Alcohols and Thiols

Problems: 23, 24, 25, 27, 28, 31, 33, 35, 36

### Chapter 18 Ethers, Epoxides and Sulfides

Problems: 21, 22, 24, 26, 28, 33, 36, 45, 47

### Chapter 19 Aldehydes and Ketones: Nucleophilic Addition Reactions

Problems: 24, 27, 29, 32, 34, 36

### Chapter 20 Carboxylic Acids

Problems: 14, 19, 20, 21, 26, 28,

### Chapter 21 Carboxylic Acid Derivatives

Problems: 34, 37, 38, 40, 46, 56

### Chapter 22 Carbonyl Alpha Substitution Reactions

Problems: 23, 24, 25, 31, 33, 36

### Chapter 23 Carbonyl Condensation Reactions

Problems: 24, 26, 27, 29, 31, 35

### Chapter 24 Aliphatic Amines

Problems: 20, 21, 24, 25

### Chapter 25 Aryl Amines and Phenols

Problems: 17, 21a,b,c, 27

### Chapter 26 Carbohydrates

Problems: 26, 27, 30, 33, 35, 39



## TENTATIVE LABORATORY SCHEDULE, WINTER 1997

(Text: Kenneth L. Williamson, 2nd. Edition)

### LABORATORY ACTIVITY:

**Check-in. Introduction to Microscale Experiments**

**Friedel Crafts Alkylation. Preparation of 1,4-di-  
butylbenzene**

**Nitration of Methyl Benzoate**

**Dry lab. Problems in Organic Synthesis**

**Oxidation: Cyclohexanol to Cyclohexanone**

**Esterification I: Synthesis of Aspirin**

**II: Synthesis of Butyl Acetate**

**De-Esterification (Hydrolysis) of Methyl Salicylate**

**Aldol Condensation : Synthesis of Dibenzalacetone**

**Spectroscopy Revisited. MS, IR and NMR Spectroscopy**

**Systematic identification of Unknowns. U-1 and U-2**

The lecture part of this course meets 4 hours per week and labs last up to 3 hours per week. A diligent student is expected to study a minimum of 2-3 hours per hour of lecture. Attendance and participation is expected for every lecture and may be factored into your final grade. The suggested problems provided in this syllabus have been selected to reinforce an understanding of the topics covered in class. Remember that the organic textbooks cited in this syllabus are not to be read as novels. Rather as you read and study you ought to in addition attempt as many problems as possible with pencil and paper close at hand. The use of notecards is particularly effective in condensing for you the key points of the material covered and can facilitate your studies. Don't hesitate to write in your book- it is not the Bible- or to rewrite your class notes if you find this useful in understanding the material.

CHEM 231

Quantitative Analysis  
4 Credits

|               |                                    |                      |
|---------------|------------------------------------|----------------------|
| Instructor :  | Dr. Prabhakara Shetty              | Fall1997             |
| Office:       | ASC 3097                           | STR 233              |
| Telephone:    | 592 2589                           | MWF 10:00 - 10:50 AM |
| Office Hours: | MWF 10:50-11:50 AM, R 3:00-4:00 PM |                      |

Goals and Objectives:

To enable students to understand the concepts of classical and modern quantitative analysis involving both wet and instrumental methods.

To develop ability to draw reasonable inferences from observations, and to improve problem solving skills

Requirements:

|                   |                                                                                      |
|-------------------|--------------------------------------------------------------------------------------|
| Four hourly tests | 400 points (100 pts. each)                                                           |
| Six Quizzes       | 100 points (20 pts. each, you can drop one quiz of lowest grade, no make up quizzes) |
| Final Exam        | 100 points (cumulative)                                                              |
| Laboratory        | 200 points.                                                                          |

Grading Scale:

|                  |    |
|------------------|----|
| 92.5 % and above | A  |
| 89.5 to 92.4 %   | A- |
| 86.5 to 89.4 %   | B+ |
| 82.5 to 86.4 %   | B  |
| 79.5 to 82.4 %   | B- |
| 76.5 to 79.4 %   | C+ |
| 72.5 to 76.4 %   | C  |
| 69.5 to 72.4 %   | C- |
| 66.5 to 69.4 %   | D+ |
| 62.5 to 66.4 %   | D  |
| 59.5 to 62.4 %   | D- |

Text Book: Quantitative Chemical Analysis by Daniel C. Harris, Fourth edition

Laboratory Manual: Laboratory Manual for Chemistry 231

Topics:

1. Introduction to chemical analysis
2. Statistical approaches to error in analysis and data handling.
3. Chemical equilibrium: concept and calculations.
4. acids, bases and buffers
5. Volumetric analysis: titrations and equivalence points.
6. gravimetric analysis: the limits of solubility
7. Introduction to Instrumentation.
8. Molecular spectroscopy.
9. Chromatography.
10. Electrochemistry.

## Biochemistry Laboratory CHEM 332 Fall '97

**Instructor:** Dr. Kim K. Colvert **Office:** ASC 3098

**Hours:** MTF 9-9:50 R 1-1:50(or by appt.)

**Textbook:** Boyer, "Modern Experimental Biochemistry", Addison-Wesley, supplemental material will be provided.

**Supplies:** Gridded notebook with perforated carbon sheets, goggles, metric straight edge, graph paper(no larger than 10 divisions/in.), calculator (suggest a scientific), flexicurve (optional).

**Grading:** Grades will be based on as many lab reports as we complete, written as described in the following pages. Over the course of the term you must keep a notebook that documents everything you do. The carbon copies will be collected upon completion of an experiment for grading. There will be a final exam during the last laboratory period. All assignments are worth 100 pts, even if they take more than one lab period.

**Absences/Make up Labs:** There will be no make-up labs. Absence from lecture will not be counted against you but will be to your disadvantage. Absence from a lab which requires more than one lab period will result in a proportionate deduction. For example, if a lab requires 2 lab periods and you miss one you may obtain the data from your partner but 20% will automatically be deducted from the completed report. If you miss a lab that only requires one period an excused absence might be negotiated if the reasons are fully documented. Missing three labs for any reason will result in failure of the course.

## LAB NOTEBOOKS AND REPORTS

Each of you will be required to keep a lab notebook in which you will record all the information necessary to write a report. It is a running account of everything done in an experiment—the procedure (suggested and what you actually did) errors, accidents, the conditions of the experiment, the data collected, the calculations, notes to yourself, lecture notes, literature references, errors and so on. For your own sake, it should include a table of contents and therefore each experiment should be titled and the pages numbered. It will not be graded but will be periodically checked. It is like a diary in many ways. you ought to be able to go back to your notebook, even years later, and know exactly what you did and why you did it. Theoretically, if you were to die, a fellow scientist could reconstruct your research from your notebooks.

It is helpful to prepare tables in advance for any data you need to collect so it is labeled and ready to fill in as you take your measurements. As you work record observations, any stray thought or question and any helpful hints you might receive. When you get ready to finish your report your notebook should have all the necessary data and maybe even a few ideas that will help with the discussion. Whatever you do don't take your data down on the odd piece of paper thinking you will enter it in your notebook later. Neatness is important, you must be able to tell exactly what each piece of data is. If you get sloppy you might not know what information to use where in your write-up.

Format for a report

### TITLE PAGE

TITLE  
NAME  
DATE

**INTRODUCTION:** The introduction should not be more than a page or so long and should be in your own words. It should include a statement of the objective(s) as well as any specific background information necessary for a general understanding of the theories, procedures, techniques and calculations necessary for the successful completion of the experiment and report. Any given data or literature values should be included here.

**PROCEDURE:** The procedure section pertains to what is done during the laboratory period. Do not copy the procedure handout or from the book. Distill the method provided down to a page or so of concise directions. Try to convey the necessary information in as few words as possible. When appropriate, a table or tables may be used to clearly show reagents, amounts, dilution factors, times, etc. Try to use passive, past tense

*Ex. "I will then add some ammonium sulfate to the solution," is incomplete and incorrectly phrased*

*"Two milliliters of 0.3 M ammonium sulfate was added to one liter of the protein solution," provides much more information and avoids the use of 'I' and 'some'.*

**DATA:** The data section should include tables and/or graphs of **RAW DATA** obtained from direct observation or with the aid of instruments. Some examples of raw data are: colors, absorbances, pH's, degrees of observed rotation, chromatograms, measured distances, etc. Once a measurement or observation is manipulated (for example, by calculation, graphing) it is no longer **RAW DATA** but becomes results. **ALL** tables should be titled. They should have labels that can be understood by the casual reader. All raw data should be clearly and succinctly identified, whether machine recorded or experimenter recorded.

**CALCULATIONS:** The calculation section should include any mathematical formulas used to handle the data to obtain results. Define the formula, state the formula then show a set-up using actual experimental data. Repetitive use of the same formula using different data is unnecessary. One sample will do in this section. If more than one number is generated by the same calculation usually these numbers are presented in graphical or tabular form in the results section. The proper use of standard mathematical manipulations and symbols is expected.

**RESULTS:** The results of the experiment should be presented in a clear and concise form. Each type of data or manipulated data should be presented, whether in tables, graphs or smoothly integrated prose. For instance, suppose that you are asked in the analysis section to plot the absorbance of a solution as a function of time. You would make the graph, label it appropriately with a figure number and then discuss what the graph shows and to a limited extent what trend or principle it illustrates. You would use a phrase like "As can be seen in Figure 6 the absorbance of the solution decreased with time, indicating that a basal level of decay occurs."

**DISCUSSION:** In this section the individual observations from the results are integrated. This should include a comparison of the expected results (from text or literature or lecture) with your experimental results, whether favorable or unfavorable, and an explanation. This is where you prove you understood the principles enumerated in the introduction and relate them to the actual observations you have made. General statements of conclusions go in this section. This section is heavily weighted in the grading, along with the results and introduction.

**LITERATURE CITED:** Any references you used for literature values or other information should be listed in any accepted style.

## **General directions for writing the report.**

- 1) The writing should be well constructed, concise and scientific,
- 2) all experimental work is to be reported thoroughly and accurately,
- 3) the report should not have to be reread to 'figure out' what the writer means,
- 4) the report, written in the passive mode, should be free of mechanical errors
- 5) For the first semester the report may be written in ink but you should try to produce them on a computer. For the second semester computer generated reports will be required. I have no preference as to the software so you may use what is familiar to you but you should have access to a versatile graphing program and a word processing program that can handle chemical symbols and integrate tables.
- 6) When it is not appropriate to use computer generated graphs they should be done on standard graph paper with 20 squares to the inch. They must conform to the following format:
  - a. *margins free of any writing*
  - b. *a suitable and descriptive title*
  - c. *x-axis (independent variable) label and units*
  - d. *y-axis (dependent variable) label and units*
  - e. *both axes conveniently and correctly scaled*
  - f. *data points plotted clearly and precisely*
  - g. *smooth curves or straight lines drawn when appropriate.*
  - h. *one idea per graph (may be more than one line, however)*
  - i. *neat and pleasing appearance*

## SYLLABUS

**Course:** CHEM 364 Biochemistry 4 Cr.  
Prereq.: Completion of CHEM 222

**Instructor:** Dr. Kim K. Colvert ASC 3098  
Ext. 5851 Office Hours: MTF 9-9:50  
R 1-1:50  
Home 592-1539 (before 10 p.m.) (other times by appoint.)

**Text:** "Principles of Biochemistry," Horton, *et al*, 2nd Edition, Prentiss-Hall. Bring this to class. A scientific calculator is also required.

**Attendance:** There is no specific penalty for absences however, in-class assignments cannot be made up. Late assignments will not be accepted. If possible, make arrangements for absences in advance. Excused absences must be documented. Special arrangements for excused absences must be made in person no later than the day after return to class. You are responsible for obtaining notes, etc. from classmates. Handouts will be available from me.

Being late isn't a good idea. Get up early. If you are late come in quietly and avoid disrupting the class.

**Class Deportment:** See *CAS Syllabus Attachment*. We will strive to create a friendly, positive environment. If any of us happen to come into conflict these concerns must be addressed outside of class. Try to remember that education is a two-way street. You cannot be magically endowed with knowledge; you must come prepared and strive for understanding both in and out of class. I am a facilitator not a programmer so I must come prepared to help you in that process.

There are two common questions I do not answer: 1) "Will this be on the test?" and 2) "I'll never use this, why do I have to know it?" In the first case assume that if it is covered in class or in the assigned reading it is fair game for an exam. In the second case assume there is a reason even if it is not immediately apparent. If it is keeping you up nights, come and ask; I probably have an answer.

I'd rather you didn't eat in class and falling asleep could prove to be embarrassing.



**Cheating :** In a word, don't. See *CAS Syllabus Attachment*. Penalty for a first offense will be a zero for that assignment. A second offense will result in failure of the course.

**Grading:** There will be four in-class exams worth 100 pts each. These exams will be short answer/essay/ problem combinations and will primarily test your ability to apply the specific knowledge you have accumulated rather than testing your ability to accumulate data. There will be a comprehensive final worth 100 pts. It is not optional. It is possible that this will be a multiple choice national standardized exam so your grade will be internally normalized. I wish to use this exam as an assessment tool for the course, to see how your performance compares with other undergraduate Biochemistry students across the country.

There will be approximately ten group assignments worth 20 pts. each; 10 pts for individual effort, 10 pts for the group's effort. In addition there will be occasional computer/Internet assignments worth 5 pts each.

| <u>Grading Scale</u> | <u>Cutoff</u> | <u>Grade</u> |
|----------------------|---------------|--------------|
|                      | 89%           | A-           |
|                      | 78%           | B-           |
|                      | 67%           | C-           |
|                      | 56%           | D-           |

**Exam Schedule:**

Exams will begin at 7:45 a.m.

|        |                        |
|--------|------------------------|
| Exam 1 | Sept. 18               |
| Exam 2 | Oct. 13                |
| Exam 3 | Nov. 6                 |
| Exam 4 | Dec. 4                 |
| Final  | Dec. 11 7:40-9:40 a.m. |

**Review Sessions:** (locations to be announced)

|                       |                |
|-----------------------|----------------|
| Tuesday, September 16 | 5:30-7:30 p.m. |
| Sunday, October 12    | 2:00-4:00 p.m. |
| Tuesday, November 4   | 5:30-7:30 p.m. |
| Tuesday, December 2   | 5:30-7:30 p.m. |

**Class Format:**

Read the appropriate material before you come to class. The lectures will assume this has been done and may not discuss certain principles in detail. An outline will be provided for the lectures. Any overheads used will be available after class but I encourage you to listen and take notes. If you are copying overheads you are doing neither and cannot possibly be processing any of the information. If all you needed were the overheads I could hand out copies and you would only need to come in for the exams.

Questions are encouraged. Be sure that if you didn't understand something you weren't the only one.

Bring your text to class. There will be times I will refer to it directly. By the way USE YOUR TEXT. It has nice summaries at the end of the chapters and a nice selection of problems. These problems will not be assigned for credit but you must do them as part of your study routine. The solutions are provided but try not to use them until after you have made an effort. Remember the rule of thumb for study time: you must spend two to three hours outside of class for every hour in class. Study groups are encouraged. You learn a lot by teaching.

**Group Assignments:** You will be divided into groups of four. Each group will consist of an Alpha, Beta, Gamma, and Delta. For every assignment each person will have an individual problem to solve before class. On assignment day (usually Friday) your groups will meet and each member will present the solution to the  $\alpha$ ,  $\beta$ ,  $\gamma$  or  $\delta$  section. Then you will work together to solve another problem that requires the separate pieces.

1) Each person should make two copies of their individual solutions. One copy will be collected at the beginning of class. Be sure both copies have your name on it. You will use the second copy to present your solution to the group. They will be expected to comment and correct if necessary, you will make corrections or additions in red pen. These will be turned in.

2) Each member will serve as coordinator in a rotating pattern. The coordinator is responsible for organization and preparation of the group answer. It is not the coordinator's job to judge but to organize, keep an eye on the time and encourage everyone to participate.

3) Your individual efforts will be worth a maximum of 10 pts. If you fail to do your part you will receive no credit for the individual portion and only 1/2 of your group grade (5 pt maximum). The group will be expected to solve the missing portion (entirely in red pen) before proceeding to the group problem.

4) Upon completion the coordinator will collect the individual problems (being sure each has a name), staple them to the group solution (which should have all four names), and turn in the whole.

5) My role is simple. I will wander around observing but I will try to interfere as little as possible. Cooperative learning is the key to this exercise and be sure I will notice if someone is not doing their share or is bullying. Expect penalty points if I catch you. Learn by teaching. Try not to be shy. Everyone's entitled to an opinion. Verbal abuse is no more acceptable than physical abuse.

### Tentative Timetable

| <u>Dates</u> | <u>Subject</u>                                 | <u>Chapt.</u> |
|--------------|------------------------------------------------|---------------|
| 8/25         | Organization                                   |               |
| 8/26-29      | Introduction: Setting the Stage                | 1             |
| 9/2-5        | In an Aqueous Environment                      | 2             |
|              | It's Amino World                               | 3             |
|              | Proteins: Structure and Function               | 3,4           |
| 9/8-16       | Proteins: In the Lab                           | (expanded)    |
|              | Enzymes: Molecular Machines                    | 5             |
| 9/19-23      | Enzymes: Mechanisms                            | 6             |
| 9/25-26      | Behind Every Good Enzyme                       | 7             |
| 9/29-10/6    | Sugar (da da da da dit da) Ahhh, Honey, Honey  | 8             |
|              | What Do You Mean It Won't Dissolve in Water?   | 10            |
|              | The Wall                                       |               |
|              | Breaching the Wall                             |               |
| 10/7-10      | Bioenergetics: The Paths to Power              | 11            |
| 10/14-16     | Glycolysis: The Start of Something Big         | 12            |
| 10/17-21     | Round and Round We Go : The TCA Cycle          | 13            |
| 10/23-27     | The Rest of the Sugar Saga                     | 14            |
| 10/28-10/31  | Where's the Beef?: Ox-Phos                     | 15            |
| 11/3-4       | Butter-Lovers Beware: The Catabolism of Lipids | 17            |
| 11/10        | The Green Machine                              | 16            |
| 11/11-14     | Nitrogen, Amino Acids, and You                 | 18            |
| 11/17-18     | Interlude: Nucleotides                         | 9             |
|              | Nucleotide Metabolism: A Scavenger's Tale      | 19            |

|            |                                              |            |
|------------|----------------------------------------------|------------|
| 11/20-12/2 | Tinker to Evers to Chance: The Central Dogma |            |
|            | Nucleic Acids                                | 20         |
|            | Replication                                  | 21         |
|            | Transcription                                | 22         |
|            | In the Lab: Sequencing                       | (expanded) |
|            | Translation                                  | 23         |
|            | Recombinant Technology                       | 24         |

## **CHEM 474 Advanced Biochemistry**

Dr. Kim K. Colvert  
ASC 3098 ex. 5851  
Home 592-1539

Office Hours MWF 9-9:50, W 2-2:50  
or by appointment

**Text:** "Biochemistry", Voet and Voet, 2nd edition, Wiley

### **Course Objectives.**

Survey courses in biochemistry lay a general framework of information and analytical skills. By building on this foundation this course will help students pursuing careers relating to biochemistry become more sophisticated in the evaluation and analysis of biochemical relationships. To this end the course will focus on advanced concepts in metabolism and will contain a significant literature review component. The major objectives will be:

- 1) To deepen specific understanding of anabolism and catabolism stressing regulation and interdependency of pathways.
- 2) To develop the ability to analyze and predict metabolic effects.
- 3) To increase awareness of biochemical literature.
- 4) To develop skills in the evaluation of published research.
- 5) To promote oral and written communication of scientific information.

### **Grading**

Grades in this course will be based on three class exams and a comprehensive final. The exams will be open book, open note, essay. Each exam is worth 100 pts. There will also be presentations of literature required from each student. A paper must be selected for presentation. The paper should be a single-topic, peer reviewed article (not a review paper) must be provided to the class and a copy provided to the instructor. The presentation will consist of a brief explanation of the point of the research, the techniques and the results. Critical evaluation is expected, discussion will take place. The whole class must participate. There will be three of these per student in this semester. In addition a subject paper is required. The paper must be at least ten single-spaced, Times-New Roman-12, equivalent pages long, and reference at least ten sources. Topics must be submitted and approved by January 30. Papers are due April 20. Only documented excused absences can be accommodated. Missing a classmate's presentation will result in a 25% reduction in your presentation grade. The exams will include questions from these presentations.

### **Cheating and Plagiarism**

Don't. First offense, zero for that assignment. Second offense, failure of the course.

| Lecture/Discussion Topics                                                                                                                         | Lecture periods (approx.) |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Biosynthesis of amino acids<br>The five families and histidine<br>Amino acid analogs                                                              | 3                         |
| Metabolic fate of amino acids<br>Review of catabolism and links to<br>catabolic paths<br>Synthesis of porphyrin, glutathione<br>Neurotransmitters | 4                         |
| Nucleotide metabolism<br>Anabolism, catabolism, regulation<br>Biosynthesis of nucleotide coenzymes                                                | 4                         |
| Biosynthesis of complex carbohydrates<br>Monosaccharides to polysaccharides<br>Bacterial cell walls<br>Glycoproteins, receptor mechanisms         | 4                         |
| Photosynthesis<br>Light reactions--photosystems and<br>chlorophyll<br>Dark reactions--CO <sub>2</sub> to sugars                                   | 2                         |
| Membranes<br>Fatty acid and phospholipid synthesis<br>Membrane assembly<br>Protein targeting                                                      | 4                         |
| Cholesterol metabolism<br>Cholesterol, lipoproteins, bile acids<br>steroid hormones, vitamin D                                                    | 2                         |
| Metabolism and hormone action                                                                                                                     | 2                         |

Exam Dates: 2/16, 3/30, 5/1  
Comprehensive Final Tuesday, May 5, 10:00

Biotechnology  
APRC 1998-1999

section 3 of 6



FRIDAYS

January 16

Dr. C

January 23

Open date

January 30

\_\_\_\_\_

February 6

\_\_\_\_\_

February 13

\_\_\_\_\_

February 20

\_\_\_\_\_

February 27

\_\_\_\_\_

March 13

Spring Break

March 20

\_\_\_\_\_

March 27

\_\_\_\_\_

April 3

\_\_\_\_\_

April 10

Easter Recess

April 17

\_\_\_\_\_

April 24

\_\_\_\_\_

**SECTION 12:**

**ENROLLMENT TRENDS**

## ENROLLMENT TRENDS

The following data on enrollment in the Biotechnology Program was obtained from the Office of Academic Affairs.

| 1993/4 | 1994/5 | 1995/6 | 1996/7 | 1997/8 |
|--------|--------|--------|--------|--------|
| 19     | 24     | 42     | 38     | 28     |

These figures do not include the relatively large number of students who enter Ferris as Pre-Pharmacy or Pre-Optometry students, who later decide to switch into Biotechnology, as their career plans become more firmly decided.

Enrollment in the program has been steadily growing since its inception. In recent years, as the program has become more widely advertised through workshops and related activities, students have begun to enroll at Ferris specifically for the purpose of entering this program. These students are usually better qualified than the average student. Fifty percent of biotechnology students are eligible for the Honors Program. Many hold major scholarships. Thus, in addition to increasing enrollment, we are witnessing an increase in the academic quality of students as well.

The decline in the enrollment from the high in 1995/6 to the present most likely reflects two temporary conditions. First, during the last two years the workshops for high school teachers and students and for community college teachers and students had to be suspended due to the renovation of the science building. These were a major advertisement for the program, and represent a significant contribution by our Department Head, and by various temporary faculty. These workshops will be resumed when the science building is completed. Specifically, the roof must be fixed before these can resume. Second, the absence of Drs. Colvert and Boogaard during these two years while they were on sabbatical leave may have contributed to the loss of students. Their return may serve to stabilize enrollment.

Full enrollment would be 48-56 students. We are slowly approaching this figure, and feel that the overall upward trend in enrollment indicates that we are succeeding in this effort.

**SECTION 13:**

**PROGRAM PRODUCTIVITY AND COSTS**

## ADMINISTRATIVE PROGRAM REVIEW

Program/Department: Biotechnology (Department of Biological Sciences)

Date Submitted: January 15, 1997

Dean: Sue Hammersmith

Please provide the following information:

### Enrollment/Personnel

|                                | Fall 1992 | Fall 1993 | Fall 1994 | Fall 1995 | Fall 1996 |
|--------------------------------|-----------|-----------|-----------|-----------|-----------|
| Tenure Track FTE               |           | 1.57      | 1.57      | 1.57      | 1.57      |
| Overload/Supplemental FTEF     |           | .50       | .50       | 1.00      | 1.13      |
| Adjunct/Clinical FTEF (unpaid) |           |           |           |           |           |
| Enrollment on-campus total*    | 14        | 19        | 24        | 42        | 38        |
| Freshman                       |           | 5         | 8         | 9         | 12        |
| Sophomore                      |           | 2         | 2         | 9         | 10        |
| Junior                         |           | 2         | 3         | 12        | 9         |
| Senior                         |           | 10        | 11        | 12        | 7         |
| Masters                        |           |           |           |           |           |
| Doctoral                       |           |           |           |           |           |
| Enrollment off-campus*         |           |           |           |           |           |

\* Use official count (7-day count for semesters, 5-day count for quarters).

### Financial

| Expenditures     | FY 92  | FY 93  | FY 94  | FY 95  | FY 96  |
|------------------|--------|--------|--------|--------|--------|
| Supply & Expense | 12,936 | 12,936 | 12,936 | 12,936 | 12,941 |
| Equipment        | N/A    | N/A    | N/A    | N/A    | N/A    |
| Gifts & Grants   | N/A    | N/A    | N/A    | N/A    | N/A    |

\* Use end of fiscal year expenditures.

### Other

|                                      | AY 91-92 | AY 92-93 | AY 93-94 | AY 94-95 | AY 95-96 |
|--------------------------------------|----------|----------|----------|----------|----------|
| Number of Graduates* - Total         | 3        | 1        | 10       | 11       | 12       |
| - On campus                          | 3        | 1        | 10       | 11       | 12       |
| - Off campus                         |          |          |          |          |          |
| Placement of Graduates               | 3        | 1        | 10       | 9        | 12       |
| Average Salary                       |          |          | \$27,000 | \$29,000 | \$31,000 |
| Productivity - Academic Year Average |          |          |          |          |          |
| - Summer                             |          |          |          |          |          |
| Summer Enrollment                    |          |          |          |          |          |

\* Use total for academic year (F, W, S)

JAN 21 1997

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## **BIOTECHNOLOGY**

### **I. Strengths**

- Successful placement of graduates (100%).
- Initial earnings of graduates (\$31,000/yr.).
- Quality of instruction and extensive "hands-on" laboratory experience.
- Recently renovated laboratories and start-of-the-art instrumentation.
- An active advisory board that ensures a curriculum that reflects that changing needs of the biotechnology industry.
- Strong and expanding ties with the Michigan biotechnology industry, including internships sites.
- Program holds unique "market niche" (very few undergraduate, lab-intensive programs in U.S.).
- There is a high demand for trained lab personnel at the B.S. level as biotechnology industry shifts from research to production.
- Growing public awareness of biotechnology (e.g., awareness of this as a career field, its impact on human health, and FSU's program).
- Growing interest among Michigan high schools to have Ferris offer biotechnology workshops for teachers will help to promote public awareness as well as the recruitment of strong high school students.
- Curriculum is well integrated with existing CAS course work in chemistry, physics, and biological sciences; this promotes academic quality as well as cost-effectiveness.
- A number of new partnerships and 2+2 articulation agreements have been formed within the last 2 years.

### **II. Concerns**

- Lack of a standing equipment budget, for routine replacement and upgrading of equipment.
- This lab-intensive program needs a lab technician. A lab technician can provide logistical support more cost-effectively than can faculty.
- We need a modest amount of start-up funding to establish new internship sites.
- The department needs to continue to actively recruit for and publicize the program.
- Our students have limited economic resources (e.g., for the internship semester); consequently, internship scholarship dollars are needed.

## **BIOTECHNOLOGY (cont.)**

### **III. Future Goals**

- To establish an endowment to provide tuition scholarships for students on internships (endowed internships).
- To increase number of 2+2 articulation agreements with Michigan community colleges. *(Fall 1997)*
- After renovation project is completed, resume holding biotechnology workshops for high school and community college science teachers to enhance program visibility and recruitment. *(Fall 1997)*
- To design a biotechnology home page describing program and career potential. *(Fall 1997)*
- Finalize internship partnership with Michigan Biotechnology Institute. *(Winter 1998)*
- Host a Science Building open house. *(Fall 1997)*

### **IV. Recommendations**

- Continue and enhance this program to prepare for future expansion.
- Cultivate additional industrial sponsors.
- Establish endowment for internship tuition scholarships.
- Establish an annual equipment/maintenance budget.

**SECTION 14:**

**CONCLUSIONS**



## Summary of Major Conclusions

1. The FSU Biotechnology Program is an academically and technologically very strong program, which is run at average expense. It is an example *par excellence* of the Role and Mission of Ferris State University as a leader in technological education in the context of a liberal arts institution.

2. All groups surveyed rated the program as exemplary or favorable. We believe this reflects the quality of teaching and the program design. The program is taught by qualified professionals, most of whom have earned the PhD in their disciplines. Only 4 of the 94 science credits required for graduation are taught by part-time faculty, who do not have a PhD. Those 4 credits represent 2 laboratory-only classes. The program is administered effectively and inexpensively, by a program coordinator with 1/3 released time.

3. The labor market analysis and the employer survey indicate that there are ample jobs available for students who are well-trained in laboratory procedures and skills. In some weeks, over 100 BS-level positions are advertised in a single issue of *Science*. We routinely receive requests for interns and entry-level personnel, from as far away as the Mayo Clinic, and Amgen in California, as well as from here in Michigan. Our 90% placement rate reflects the job availability and the need for laboratory trained personnel. The program is unique in its exceptional laboratory training. This level of training is rarely found at undergraduate institutions. Entry-level positions at major biotechnology firms carry a salary of \$30,000 to \$35,000 per year. At smaller firms, starting salaries are in the twenties, but promotions are more frequent and stock options are added to the salary.

4. For reporting and responsibility purposes, in which department the physical facility (SCI 337/343) is located administratively needs to be identified. Similarly, financial responsibility for the repair of equipment used in Physical Sciences classes, which are offered for biotechnology program students, needs to be established.

5. Graduates, employers, students, and advisors report that an increased training in computer usage is needed. While this has been partly addressed (some of the comments pre-date the last curriculum review), this issue must be re-examined for ways to increase computer use. There is a lack of support for Mac use on campus, which hinders the institution of such use in the program. The advisory committee will monitor the need for the use of Mac computers and the usage of computers in the program.

6. Graduates have indicated that their oral and written communications skills need improvement. However, their employers rate them as above average in these areas. The advisory committee should consider ways in which communication skills can be enhanced. The substitution of ENGL 321 for Science majors for the current requirement of ENGL 311 (technical writing), and the substitution of COMM 121 for COMM 105 should be addressed again. At its last meeting in December of 1997, the External Advisory Committee considered these issues, and voted unanimously to retain the present curriculum.

7. Enrollment in the program has been low since its inception. Advertising a poor or inadequate product serves only to establish a poor reputation. For this reason, recruiting and advertising of the program was not a priority in its beginning years, when major effort had to be placed on developing the quality of the program. Now that this pre-requisite has been accomplished, the program is ready for enhancement. Enrollment is slowly increasing, but needs to increase further, to hold a full class (15 students) each year. The program is not well advertised enough to be highly visible yet. Articulation agreements with community colleges will help, as well as a newly developed home page on the world wide web. Workshops will be re-instituted next year.

8. Students indicate that Career Placement Services does not meet the needs of the students. However, since 90% of graduates find placement in the field, this problem does not seem to hinder the success of the graduates. The advisory committee will monitor this issue.

9. The Biology Department faculty perceive themselves as supporting the program, but some of the faculty would like more information about the program. The program coordinator is willing to make periodic reports on the program at department meetings.

**SECTION 15:**

**RECOMMENDATIONS**

## **Recommendations**

Our major recommendation is that the program receive increased visibility to enhance enrollment. The program has evolved since its inception. The program is now of sufficient quality that increased visibility will not result in a bad reputation for us. The program should be limited to 16 students per class, since lab facilities and faculty restrictions prohibit larger classes. Beyond this number, the program would lose precisely that in-depth, hands-on training which currently makes it unique. We would like to see enrollment stabilize. Ferris State University has on staff several educational counselors, recruiters, and university marketers. We recommend that Ferris market this program more aggressively. The following are activities that we ourselves have undertaken in the past: visitation of honors program groups and first year biology and chemistry classes; presentations to FSUS classes; tours of the facilities for high school and community college groups; and workshops for high school and community college groups. Some of these activities can be re-instituted.

We recommend that the internal advisory committee continue to re-examine the curriculum on an on-going basis, with no further major revisions, but with continued monitoring of the need for computer use by students. The committee should continue to evaluate the substitutions of COMM 121 for COMM 105, and the possible substitution of ENGL 321 for Science majors for ENGL 311. The external advisory committee should continue to be active in offering recommendations for changes needed by the industry.

We recommend that faculty be encouraged and well-supported in professional development activities. Students and employers see the expertise of the faculty as central to the quality of the degree. A financial commitment is needed on the part of the administration to maintain this strength.

**SECTION 16:**

**APPENDIX**

Appendix I

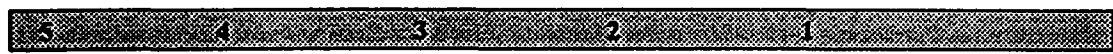
PROGRAM REVIEW PANEL EVALUATION

Program: BIOTECHNOLOGY

Instructions: Circle the number which most closely describes the program you are evaluating.

1. Student Perception of Instruction

Average Score 4.5



Currently enrolled students rate instructional effectiveness as extremely high.

Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program

Average Score 4.8



Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.

Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program

Average Score 4.4



Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.

Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates

Average Score 4.2



Graduates easily find employment in field.

Graduates are sometimes forced to find positions out of their field.

5. Use of Information on Labor Market

Average Score 4.4



The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop and evaluate the program.

The faculty and administrators do not use labor market data in planning or evaluating the program.

6. Use of Profession/Industry Standards

Average Score 4.6



Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

7. Use of Student Follow-up Information

Average Score 4.6



Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

8. Relevance of Supportive Courses

Average Score 4.4



Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students.

Supportive course content reflects no planned approach to meeting needs of students in this program.

9. Qualifications of Administrators and Supervisors

Average Score 4.6



All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing

Average Score 4.4



Instructional staffing for this program is sufficient to permit optimum program effectiveness.

Staffing is inadequate to meet the needs of this program effectively.

11. Facilities

Average Score 4.2



Present facilities are sufficient to support a high quality program.

Present facilities are a major problem for program quality.

12. Scheduling of Instructional Facilities

Average Score 4.8



Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction.

Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment

Average Score 4.2



Present equipment is sufficient to support a high quality program.

Present equipment is not adequate and represents a threat to program quality.

14. Adaption of Instruction

Average Score 3.8



Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as, small group or individualized instruction, laboratory or "hands on" experiences, credit by examination).

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies

Average Score 4.0

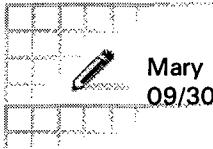


Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction.

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs.



BIOTECH



Mary R Murnik  
09/30/98 08:38 AM

To: Douglas Haneline/FSU@Ferris  
cc:  
Subject: biotech

I just looked again at Mitchell's load information. The note with his winter load is strongly related to their complaints about having no lab prep person (yet they did not list a request for one in their recommendations).

Could we revisit this aspect? Perhaps we could recommend that a staff person be trained (or hired) to assist in biotech lab prep, or that Mitchell receive adequate load credit to reflect the considerable preparation work which is necessary because there is to technical support.

Thanks. Mary

| ROGER MITCHELL FACULTY LOAD FALL 98                  |         |         |           |         | 8/14/98 16:26 |         |        |        |                                      |         |             |  |
|------------------------------------------------------|---------|---------|-----------|---------|---------------|---------|--------|--------|--------------------------------------|---------|-------------|--|
| COURSE                                               | LEC HRS | LEC PTS | # LABS    | HRS/LAB | LAB HRS       | LAB PTS | CR HRS | ENROLL | SCH                                  | RELEASE | GRAND TOTAL |  |
| BIOL 113                                             | 2       | 4       | 1         | 3       | 3             | 4       | 3      | 21     | 63                                   |         |             |  |
| BIOL 121                                             | 3       | 7       | 0         | 0       | 0             | 0       | 3      | 72     | 216                                  |         |             |  |
| BIOL 121                                             |         | 0       | 3         | 3       | 9             | 12      | 1      | 72     | 72                                   |         |             |  |
|                                                      |         |         |           |         |               |         |        |        | 351                                  |         |             |  |
| TOTALS                                               |         | 11      |           |         |               | 16      |        |        | 5                                    |         | 32          |  |
| OVERLOAD COURSE - Points to be applied to Winter '99 |         |         |           |         |               |         |        |        |                                      |         |             |  |
|                                                      |         |         | # LEC HRS |         |               |         |        |        |                                      |         |             |  |
|                                                      |         |         | 0         |         | \$0.00        |         |        |        |                                      |         |             |  |
|                                                      |         |         | # LAB HRS |         |               |         |        |        |                                      |         |             |  |
|                                                      |         |         |           |         | \$0.00        |         |        |        |                                      |         |             |  |
|                                                      |         |         | TOTAL \$  |         | \$0.00        |         |        |        |                                      |         |             |  |
|                                                      |         |         |           |         |               |         |        |        |                                      |         |             |  |
|                                                      |         |         |           |         |               |         |        |        | OVERLOAD POINTS                      |         | 5           |  |
|                                                      |         |         |           |         |               |         |        |        | (Points to be applied to Winter '99) |         |             |  |
|                                                      |         |         |           |         |               |         |        |        | LOAD REMAINING                       |         | 27          |  |
| load.xls                                             |         |         |           |         |               |         |        |        |                                      |         |             |  |

*As a recent hire, Dr. Mitchell is required to carry out research. This is not reflected in his workload, and he receives no remuneration for this. In addition, please see over.*

| ROGER MITCHELL FACULTY LOAD WINTER 99 |         |         |           |         | 6/24/98 10:46 | DRAFT   |        |        |                 |         |             |
|---------------------------------------|---------|---------|-----------|---------|---------------|---------|--------|--------|-----------------|---------|-------------|
| COURSE                                | LEC HRS | LEC PTS | # LABS    | HRS/LAB | LAB HRS       | LAB PTS | CR HRS | ENROLL | SCH             | RELEASE | GRAND TOTAL |
| BIOL 122                              | 3       | 6       | 0         |         | 0             | 0       | 3      | 96     | 288             |         |             |
| Overload transferred from fall        |         |         |           |         | 0             | 4       |        |        | 0               |         |             |
| BIOL 471                              | 1       | 3       | 2         | 4       | 8             | 10      | 3      | 15     | 45              |         |             |
|                                       |         |         |           |         |               |         |        |        | 333             |         |             |
| TOTALS                                |         | 9       |           |         |               | 14      |        |        | 5               |         | 28          |
| OVERLOAD COURSE                       |         |         |           |         |               |         |        |        |                 |         |             |
|                                       |         |         | # LEC HRS |         |               |         |        |        |                 |         |             |
|                                       |         |         | 0         |         | \$0.00        |         |        |        |                 |         |             |
|                                       |         |         | # LAB HRS |         |               |         |        |        |                 |         |             |
|                                       |         |         |           |         | \$0.00        |         |        |        |                 |         |             |
|                                       |         |         | TOTAL \$  |         | \$0.00        |         |        |        |                 |         |             |
|                                       |         |         |           |         |               |         |        |        | OVERLOAD POINTS |         | 0           |
|                                       |         |         |           |         |               |         |        |        | LOAD REMAINING  |         | 28          |
| load.xls                              |         |         |           |         |               |         |        |        |                 |         |             |

***Dr. Mitchell teaches the Recombinant DNA lab. This advanced lab requires 10 to 12 hours per week of preparation. This does not reflect the time he needs to prepare himself to teach the lab. This is the time required to prepare the lab itself: ensure equipment is working, chemicals are available and sufficient, solutions are made, etc. He receives no released time for this, and no remuneration.***

1F5 Faculty Teaching Schedule

Colvert, Kim Katherine

Screen: \_\_\_ Faculty ID: 557043058 Course: \_\_\_\_\_ Term: 97F

| Section      | S Act Days | Time      | Room    | Col Dept | Cont Hrs | Pct. Load | Enr | OV LG |
|--------------|------------|-----------|---------|----------|----------|-----------|-----|-------|
| BIOL-473-211 | LEC W      | 0900-0950 | SCI 337 | A/S BIOL | 1.0      | 100       | 5   |       |
|              | LAB W      | 1000-0150 | SCI 337 |          | 8.0      | 100       |     |       |
|              | W          | 0200-0550 | SCI 337 |          |          |           |     |       |
| CHEM-332-211 | LEC R      | 1200-1250 | SCI 111 | A/S PHYS | 1.0      | 100       | 8   |       |
|              | LAB F      | 1200-0350 | SCI 337 |          | 4.0      | 100       |     | *     |
| CHEM-364-001 | LEC MTRF   | 0800-0850 | STR 233 | A/S PHYS | 4.0      | 100       | 40  |       |

Total 53

4-© 1 Sess-1 NET3270 N03C 4/10

1F5 Faculty Teaching Schedule

Colvert, Kim Katherine

Screen: \_\_\_ Faculty ID: 557043058 Course: \_\_\_\_\_ Term: 98W

| Section      | S Act Days | Time      | Room    | Col Dept | Cont Hrs | Pct. Load | Enr | OV LG |
|--------------|------------|-----------|---------|----------|----------|-----------|-----|-------|
| CHEM-324-001 | LEC MWF    | 0800-0850 | STR 233 | A/S PHYS | 3.0      | 100       | 34  |       |
| CHEM-333-211 | LEC W      | 0100-0150 | SCI 336 | A/S PHYS | 1.0      | 100       | 9   |       |
|              | LAB R      | 1200-0350 | SCI 337 |          | 4.0      | 100       |     |       |
| CHEM-474-001 | LEC MWF    | 1000-1050 | SCI 117 | A/S PHYS | 3.0      | 100       | 5   |       |

1F5 Faculty Teaching Schedule

Colvert, Kim Katherine

Screen: \_\_\_ Faculty ID: 557043058 Course: \_\_\_\_\_ Term: 99W

| Section      | S Act Days | Time      | Room    | Col Dept | Cont Hrs | Pct. Load | Enr | OV LG |
|--------------|------------|-----------|---------|----------|----------|-----------|-----|-------|
| CHEM-104-211 | LEC MWF    | 0800-0850 | STR 233 | A/S PHYS | 3.0      | 100       | 0   |       |
|              | LAB M      | 0300-0450 | SCI 314 |          | 2.0      | 100       |     |       |
| CHEM-104-212 | LEC MWF    | 0800-0850 | STR 233 | A/S PHYS | 3.0      | 100       | 0   |       |
|              | LAB F      | 0100-0250 | SCI 314 |          | 2.0      | 100       |     |       |
| CHEM-333-211 | LEC W      | 0100-0150 | SCI 336 | A/S PHYS | 1.0      | 100       | 0   |       |
|              | LAB R      | 1200-0350 | SCI 337 |          | 4.0      | 100       |     |       |
| CHEM-474-001 | LEC MWF    | 1000-1050 | SCI 117 | A/S PHYS | 3.0      | 100       | 0   |       |

Total 0

4-© 1 Sess-1 NET3273 N30A 4/10

**BIOTECHNOLOGY**  
**FERRIS STATE UNIVERSITY**  
**College of Arts and Sciences**  
**Bachelor of Science Degree**  
**(130 credit hour minimum)**

**I. GENERAL EDUCATION REQUIREMENTS**

**A. COMMUNICATION COMPETENCE 12 Sem Credits**

| Course       | Grade | Credits |
|--------------|-------|---------|
| ENGL 150     |       | 3       |
| ENGL 250     |       | 3       |
| ENGL 311     |       | 3       |
| COMM 105     |       | 3       |
| <b>TOTAL</b> |       |         |

**B. SCIENTIFIC UNDERSTANDING 8 Sem Credits**

Two courses from the following (one must be a lab): ASTR, \*BIOL, CHEM, GEOG 111 or GEOG 121, GEOL, PHSC, PHYS, \*BIOL 121 and BIOL 122 are required for biotechnology.

| Course       | Grade | Credit |
|--------------|-------|--------|
| *BIOL 121    |       | 4      |
| *BIOL 122    |       | 4      |
| <b>TOTAL</b> |       |        |

**C. QUANTITATIVE SKILLS 6 Sem Credits**

| Course            | Grade | Credit |
|-------------------|-------|--------|
| MATH 130 required |       | 4      |
| MATH 250 required |       | 2      |
| <b>TOTAL</b>      |       |        |

**D. CULTURAL ENRICHMENT 9 Sem Credits**

Select from the following: ARCH 244, ARTH, ARTS, COMM 231, ENGL 322, FREN, GERM, HIST, HUMN, LITR, MUSI, SPAN, THTR. Requirements: 1) one course must be 200+ level. 2) maximum 5 credit hours of music and/or theater activities may apply. 3) one course from D or E must fulfill global consciousness.

| Course       | Grade | Credits |
|--------------|-------|---------|
| 200+ level   |       |         |
|              |       |         |
|              |       |         |
|              |       |         |
| <b>TOTAL</b> |       |         |

**E. SOCIAL AWARENESS 9 Sem Credits**

Select from the following: ANTH, ECON, GEOG (except GEOG 111 or GEOG 121), PLSC, PSYC, SOCY, SSCI. Requirements: 1) two different subject areas including at least one "foundation" course. 2) one 300+ level course. 3) one course from E must fulfill race, ethnicity, and/or gender issues requirement.

| Course       | Grade | Credits |
|--------------|-------|---------|
| Foundation   |       |         |
| 300+ level   |       |         |
|              |       |         |
|              |       |         |
|              |       |         |
| <b>TOTAL</b> |       |         |

**II. BIOTECHNOLOGY MAJOR PROGRAM REQUIREMENTS 3-6 Sem Credits**

Choose one of the following:

| Course       | Grade | Credits |
|--------------|-------|---------|
| *BIOL 491    |       |         |
| *BIOL 496    |       |         |
| *CHEM 497    |       |         |
| *PHSV 496    |       |         |
| <b>TOTAL</b> |       |         |

**III. DESIGNATED ARTS AND SCIENCES COURSE WORK FOR BIOTECHNOLOGY 83 Sem Credits**

| Course       | Grade | Credits |
|--------------|-------|---------|
| BIOL 231     |       | 4       |
| BIOL 232     |       | 4       |
| BIOL 370     |       | 4       |
| BIOL 375     |       | 3       |
| BIOL 379     |       | 2       |
| BIOL 386     |       | 5       |
| BIOL 388     |       | 2       |
| BIOL 470     |       | 4       |
| BIOL 471     |       | 3       |
| BIOL 472     |       | 3       |
| BIOL 473     |       | 3       |
| BIOL 474     |       | 3       |
| CHEM 121     |       | 5       |
| CHEM 122     |       | 5       |
| CHEM 221     |       | 5       |
| CHEM 222     |       | 5       |
| CHEM 231     |       | 4       |
| CHEM 332     |       | 2       |
| CHEM 333     |       | 2       |
| CHEM 364     |       | 4       |
| CHEM 474     |       | 3       |
| PHYS 211     |       | 4       |
| PHYS 212     |       | 4       |
| <b>TOTAL</b> |       |         |

**IV. ELECTIVES**

| Course       | Grade | Credits |
|--------------|-------|---------|
|              |       |         |
|              |       |         |
|              |       |         |
|              |       |         |
|              |       |         |
| <b>TOTAL</b> |       |         |

\* - No grade lower than C- allowed for graduation.

## BOOGAARD, CONNIE: WORKLOAD, 1997-98

Fall, 1997:

|                                                       | Workload Pts |
|-------------------------------------------------------|--------------|
| Teaching responsibilities:                            |              |
| BIOL 108: 1 section of lab, 2 x/week                  | 5            |
| BIOL 474: 3 hours of lecture                          | 6            |
| BIOL 274: 1 hour of lecture (transferred from winter) | 3            |
| Student Credit Hours                                  | 3            |
| Released for Program Coordination (see below)         | 10           |
| <b>Total</b>                                          | <b>27</b>    |

Winter, 1998

|                                                     |           |
|-----------------------------------------------------|-----------|
| Teaching responsibilities:                          |           |
| BIOL 472: 3 hours lecture/week                      | 6         |
| BIOL 474: 4 hours lecture/week                      | 9         |
| BIOL 274: 1 hour lecture/week (transferred to fall) | 0         |
| Student Credit Hours                                | 3         |
| Released for Program Coordination (see below)       | 9         |
| <b>Total</b>                                        | <b>27</b> |

### Program Coordinator Duties Include:

#### Program Administration:

- \* Write the Program Role and Mission Statement.
- \* Prepare the Program Outcomes Assessment Plan: Design outcomes assessment materials: define course objectives relative to the program objectives as stated in the Role and Mission statement, for each course and for the program as a whole; compile records of objectives, outcomes and assessment tools for each course and for the program as a whole; identify which departmental objectives and which general education objectives were met by which biotechnology courses.
- \* Contribute to the Strategic Action Plan for the Program, by providing information on goals, objectives, and assessment tools for the program to the department head.
- \* Prepare the Program Annual Report.
- \* Chair the Program Review Panel and write the Program Review.
- \* NCA accreditation: provide specific course objectives and student learning outcomes to the NCA Criterion III Committee on Institutional Effectiveness; provide information on program resources to the NCA Criterion II Subcommittee; provide information on program funding and support to the NCA Criterion II Subcommittee; prepare a file of publications I distribute to communicate with students and other interested persons about the biotechnology program (this file was requested by the NCA Office).

Continued...

- \* Write the Program Policy Statement on General Education Requirements.
- \* Chair the External Advisory Committee and the Internal Advisory Committee.
- \* Chair the remodeling committee for biotechnology program labs.
- \* Arrange new members of the External Advisory Committee.
- \* Arrange adjunct faculty appointments.
- \* Arrange field trips for students.
- \* Provide information on the biotechnology industry to the Placement Office.
- \* Provide the administration with a list of program benefactors in industry.
- \* Course scheduling.
- \* Ordering and budget accounting.
- \* Write budget projections.
- \* Screen applicants for entry into the program; clear seniors for graduation.
- \* Nominate students for *Who's Who in American Colleges and Universities* and the Outstanding Student Award; allocate the Dean's Ability-Based Scholarships; attend the Awards Banquet.
- \* Assist students with resume, abstract, and cover letter writing, applying for graduate schools and for jobs and internships.
- \* Provide transfer equivalencies.
- \* Maintain records of all graduates of the program, their internship sites, first jobs, and current jobs.
- \* Maintain writing samples of program students and internship abstracts of graduates.
- \* Curriculum revision: I prepared a 19-page Biotechnology Program Curriculum Revision Proposal to institute changes in the curriculum requested by industry and approved by the Advisory Committees; consulted with various departments involved; re-wrote the checksheets, the graduation clearance forms; the curriculum information handouts, and the program descriptions in the university catalog and brochures to reflect these changes. Revise community college curriculum articulation agreements accordingly. Curriculum revision is on-going and continuous.
- \* Arrange interviews of internship nominees (several industries prefer to come here to do this) and mutually select awardees.
- \* Correct graduation clearance forms to all-semester format.
- \* Prepare the Program Information Form for the Academic Affairs Office.
- \* Design semester curricula for the Biotechnology Program; design the Course Completion Agreement forms; revise the checklists for the new semester curriculum, and write new catalogue course descriptions.
- \* Meet with industry representatives: coordinate visits to this campus to present seminars, interview internship applicants, and to attend the External Advisory Committee meeting.

#### **Laboratory maintenance:**

- \* Equipment repair (example: installation of a special water supply line and a 220 voltage outlet; repair of the centrifuge, and the biohazard hood)
- \* Installation of new equipment.

- \* Provide lists of equipment needs and price quotes for new items from several vendors to Dr. Jim Hoerter, Department Head.
- \* Dispose of the scintillation counter.
- \* I de-commissioned the biotech lab, so that it is no longer designated a low-level radiation facility.

**Internship Enhancement:** (I have no released time for these activities.)

- \* I compiled a file of over 500 possible internship sites nationwide for students to apply for, including sites with the NSF, NIH, HHMI, National Laboratories, and several universities.
- \* I prepared a file of Michigan Biotechnology Industries, and sent packages of information about the program to these, and provided this list to the Placement Office for invitations to the Job Fair.
- \* I prepared fliers on the program, and sent these to biotechnology industries in the area.
- \* I assisted students in preparing presentations to the Argonne National lab undergraduate research conference.
- \* I interact with industry to arrange for internship appointments.

**Recruitment and retention activities:** (I have no released time for these activities.)

- \* Prepare packages of information on the program for community colleges: I prepared a 13-page package of information for community colleges.
- \* Provide tours of the facilities, and program information for visiting high school and community college groups.
- \* Present program information at Career Focus.
- \* Arrange seminars featuring speakers from industry and from other academic institutions.
- \* Write and update the Program Website. (This involves legal counsel.)
- \* Make presentations to Biotechnology Workshops.
- \* Edit new brochures and program checksheets.
- \* Spend innumerable hours discussing the program with students from on or off-campus.
- \* Arranged information transfer to University Advancement regarding internship awards, etc.
- \* Update the Biotechnology Program entry in the National Biotechnology Register.
- \* Coordinate Autumn Adventure.
- \* Offer freshman and sophomore information sessions throughout the year.
- \* Write new letters for interested students and admitted students.
- \* Write program descriptions for Ferris Career Guide.
- \* Write checksheets for transfer students.
- \* Set up early advising for freshman students (prior to official start of classes).
- \* Set up Biotechnology Mentoring Program for freshman and sophomore students.
- \* Interact with students from other schools to coordinate classes and provide equivalencies.



| CONNIE BOOGAARD FACULTY LOAD WINTER 98 |         |         |           | 1/16/98 8:50 |         |         |        |        |                 |         |             |
|----------------------------------------|---------|---------|-----------|--------------|---------|---------|--------|--------|-----------------|---------|-------------|
| COURSE                                 | LEC HRS | LEC PTS | # LABS    | HRS/LAB      | LAB HRS | LAB PTS | CR HRS | ENROLL | SCH             | RELEASE | GRAND TOTAL |
| BIOL 472                               | 3       | 6       | 0         | 0            | 0       | 0       | 3      | 8      | 24              |         |             |
| BIOL 470                               | 4       | 9       | 0         | 0            | 0       | 0       | 4      | 4      | 16              |         |             |
| BIOL 274                               |         |         |           |              |         | 0       |        | 5      | 0               |         |             |
| (Transferred to Fall)                  |         |         |           |              |         |         |        |        | 40              |         |             |
| TOTALS                                 |         | 15      |           |              |         | 0       |        | 3      | 9               | 27      |             |
| OVERLOAD COURSE                        |         |         |           |              |         |         |        |        |                 |         |             |
|                                        |         |         | # LEC HRS |              |         |         |        |        |                 |         |             |
| XXXX XXX XXX                           |         |         |           |              | \$0.00  |         |        |        |                 |         |             |
|                                        |         |         | # LAB HRS |              |         |         |        |        |                 |         |             |
| XXXX XXX                               |         |         |           |              | \$0.00  |         |        |        |                 |         |             |
|                                        |         |         | TOTAL \$  |              | \$0.00  |         |        |        |                 |         |             |
|                                        |         |         |           |              |         |         |        |        | OVERLOAD POINTS |         |             |
|                                        |         |         |           |              |         |         |        |        | LOAD REMAINING  |         | 27          |
| load.xls                               |         |         |           |              |         |         |        |        |                 |         |             |

| CONNIE BOOGAARD FACULTY LOAD FALL 97 - DRAFT - REVISED |         |         |           |         |         |         |        |        |     |         |             |
|--------------------------------------------------------|---------|---------|-----------|---------|---------|---------|--------|--------|-----|---------|-------------|
| COURSE                                                 | LEC HRS | LEC PTS | # LABS    | HRS/LAB | LAB HRS | LAB PTS | CR HRS | ENROLL | SCH | RELEASE | GRAND TOTAL |
| BIOL 108                                               | 0       | 0       | 2         | 1.5     | 3       | 5       | 1      | 48     | 48  |         |             |
| BIOL 474                                               | 3       | 6       |           |         | 0       | 0       | 3      | 3      | 9   |         |             |
| BIOL 274                                               | 1       | 3       |           |         |         | 0       | 1      | 10     | 10  |         |             |
|                                                        |         |         |           |         |         |         |        |        | 67  |         |             |
| TOTALS                                                 |         | 9       |           |         |         | 5       |        |        | 3   | 10      | 27          |
| OVERLOAD COURSE                                        |         |         |           |         |         |         |        |        |     |         |             |
|                                                        |         |         | # LEC HRS |         |         |         |        |        |     |         |             |
| XXXX XXX XXX                                           |         |         |           |         | \$0.00  |         |        |        |     |         |             |
|                                                        |         |         | # LAB HRS |         |         |         |        |        |     |         |             |
| XXXX XXX                                               |         |         |           |         | \$0.00  |         |        |        |     |         |             |
|                                                        |         |         | TOTAL \$  |         | \$0.00  |         |        |        |     |         |             |
| OVERLOAD POINTS                                        |         |         |           |         |         |         |        |        |     |         |             |
| LOAD REMAINING                                         |         |         |           |         |         |         |        |        |     |         |             |
|                                                        |         |         |           |         |         |         |        |        |     |         | 27          |
| load.xls                                               |         |         |           |         |         |         |        |        |     |         |             |

## CONNIE BOOGAARD

Biotechnology Program Coordinator  
Biology Department  
Ferris State University  
820 Campus Dr., ASC 2004  
Big Rapids, MI 49307  
(616) 592-2544

**PROFESSIONAL OBJECTIVES:** Provide quality teaching in both lecture and laboratory courses.  
Administer the Biotechnology Program.

**EDUCATION:** Diploma, Mittlestufe, Goethe Institute, Rothenburg odT, Germany, 1969

B.A. (Honors, Biology), California State University, Fullerton, 1970

M.Sc. (First Class, Zoology), University of British Columbia, 1975 Thesis: "The Effects of Estradiol and Progesterone on the Growth and Differentiation of the Quail Oviduct"; Dr. Cyril Finnegan, advisor.

Ph.D. (Biochemistry), Division of Medical Biochemistry, University of Calgary, Alberta, 1982. Thesis: "Vesicle-Mediated Microinjection of Protamine Messenger RNA into HeLa Cells"; Dr. Gordon H. Dixon, advisor.

**EXPERIENCE:**

|                               |                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------|
| September, 1990-present:      | Associate Professor, and Biotechnology Program Coordinator Biology Department, Ferris State University.   |
| June -August 1991 and 1992    | Research Collaborator in the laboratory of Dr. Fred Stevens Argonne National Lab, Argonne, IL.,           |
| September 1987-September 1990 | Assistant Professor and Biotechnology Program Coordinator, Biology Department, Ferris State University    |
| September 1986-September 1987 | Visiting Fellow in the Cell and Molecular Biology Laboratory, Biotechnology Division, Agriculture Canada. |
| September 1983-June 1986      | Instructor, Chemistry Department, Division of Biochemistry, University of Calgary, Calgary, Alberta       |

**HONORS AND ORGANIZATIONS** NSERC Visiting Fellowship; Animal Research Center, Ottawa, Ontario. 1986-7  
Alberta Medical Research Studentship, University of Calgary, Alberta. 1981-2  
Medical Research Council Studentship, University of Calgary, Alberta. 1977-81  
Isaac Walton Killam Memorial Fellowship, University of Calgary, Alberta. 1977-79  
Career Development Award from British Columbia Provincial Government. 1975  
University Fellowship, University of British Columbia, Vancouver, Canada. 1973-75  
Participant, International Students Program, California State University. 1968-69  
American Cell Biology Society  
American Association for the Advancement of Science  
Sigma Xi Scientific Research Society

**TEACHING PHILOSOPHY AND TEACHING EXPERIENCE:**

We as human beings have an inherent desire to understand and find order in the world around us. Teaching is the facilitation of that goal. My goal as a teacher is to help the student to learn more than he would learn on his own. Teaching is most rewarding when the "light dawns" on students, and they understand for the first time something which has been puzzling them. Those moments when everything seems to break open, and the classroom is suddenly flooded with questions, as if a dam were breaking in the students minds, keep me in the business of teaching.

The vision behind the creation of the laboratory-intensive Biotechnology Program was the need, here and nation-wide, for a systematic organization of undergraduate laboratory instruction. This program has achieved that goal. Material is organized in such a way that students progress smoothly from individual techniques in prepped laboratories, to individual experiments in unprepped laboratories, through combinations of techniques in partial-projects laboratory courses, to advanced projects and ultimately to independent research projects.

In my own area of specialization (cell and molecular biology), the greatest difficulty encountered by students is in relating each detail to the whole picture. This is not surprising, since the details are chemical, whereas the larger picture is biological. Special care must be taken as an instructor, to ensure that this connection is made.

My teaching assignment at Ferris State currently includes Molecular Genetics, Proteins, Advanced Cell and Molecular Biology, Introduction to Biotechnology. I most enjoy teaching Molecular Genetics from Lewin (*Genes VI*), and Advanced Cell from Alberts *et al* (*Molecular Biology of The Cell*). I also very much enjoy teaching the first year general biology class. In the past I have also taught Recombinant DNA Lab, Proteins Lab, and Cell and Tissue Culture Lab.

My teaching assignment at the University of Calgary included Advanced Biochemical Techniques, Lipid Biochemistry, and Biochemistry Laboratory.

**PROGRAM ADMINISTRATION:**

As Coordinator of the Biotechnology Program, I receive twelve hours a week released time from teaching to carry out the following:

- \* Write the Program Role and Mission Statement.
- \* Prepare the Program Outcomes Assessment Plan: Design outcomes assessment materials: define course objectives relative to the program objectives as stated in the Role and Mission statement, for each course and for the program as a whole; compile records of objectives, outcomes and assessment tools for each course and for the program as a whole; identify which departmental objectives and which general education objectives were met by which biotechnology courses.
- \* Contribute to the Strategic Action Plan for the Program.
- \* Prepare the Program Annual Report.
- \* Chair the Program Review Panel and write the Program Review.
- \* NCA accreditation: provide specific course objectives and student learning outcomes to the NCA Criterion III Committee on Institutional Effectiveness; provide information on program resources to the NCA Criterion II Subcommittee; provide information on program funding and support to the NCA Criterion II Subcommittee.
- \* Write the Program Policy Statement on General Education Requirements.

- \* Chair the External Advisory Committee and the Internal Advisory Committee.
- \* Chair the remodeling committee for biotechnology program labs.
- \* Arrange new members of the External Advisory Committee.
- \* Arrange adjunct faculty appointments.
- \* Arrange field trips for students.
- \* Provide information on the biotechnology industry to the Placement Office.
- \* Provide the administration with a list of program benefactors in industry.
- \* Course scheduling.
- \* Ordering and budget accounting.
- \* Write budget projections.
- \* Screen applicants for entry into the program; clear seniors for graduation.
- \* Nominate students for *Who's Who in American Colleges and Universities* and the Outstanding Student Award; allocate the Dean's Ability-Based Scholarships; attend the Awards Banquet.
- \* Assist students with resume, abstract, and cover letter writing, applying for graduate schools and for jobs and internships.
- \* Provide transfer equivalencies.
- \* Maintain records of all graduates of the program, their internship sites, first jobs, and current jobs.
- \* Maintain writing samples of program students and internship abstracts of graduates.
- \* Curriculum revision: Prepare the 19-page Biotechnology Program Curriculum Revision Proposal to institute changes in the curriculum requested by industry and approved by the Advisory Committees; consulted with various departments involved; re-wrote the checksheets, the graduation clearance forms; the curriculum information handouts, and the program descriptions in the university catalog and brochures to reflect these changes. Revise community college curriculum articulation agreements accordingly. Curriculum revision is on-going and continuous.
- \* Arrange interviews of internship nominees (several industries prefer to come here to do this) and mutually select awardees.
- \* Prepare the Program Information Form for the Academic Affairs Office.
- \* Meet with industry representatives: coordinate visits to this campus to present seminars, interview internship applicants, and to attend the External Advisory Committee meeting.
- \* Equipment repair and installation of new equipment. Provide lists of equipment needs and price quotes for new items from several vendors to the Department Head. Dispose of unuseful items.

Recruitment and retention activities: (I have no released time for these activities.)

- \* Prepare packages of information on the program for community colleges: I prepared a 13-page package of information for community colleges.
- \* Provide tours of the facilities, and program information for visiting high school and community college groups.
- \* Present program information at Career Focus.
- \* Arrange seminars featuring speakers from industry and from other academic institutions.
- \* Write and update the Program Website. (This involves legal counsel.)
- \* Make presentations to Biotechnology Workshops.
- \* Edit new brochures and program checksheets.
- \* Spend innumerable hours discussing the program with students from on or off-campus.
- \* Arranged information transfer to University Advancement regarding internship awards, etc.
- \* Update the Biotechnology Program entry in the National Biotechnology Register.
- \* Coordinate Autumn Adventure.
- \* Offer freshman and sophomore information sessions throughout the year.
- \* Write new letters for interested students and admitted students.
- \* Write program descriptions for Ferris Career Guide.
- \* Write checksheets for transfer students.

- \* Set up Biotechnology Mentoring Program for freshman and sophomore students.
- \* Interact with students from other schools to coordinate classes and provide equivalencies.
- \* Prepare new form letters for freshman applicants and for junior and transfer level applicants, and sent packages of information to these prospective students.

Internship Enhancement: (I have no released time for these activities.)

- \* I compiled a file of over 500 possible internship sites nationwide for students to apply for, including sites with the NSF, NIH, HHMI, National Laboratories, and several universities.
- \* I prepared a file of Michigan Biotechnology Industries, and sent packages of information about the program to these, and provided this list to the Placement Office for invitations to the Job Fair.
- \* I prepared fliers on the program, and sent these to biotechnology industries in the area.
- \* I assisted students in preparing presentations to the Argonne National lab undergraduate research conference.
- \* I interact with industry to arrange for internship appointments.

#### STATEMENT OF RESEARCH INTERESTS:

My interest in carrying out research primarily centers on the use of research for teaching purposes. A research project should teach several techniques, the arranging of techniques into a logical sequence, the bridging of techniques, data acquisition, manipulation and interpretation, time management, record keeping, design of controls, and other relevant skills. In addition, it should have a high probability of success. Two examples of projects I am interested in establishing are: RFLP analysis of allelic variations at different loci both within a population and between species, and *in vitro* mutagenesis, followed by analysis of the mutant protein. The first project teaches DNA isolations, restrictions and electrophoresis, Southern transfers, basic cloning of probes, probe labelling, hybridizations, and detections. Through careful choice of loci (repeated sequences), the use of radioactivity can be avoided. The second project teaches *in vitro* mutagenesis, cloning, expression of the clone, protein isolations and enzymatic characterizations.

#### PUBLICATIONS:

C. Boogaard and G. H. Dixon, *Exp. Cell Res.* 143: 175-190 (1983). "Red Cell Ghost Mediated Microinjection of RNA into HeLa Cells. I. A Comparison of Two Techniques."

C. Boogaard and G. H. Dixon, *Exp. Cell Res.* 143: 191-205 (1983). "Red Cell Ghost-Mediated Microinjection of RNA into HeLa Cells. II. Cellular Translation of Protamine messenger RNA, Post-translational Modifications, and Nuclear Binding of Newly-Synthesized Protamine."

C. Boogaard and G. H. Dixon, *Can. Fed. Biol. Soc.* 24: 248 (1981). "Microinjection of Protamine messenger RNA into HeLa Cells."

C. Boogaard and C. V. Finnegan, *Can. J. Zool.* 54: 324-335 (1981). "The Effects of Estradiol and Progesterone on the Growth and Differentiation of the Quail Oviduct."

**RESEARCH PROJECTS:****THE EFFECT OF A VARIABLE FRAMEWORK REGION MUTATION, M4L, ON LEN  $\kappa$ IV LIGHT CHAIN DIMERIZATION, DENATURATION, AND CRYSTALLIZATION**

C. Boogaard, R. Raffin, and F. Stevens, Argonne National Lab, Argonne, IL (A sabbatical leave project).

Human monoclonal light chains are produced in overabundance as a consequence of multiple myeloma, and sometimes spill over into the urine as Bence-Jones proteins. The pathogenicity of these light chains varies widely, from non-pathogenic, to formation of casts in renal tubules, precipitates on basement membranes, crystals in renal tubules, or amyloid fibrils. The variation in formation of higher order structures must reflect in part the variance in the primary amino acid sequence. This study engineered a change in residue four, in variable framework region one on the Bence-Jones protein LEN, from methionine to leucine. This change has been shown to result in increased stability in other immunoglobulin light chains. The effect of the change on dimer formation, stability to denaturation, and crystallization was measured. Laboratory and computer simulated HPLC chromatography indicated that the mutant and the wild type have identical  $K_a$ 's for dimerization. Fluorescence measurements on denaturation with guanidine HCl indicate that the  $\Delta G$  for denaturation of the mutant is  $-0.99$  Kcal/mole less than the wild type. Crystal formation indicates that the wild type forms at least two types of crystals, whereas only one type of crystal was obtained with the mutant.

**THE EFFECTS OF NITRATE AND URANYL CHLORIDE ON THE GROWTH OF *THIOBACILLUS FERROOXIDANS* AND *E. COLI***

C. Boogaard, F. Stevens, and J. Trent, Argonne National Lab, Argonne, IL. (A sabbatical leave project).

*Thiobacillus ferrooxidans* is a gram-negative mesophilic obligate autotroph capable of oxidizing both reduced sulfur and iron compounds for energy. It is acidophilic, producing sulfuric acid, and tolerating a pH gradient of 5 units across the plasma membrane. It inhabits the waste water and drainage of mines, where it attracts notice by precipitating rust, which gives the area a reddish brown color. The strain used in this study was isolated from a uranium mine, and preliminary reports indicate that resistance may have developed to this toxic and radioactive metal. This study compared the resistance of *Thiobacillus ferrooxidans* and *E. coli* to ammonium nitrate and uranyl chloride. This study indicates that *Thiobacillus ferrooxidans* strain ATCC 33020 is not more resistant to uranium than bacterial species that do not inhabit mining habitats. We also demonstrate that *E. coli* is capable of tolerating higher levels of uranyl chloride than *Thiobacillus ferrooxidans*. However, the *E. coli* cells grew slower than normal, perhaps as a result of the need for DNA repair. They do not take up the uranyl ion, which is chelated by the citrate that is needed to keep it in solution at the pH of growth. The *Thiobacillus* grows at a pH where the uranyl ion is soluble, and therefore available for uptake. In addition, the uranyl ion may also be interacting with the electron transfers that take place in the oxidation of ferrous sulfate for energy. Therefore, the two cell types are interacting with very different forms of the uranyl ion, and in potentially different ways. Two-dimensional gel electrophoresis of the proteins present in the cells grown in the presence or absence of uranyl chloride indicates several differences between the two samples. Current efforts focus on the identifying the proteins the cells make in response to the uranyl ion.

A comparison of solution phase (HPLC) and solid phase (ELISA) competitive monoclonal antibody binding assays to the antigen Pertussis Toxin, with the purpose of mapping the antigenic determinants of the toxin. This research project was carried out with Dr. Fred Stevens, Biomedical Research Division, Argonne National Laboratory, as part of the Research Semester Program, summers, 1991 and 1992.

Development of the use of cDNA clones to detect restriction fragment length polymorphisms at the bovine kappa-casein locus, as a means of genotyping animals prior to mating. This project was carried out with Dr. Parviz Sabour at the Animal Research Center of Agriculture Canada Experimental Farm in Ottawa, Ontario, from September 1986-1987.

Entrapment of protamine messenger RNA in vesicles and fusion of these vesicles to HeLa cells, for the purpose of characterizing the translation of the messenger RNA and the post-translational modifications to the protamines, in a heterologous cell type. This was the Ph.D. thesis, carried out in the laboratory of Dr. Gordon H. Dixon, Division of Medical Biochemistry, University of Calgary Medical School, 1979-82.

Investigation of premature chromatin condensation and heterochromatinization induced in chicken cells by fusion to synchronized cells in various stages of the cell cycle. This project was carried out as a research associate with Dr. J. B. Rattner, Department of Anatomy, University of Calgary, 1983.

Extraction of phytoestrogens from plant tissues and investigation of the binding of these molecules to mammalian estrogen receptors. This project was carried out with Dr. Kitts, in the Department of Animal Science, at the University of British Columbia, Vancouver, B.C., 1976-77.

The documentation of the growth and differentiation response of the quail oviduct to stimulation with estrogen and progesterone, in terms of DNA, RNA, and protein synthesis, and the synthesis of the differentiation proteins, ovalbumin, lysozyme, and avidin. This project was carried out as a Masters Degree graduate student in the laboratory of Dr. Cyril V. Finnegan, at the University of British Columbia, Vancouver, B.C., 1972-5.

#### **TECHNIQUES:**

PCR, *in vitro* site-specific mutagenesis, DNA Sequencing and silver staining, DNA restrictions, electrophoresis, genomic library handling, Southern transfers, nick translations, multi-prime labelling, probe hybridizations, RFLP analysis, CsCl and mini-prep isolations of plasmid DNA, eukaryotic cell DNA isolations, nucleic acid iodinations (thallium chloride) and protein iodinations (lactoperoxidase).

Preparations of liposomes and red cell ghosts, entrapment of nucleic acids, isolation and *in vitro* translations of messenger RNA.

Use of tritium, carbon-14, iodine-125, and P-32 radiotracers.

Tissue culture of animal cells, microscopy, mutagenesis, cell organelle fractionation, cell fusions. Protein crystallizations, HPLC, enzymatic assays, antigen-antibody binding assays, filter binding assays, ELISA assays, (normal and competitive), competitive receptor-binding assays, Scatchard plots, Chromatography, Ultracentrifugation (velocity sedimentation and isopycnic), 2-D Electrophoresis.



## CURRICULUM VITA

Kim K. Colvert

### PERSONAL DATA

Date of Birth: August 30, 1956

Residence: 517 N. Michigan Ave.  
Big Rapids, MI 49307  
(616) 592-2580

Office: Department of Physical Sciences  
ASC 3098  
Ferris State University  
Big Rapids, Michigan 49307 (616) 592-2596

### CURRENT TEACHING RESPONSIBILITIES

Survey, introductory and advanced courses in biochemistry and biochemistry labs, evaluation and teaching of introductory courses.

Courses Taught at Ferris: Quantitative Analysis (CHM 231)  
Introductory Biochemistry (CHM 324)  
Biochemistry (CHM 364)  
Instrumental Analysis (CHM 231)  
Chemical Calculations (ICT 221)  
Biochemistry Lab I (CHM 332)  
Biochemistry Lab II (CHM 333)  
Organic/Biochemistry (CHM 124)  
Inorganic Chemistry Labs (CHM 114)  
Introductory Chemistry (CHM 100)  
Proteins Laboratory (BIOL 473)  
Advanced Topics in Biochemistry (CHEM 474)

### CURRENT RESEARCH INTERESTS

Identification of an inhibitor protein subunit in the beef heart mitochondrial  $F_1$  ATPase. Structural mapping of chloroplast coupling factor using fluorescent energy transfer and nucleotide binding site techniques.

### POST DOCTORAL RESEARCH

*In vitro* metabolism and macromolecular binding of suspected carcinogens using HPLC, radioisotope, and protein and DNA isolation techniques. Suicide inactivation of cytochromes P450, affinity chromatography.

## GRADUATE RESEARCH

Interaction between proteins in the electron transport chain of photosynthesis using protein purification and analysis techniques, enzyme assays, covalent crosslinking and absorbance spectroscopy.

## EDUCATION

Ph.D August, 1984, University of Arkansas, Fayetteville, Arkansas 72701. Major: Biochemistry. GPA: 3.67/4.00. Dissertation Title: "Interaction of Ferredoxin with Ferredoxin:NADP Reductase and Chloroplast Membranes." Advisor: Dr. Danny J. Davis

B.A. June, 1977, Hendrix College, Conway, Arkansas 72032. Major: Chemistry.

## PROFESSIONAL EXPERIENCE

- September, 1988 to present Asst./Assoc. Professor of Chemistry  
Physical Sciences Department  
Ferris State University  
Big Rapids, MI
- August, 1986 to August, 1988 Assistant Professor of Chemistry  
Chemistry Department  
Southwest Missouri State University  
Springfield, MO
- August, 1984 to August, 1986 Postdoctoral position with  
Peter P. Fu, Division of Biochemical  
Toxicology, National Center for  
Toxicological Research, Jefferson, AR.  
(Exchange Program with Veteran's  
Administration, Little Rock, AR)
- July, 1984 Temporary post-doctoral position with  
Dr. Frank Millett, University of Arkansas  
Fayetteville, AR.
- January, 1980 to July, 1984 Research and Teaching Assistant in  
Chemistry, University of Arkansas
- June, 1978 to December, 1980 Air Resources Specialist and Air Chemist,  
Arkansas Department of Pollution Control  
and Ecology, Little Rock, AR.

June, 1977 to September, 1977 Technician in Molecular Biology Division,  
(Civil Service Summer Registry), National  
Center for Toxicological Research,  
Jefferson, AR.

### ACTIVITIES AND AWARDS

Sabbatical Leave, University of Kansas-Lawrence, August 1984-June 1985  
Ferris Faculty Research Grant, June 1993-May 1994  
NSF Research Opportunity Award, University of Kansas-Lawrence. June-August  
1990 and June-August 1991  
Chair, Western Michigan Section, American Chemical Society. 1991  
Faculty Research Grant, Southwest Missouri State University. June 1987-June  
1988.

### COMMITTEES

Departmental: Curriculum Development, Biochemistry/Biotechnology,  
Safety (Chair), Chemistry Liaison, Text-selection, Faculty Search,  
ICT Advisory, Steering for Applied Chemistry Degree, Planning, Faculty  
Development, Tenure Review (Chair), Remodeling

College: Sabbatical Leave, Academic Standards and Policies (Chair)

University: Teaching Excellence Award (Chair), Biotechnology Advisory,  
Radiation Safety, Arts and Lectures, Academic Policies and Standards

### PROFESSIONAL AFFILIATIONS

American Chemical Society and ACS Division of  
Biological Chemistry

### MEETINGS AND SEMINARS

Biochemistry Graduate Student Organization Fall Symposium, University of Kansas,  
Lawrence, KS Fall 1994  
West Central States Biochemistry and Molecular Biology Conference on Research and  
Education, University of Missouri, Columbia, MO, Fall 1994  
"Systemic Changes to the Chemistry Curriculum", Michigan State University Workshop,  
East Lansing, MI Spring, 1994  
American Society of Biochemistry and Molecular Biology/American  
Chemical Society- Biochemistry Division Joint Conference,  
San Diego, CA Summer 1993  
HPLC Workshop, Ferris State University, February, 1990  
"High Performance Liquid Chromatography for the Life Sciences" Kalamazoo, MI  
Spring 1989 (Waters Assoc.)  
"Inductively Coupled Plasma/Mass Spectroscopy"  
Grand Rapids, MI Fall 1988 (Perkin-Elmer)

## PUBLICATIONS

Kirch, R.D., Colvert, K.K., Richter, M. L., Graber, P., "Intrinsic Fluoresence of the Chloroplast H<sup>+</sup>-ATPase.", Archives of Biochemistry and Biophysics, vol. 316, 1995.

K.K. Colvert, D.A. Mills, and M. L. Richter, "Structural Mapping of Cysteine 63 of the Chloroplast ATP Synthase Beta Subunit", Biochemistry, vol.31, pp. 3930-3935, 1992

L.Z.Morand, M.K. Frame, K.K. Colvert, D.A. Johnson, D.W. Krogmann, and D.J. Davis, "Plastocyanin Cytochrome *f* Interaction," Biochemistry, vol. 28, pp. 8039-8047, 1989.

K. K. Colvert and D. J. Davis, "Characterization of a covalently crosslinked complex involving ferredoxin and ferredoxin:NADP reductase," Photosynthesis Research, vol. 17, pp. 231-245, 1988.

K. K. Colvert, M. W. Chou, and P.P. Fu, "*In Vitro* Binding of Nitro-Polycyclic Aromatic Hydrocarbons and Their Oxidative Metabolites to Macromolecules," presented at the International Symposium on Polynuclear Aromatic Hydrocarbons, National Bureau of Standards, Gaithersburg, Maryland, September, 1987 (published in the proceedings of this meeting).

Kim K. Colvert and Peter P. Fu, "Xanthine Oxidase-Catalyzed DNA Binding of Dihydrodiol Derivatives of Nitro-Polycyclic Aromatic Hydrocarbons," Biochemical and Biophysical Research Communications, vol. 141, pp. 245-250, 1986.

Barbara J. Vieira, Kim K. Colvert, and Danny J. Davis, "Chemical Modification and Cross-linking as Probes of Regions on Ferredoxin Involved in its Interaction with Ferredoxin:NADP Reductase," Biochemica et Biophysica Acta, vol. 852, pp. 109-122, 1986.

Kim K. Colvert and Danny J. Davis, "Effect of pH, Salt and Coupling State on the Interaction of Ferredoxin with the Chloroplast Membrane," Archives of Biochemistry and Biophysics, vol. 225, pp. 936-943, 1983.

## PRESENTATIONS

Kim K. Colvert, "Structural Mapping of Cysteine 63 of the Chloroplast ATP Synthase Beta Subunit" Physical Sciences Department, Ferris State University, Big Rapids, Michigan, March, 1993

Kim K. Colvert, "Metabolism of Benzo(a)pyrene by Plant Microsomal Enzymes," Midwest Regional Meeting, American Chemical Society, Wichita, Kansas, November, 1987.

K.K. Colvert, N.W. Chou, and P.P. Fu, "*In Vitro* Binding of Nitro-Polycyclic Aromatic Hydrocarbons and Their Oxidative Metabolites to Macromolecules," International Symposium on Polynuclear Aromatic Hydrocarbons, National Bureau of Standards, Gaithersburg, Maryland, September, 1987

Kim K. Colvert and Peter P. Fu, "Reductive Metabolism of Nitrated Polycyclic Aromatic Hydrocarbons to DNA Binding Derivatives," 190th National Meeting of the American Chemical Society, Division of Biological Chemistry, Chicago, Illinois, September 1985.

Kim Colvert and Danny J. Davis, "Preparation and Characterization of a Covalently Linked Adduct Between Ferredoxin and Ferredoxin:NADP Reductase," Ann. Plant Biochemistry-Physiology Symposium, University of Missouri-Columbia, Missouri, April, 1984.

Kim Colvert, Keith Hough, and Danny J. Davis, "Covalent Linkage of Interacting Proteins of the Photosynthetic Electron Transport Chain by a Water-Soluble Carbodiimide," Southwest Regional Meeting, American Chemical Society, Tulsa, Oklahoma, December, 1983.

K. Colvert and D. J. Davis, "Effects of pH and Salt on  $K_m$  for Ferredoxin in NADP Photoreduction by Chloroplast Membranes," Ann. Plant Biochemistry-Physiology Symposium, University of Missouri-Columbia, Missouri, April, 1982.

D.J. Davis and K. Colvert, "Effects of pH, Salt and Coupling State on the Interaction of Ferredoxin with the Chloroplast Membrane," Midwest Photosynthesis Conference, Argonne National Laboratory, Argonne, Illinois, October, 1982.

K. Colvert and D.J. Davis, "Effects of pH, Salt and Coupling State on the Interaction of Ferredoxin with the Chloroplast Membrane," West Central States Biochemistry Conference, Stillwater, Oklahoma, November, 1982.

# CURRICULUM VITAE

## ROGER E. MITCHELL II

Department of Biological Sciences  
Ferris State University  
820 Campus Dr.  
Big Rapids MI 49307-2260  
Phone: (616)-592-5879  
E. Mail: mitchelr@ferris.edu

### CAREER GOAL

To teach biology in a college or university setting, with botanical research as a secondary goal.

### EDUCATION

**B.S.**, Molecular Biology, 1984, University of Wisconsin (Madison).

- Undeclared minor in chemistry.

**Ph.D.**, Genetics, University of Minnesota (Twin Cities), 1992.

- Thesis advisor, Dr. Irwin Rubenstein. Informal advisor, Dr. David Somers.
- Thesis, "Expression of Zein Associated Protein Genes" in the developing endosperm of *Zea mays* L. (corn).
- Applied a wide range of molecular and tissue culture research techniques to plant systems.
- Classroom emphases: genetics, plant breeding, applied statistics.
- Corn breeding.

### POSTDOCTORAL RESEARCH

1993, Louisiana State University, Department of Plant Pathology and Crop Physiology.

- Principal investigator, Dr. Norimoto Murai.
- Gene expression in common bean (*Phaseolus vulgaris* L.).

### TEACHING EXPERIENCE

**Georgia Southern University** in Statesboro, Georgia, Temporary, full-time assistant professor of biology, Winter and Spring quarters, 1994.

Courses taught:

- Bio. 151 lecture: Introductory biology for non-majors. Topics: biology as science, survey, ecology, genetics, molecular genetics.
- Bio. 152 lecture: Introductory biology for non-majors. Topics: evolution, biochemistry, plant biology, vertebrate anatomy and physiology.
- Bio. 370 lab: Cell biology lab for mid-level biology majors. Taught: microscopy, cell anatomy, enzymology.

# CURRICULUM VITAE

**Ferris State University** in Big Rapids, Michigan, Temporary, full-time assistant professor of biology, 1994-95 and 95-96 terms. Tenure track assistant professor of biology, Fall 1996 to present. Courses taught:

- Biol. 113, lecture and lab: Botany for horticulture majors. Topics: taxonomy, anatomy, physiology, biochemistry
- Biol. 121, lecture and lab: Introductory biology for biology majors. Topics: genetics, evolution, survey, ecology, plant biology.
- Biol. 122, lecture and lab: Introductory biology for biology majors. Topics: zoology, vertebrate anatomy and physiology, biochemistry, molecular genetics.
- Biol. 353, lecture and lab: Plant physiology for biology majors. Topics: anatomy, water relations, biochemistry, photosynthesis, cellular respiration, growth and hormones.
- Biol. 460 lecture: Senior seminar for biology majors. Students prepare posters and monographs that review a current topic in biology. Includes computer instruction.
- Biol. 471 lab: Recombinant DNA lab for biotechnology majors. Teaches modern methods including cloning, bacterial transformation, DNA purification, southern hybridization, sequencing, PCR. Includes computer instruction.

## RELATED EXPERIENCE

### Teaching:

- Teaching assistant, University of Minnesota.
- Three years teaching research methods to undergraduates in graduate lab.
- Attended peer review of teaching workshop, winter '96.

### Computers:

- Proficient in wide range of computer word-processing, statistics, graphics, taxonomy, and presentation applications.
- Studied three computer programming languages.
- Set up or upgraded several small computer systems.
- Sold computers briefly.

### Communication:

- Competitive forensics and debate in high school.
- High school debate judge while in college.

# CURRICULUM VITAE

## UNIVERSITY SERVICE

- Served on the introductory lab revision committee ('94-'95 term and '96 - '97 through present), introductory biology textbook selection committee (Winter '95), biotechnology program coordination committees ('94-'95 through present), department planning committee ('96 - '97 to present), department professional development committee ('96 - '97), biotechnology program review committee ('97 - '98 through present), and forensic biology development committee ('96 - '97).
  - Helped plan, develop and teach first biotechnology workshop for high school students and teachers (Winter '95).
  - Set up, and maintain, faculty workstation computer including scanner (Fall '95 to present).
  - Prepared poster for, and represented biotechnology program at, Autumn Adventure, a high school recruitment event (Fall '94 ' through present).
- supervised two biotechnology student interns in the summer of '97, and again in the summer of '98. Shared supervision of a fifth student in the fall of '97.
- supervised student independent study, Winter '97, Winter '98, and Fall '98.

## OTHER ACTIVITIES

- Carry out very large lily breeding program and small rose breeding program.
- Carry out active lab research project on lily (*Lilium*) species taxonomy, utilizing DNA sequencing, Polymerase Chain Reaction (PCR), and other methods.
- Member of several horticultural societies: Wisconsin Regional Lily Society, North American Lily Society, American Horticultural Society, North American Gladiolus Council, American Orchid Society, International Bulb Society.
- Wrote newsletter articles for, and served as assistant editor of, the Wisconsin Regional Lily Society newsletter.
- Served as flower exhibit chairman for Wisconsin Regional Lily Society.
- Serve as an accredited judge for the North American Lily Society.
- Write fiction as hobby.



# CURRICULUM VITAE

## **PUBLICATIONS:**

- "Expression of Zein Associated Protein Genes," Roger E. Mitchell II, Ph.D. thesis, University of Minnesota, St. Paul Minnesota, Jan. 1992.
- "Expression of a zein associated protein in corn endosperm," Roger E. Mitchell II, David Somers, and Irwin Rubenstein, in preparation.
- "Lily hybridizing: Something for everyone," Roger E. Mitchell II, Quarterly Bulletin of the North American Lily Society, vol. 49, #1, March 1, 1995.

## **Newsletter Notes:**

- "Transient expression of foreign genes in endosperm tissue," Roger E. Mitchell II and Irwin Rubenstein, Maize Genetics Cooperation Newsletter, #64, 1990.
- "Simplified cloning techniques utilizing kanamycin resistant plasmids," Roger E. Mitchell II, John Hunsperger, and Irwin Rubenstein, Maize Cooperation Newsletter, #64, 1990.



"Jeff Johnson" <jeff@caymanchem.com> on 09/03/98 03:36:29 PM

To: cboogaar@ART01.FERRIS.EDU  
cc: (bcc: Connie L Boogaard/FSU)  
Subject: position available

---

Dear Dr. Boogaard,

I am currently seeking to hire a technician to work in my lab. This position was recently held by Scott Bowen, a graduate of FSU, who has since taken a position at Park Davis. As you may know, we have hired several graduates of FSU and have been pleased with the performance of all of them. Therefore, it seemed logical to contact you to see if you are aware of any potential candidates for this position. The work primarily involves development of antibodies for commercial use. The candidate should have experience with protein biochemical techniques (SDS-PAGE, western blotting, purification, etc.). The position may also require some cell culture, but this has not been established. Good communication skills are essential (both oral and written). Training for additional techniques will include peptide synthesis, peptide conjugations, and ELISAs (prior experience in these techniques is not required).

If you know of former students that may be qualified please have them mail a resume to:

Cayman Chemical  
1180 E. Ellsworth Road  
Ann Arbor, MI 48108

or Fax it to my attention at 734-971-3420.

Thanks for your assistance.

Sincerely,  
Jeff Johnson, Ph.D.

*unsolicited  
requests for  
graduates*

Date sent: **Mon, 19 Jan 1998 14:54:18 -0500**  
From: **Alan Henn <ahenn@agdia.com>**  
Organization: **Agdia**  
To: **jhoerter@art01.ferris.edu**  
Subject: **Agdia Testing Services Position Announcement**

Dear Sir:

Late last year we hired one of your former students, Ms. Angela Ness. She has now left us due to the transfer of her spouses job. We were sufficiently pleased with her performance to consider another of your graduates, if of similar quality. Would you please share the following position description with any person you feel meets this description?

Thank you for your time and consideration.

Sincerely,

Alan Henn

Agdia, Inc.  
<http://www.agdia.com>  
Director, Testing Services  
30380 County Road 6  
Elkhart, IN 46514

*Some  
will be  
unsolicited  
requests  
for graduates*

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Here is the information on the job opening

Agdia, Testing Services  
Diagnostics Specialist  
Position Description

Growing internationally recognized Plant Disease Testing Laboratory seeks active, detail-oriented person to support daily activities. Duties include all aspects of sample custody, extraction, testing, confirmation and reporting. This energetic team player must be comfortable with the public and have good communication skills. Excellent laboratory habits with skills in ELISA, polymerase chain reaction, hybridization assays and willingness to evaluate and troubleshoot new tests are important to this position. Knowledge of seed sciences is a strong plus. Other knowledge and experience that would be considered include chemistry, plant pathology, plant sciences, or other diagnostic area.

Contact Alan Henn <ahenn@agdia.com>  
Agdia, 30380 County Road 6, Elkhart, IN 46514

# FAX

Date: 3-24-98

Number of pages including cover sheet: 2

To:

Dr. Connie Boogard

Phone: X 2544

Fax phone:

CC:

*unsolicited  
request for  
graduates*

REMARKS:

Urgent

For your review

Reply ASAP

Please comment

*Call me if you need any more  
info.*

*D.*

# JOB POSTING

## Laboratory Technician for Research & Development

### REPORTS TO:

Frank Klein  
Senior Research Scientist

### DESCRIPTION:

To perform daily laboratory research focusing on the development of new diagnostic tests for the food and agricultural industries.

### RESPONSIBILITIES:

- Make all reagents (buffers, solutions, solvent mixtures).
- Perform chemical and biochemical reactions.
- Perform high and low pressure liquid chromatography analysis/separations.
- Perform analytical and immunochemical assays.
- Purification of antibodies and preparation of immunoreagents for internal and external research programs.
- Analyze data collected from assays.
- Bookkeeping of all research and development data in assigned notebooks.
- Develop or improve current procedures to increase productivity.
- Perform QC assays on all kit components before transfer to manufacturing.
- Inventory and order all components used in the lab.
- Responsible for keeping a clean work area.
- Prepare reports for presentation at company or scientific meetings.
- Perform general laboratory duties and other duties as assigned by supervisor

### QUALIFICATIONS:

Bachelor of Science in Chemistry, Biochemistry, Immunology or related field. Familiarity with Immunochemistry/Protein Chemistry and Immunoassay techniques, antibody purification and reagent preparation. Ability to use chromatographic spectrophotometric instrumentation and perform regular maintenance. Computer experience - word processing, data analysis, statistics, graphics, etc.

Frank E. Klein  
Senior Research Scientist



620 Leshar Place • Lansing, MI 48912  
517-372-9200 • FAX 517-372-2006

If you are interested and would like additional information or to apply, please see Frank Klein or Cristine Stock by Wednesday, April 1, 1998.



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## Detail View

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**MICROBIOLOGIST/MOLECULAR BIOLOGIST.** The successful candidate will be responsible for conducting experiments involving cloning and characterization of recombinant DNA, as well as analysis of expressed products. Experience should include cloning, restriction mapping, handling of bacterial cultures, sequencing, PAGE and agarose gels. A BA/BS and 2 years of experience or MA/MS is required. VRI offers a competitive salaries and benefits package. Applicants should send a resume and cover letter.

Contact: Human Resources, Virus Research Institute, Inc.  
61 Moulton Street  
Cambridge, MA 02138

[Ad # 1 of 2] *Published: 02/15/98 - Boston Globe*

---

**PROTEIN BIOCHEMIST.** The successful candidate will be responsible for conducting experiments involving purification and analysis of recombinant or natural protein products and corresponding assay development. Experience should include preparative chromatography (affinity, ion-exchange, size-exclusion), PAGE and agarose gels, cell harvesting, western blotting, ELISA, and protein concentration. A BA/BS and 2 years of experience or MA/MS is required. VRI offers a competitive salaries and benefits package. Applicants should send a resume and cover letter.

Contact: Human Resources, Virus Research Institute, Inc.  
61 Moulton Street  
Cambridge, MA 02138

[Ad # 2 of 2] *Published: 02/15/98 - Boston Globe*

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## St. Jude Children's Research Hospital

ALSAC • Danny Thomas, Founder

### Research Technologist Opportunities

St. Jude Children's Research Hospital is a learning environment offering professional growth and diversity for the research technologist. Biomedical education extends beyond the laboratory and clinical experience. Workshops, seminars and lectures are regularly presented by both the St. Jude faculty and distinguished visiting investigators. St. Jude's non-faculty research staff career ladder provides several levels of promotion and financial compensation for talented and motivated technologists to advance in their field. Experienced technologists may assist the principal investigator by performing research experiments, developing new procedures, participating in the publication of research results, managing laboratory operations and training laboratory personnel.

Resumes should be sent to: **St. Jude Children's Research Hospital Human Resources Department, 332 North Lauderdale, Memphis, Tennessee, 38105. FAX: 901-495-3123.**

To learn more about the specific job opportunities that are currently available, please visit our web site at: [www.stjude.org](http://www.stjude.org)

*St. Jude Children's Research Hospital is an Affirmative Action/Equal Opportunity Employer*





## THE UNIVERSITY OF IOWA

### POSTDOCTORAL ASSOCIATE POSITIONS THE UNIVERSITY OF IOWA College of Medicine

Please contact the following departments for Postdoctoral positions at the College of Medicine. Postdoctoral positions are limited to a maximum of three years. A Ph.D. or equivalent is required. Desirable qualifications are based on Project Investigator's interest for research. Send curriculum vitae and the names/telephone numbers of three references to the individual listed below. Please specify area of interest in letter of application in accordance with the categories listed under each department below. *Women and minorities are strongly encouraged to apply.* **The University of Iowa, College of Medicine, Iowa City, Iowa, 52242, is an Equal Opportunity/Affirmative Action Employer.**

**ANATOMY**—Research areas include fetal alcohol syndrome, cell and molecular biology, cancer, development, muscle including cardiovascular, and neuroscience. **George McHenry**, 1-577 Bowen Science Building.

**BIOCHEMISTRY**—Research areas include biochemistry, biophysics, cell biology, and molecular biology. **Dr. Arthur A. Spector**, 4-403 Bowen Science Building.

**MICROBIOLOGY**—Research areas include immunology, virology, pathogenic bacteriology, microbial genetics, microbial physiology, biotechnology, and medical mycology. Send curriculum vitae and the names/telephone numbers of 3 references to **Ms. B.K. Spence**, 3-403C Bowen Science Building.

**NEUROLOGY**—The Department of Neurology welcomes applications for postdoctoral associate positions which may be recruited in the following subspecialty areas: Neuropsychology, Epilepsy, Cerebrovascular Disease, Stroke, Clinical Electrophysiology, Neuromuscular Disease, Neurochemistry, and the Laboratory of Neurobiology and Circulatory Control. **Antonio R. Damasio, M.D., Ph.D.**, Professor and Head, Department of Neurology.

**OBSTETRICS/GYNECOLOGY/PHARMACOLOGY**—Postdoctoral Associate position is available to study the molecular genetics of oncogene/tumor suppressor gene expression in ovarian cancer with a goal of establishing novel gene therapy strategies. Molecular biology experience required. **Richard E. Buller, M.D., Ph.D.**, Associate Professor, Director, Division of Gynecologic Oncology, Department of Obstetrics and Gynecology and Pharmacology. **Phone: (313) 356-2015.**

**OPHTHALMOLOGY**—Research areas include both molecular biology (pcr, DNA sequencing, SSCP) and cell biology (light and electron microscopy, tissue culture).

**PATHOLOGY**—Research areas include molecular and cellular pathology, immunology, translational research and outcomes research. **Mari Kucera**, 125 Medical Laboratories.

**PEDIATRICS**—**Dr. Frank H. Moriss, M.D.**, Professor and Head. Possible openings in all of pediatric specialties.

**PHARMACOLOGY**—Openings available in all areas of Pharmacology, including molecular and cellular mechanisms of drug action and metabolism, signal transduction, and neuropharmacology. **Dr. Gerald F. Gebhart**, Professor and Head, Bowen Science Building.

## The Science of Agricultural Genetics

### SENIOR RESEARCH ASSOCIATE

#### Plant Molecular Biology — Crop Protection (Job #CP-710)

The successful candidate will assume a key role in an established molecular biology group responsible for the rapid isolation and development of genes for transgenic control of crop insect pests. This individual will show initiative and team leadership, contributing to technology development and the timely completion of defined projects. Qualifications include competence in the production of genomic and cDNA libraries and characterization of clones, DNA sequence analyses, PCR, oligonucleotide design, Southern, northern and western blots, familiarity with methods of microbiology and protein biochemistry, gene modification, gene expression, and related detection methods. Practical experience with plant molecular biology is preferred. Computer skills include: expertise with construct design, sequence alignments and analyses for proteins and nucleic acids, database analyses, data entry. **EDUCATIONAL REQUIREMENT:** Minimum M.S. in molecular biology or closely related field and at least five years practical experience in molecular biology with strength in protein biochemistry.

### POSTDOCTORAL ASSOCIATE

#### Receptor Molecular Biology — Crop Protection (Job #CP-711)

The successful candidate will assume a key role in an established molecular biology group responsible for the control of crop insect pests. This individual will show initiative and team leadership, contributing to technology development for the isolation, study and targeting of insect receptor systems. Qualifications include competence in the production of genomic and cDNA libraries and characterization of clones, nucleic acid analyses, protein biochemistry, receptor-ligand interactions, PCR, oligonucleotide design, Southern, northern and western blots, gene modification, gene expression, transfection of cultured eucaryotic cells, related detection methods. Computer skills include: expertise with construct design, manipulation of protein and nucleic acid sequences, database analyses, molecular modeling. **EDUCATIONAL REQUIREMENT:** Minimum Ph.D. in molecular biology or closely related field and practical experience in molecular biology with strength in protein biochemistry.

### RESEARCH ASSOCIATE

#### Genome Research — Targeted Genetics (TUSC) (Job #GR-707)

The successful candidate will assume a key role on a team dedicated to facilitating the analysis of gene function in maize. A current approach uses transposon mutagenesis, array technologies, and PCR-based screening to identify "knockout" alleles for targeted genes of interest. This position requires a minimum B.S./B.A. in biology, genetics, molecular biology, or related field, plus 2-3 years direct experience in molecular biology. Emphasis is placed on organizational skills to supervise assistant-level personnel, manage laboratory operations, and complete defined projects while contributing to technology development. Fundamental knowledge of genetics and plant biology, and experience in DNA sequence alignment/analysis, PCR protocol optimization, oligonucleotide primer design, and relational databases is desired.

### RESEARCH ASSOCIATE

#### Genome Research (Job #GR-709)

This position requires a M.S. or B.S. degree or equivalent in molecular biology, biochemistry, or related field with 2-3 years experience with total and/or polyA RNA preparation from plant material. Primary responsibility will be to develop and test procedures for rapid preparation of large numbers of RNA samples. Additional responsibilities will include development and production of customized arrays of cDNA clones, cataloging RNA samples, QC, and assistance in managing transcript profiling data using proprietary software. Other skills such as Southern, Northern, RPA, PCR, and/or RT-PCR analyses are expected. Experience with robotics or automated systems and familiarity with plant breeding and genetics are a plus. Excellent computer skills with experience in DNA/RNA-related and statistical analysis are essential. Interpersonal communication and ability to work with limited supervision are also essential.

For confidential consideration send 3 copies of your current resume and cover letter indicating job number by August 31, 1997 to: Pioneer Hi-Bred International, Inc., Attn: PERSONNEL (Job # \_\_\_\_\_), P.O. Box 1004, Johnston, IA 50131-1004.

Pioneer Hi-Bred International, Inc., is the world leader in agricultural genetics. Founded in 1926, we are a publicly held company that invests more than \$115 million in research and product development. Pioneer® brand products are grown in almost every crop-producing continent in the world. At our headquarters in Des Moines, Iowa, we're adding to our Research team.

Pioneer Hi-Bred International, Inc. offers an opportunity to interact among hundreds of scientists with diverse backgrounds. We offer competitive salaries and excellent, comprehensive benefits. Des Moines is a prospering heartland city that ranks well above the national averages in affordability and education. Our location provides a mix of beautiful open spaces and city life advantages.



**PIONEER HI-BRED  
INTERNATIONAL, INC.**  
*An Equal Opportunity  
Employer*



HÔPITAL GÉNÉRAL  
D'OTTAWA OTTAWA  
GENERAL HOSPITAL

## Research Associate

### Neuromuscular Disease Laboratory

Reporting to the Director of Research, you will have responsibility for a small research group involved in viral and non-viral approaches to gene delivery in muscle, with a long-term goal of gene therapy for neuromuscular disease.

Your PhD is complemented by postdoctoral experience in molecular genetics, preferably with experience in the study of neuromuscular disease. You must also have extensive experience with genetic manipulation of plasmids, transfection of mammalian cells and assays for reporter gene expression. Additional knowledge of muscle cell culture and gene expression in muscle or of viral and non-viral vectors for gene delivery to muscle would be a definite asset.

Please forward your résumé in confidence by August 15, 1997, including three references and quoting reference number HG SC 97-011, to **Dr. Ronald Worton, Director of Research, c/o Department of Human Resources, Ottawa General Hospital, 501 Smyth Road, Ottawa, Ontario K1H 8L6. Fax: (613) 737-8204.**

## Ph.D. Scientist

### Cardiovascular Disease

**COR Therapeutics, Inc.**, is a publicly-held biopharmaceutical company located in South San Francisco. We're focused on the discovery and development of novel therapeutics for the treatment of severe cardiovascular disease, and we currently have an excellent opportunity for a well-qualified scientist with a proven track record to join our dynamic research team.

We are looking for a hands-on scientist with a strong background in protease enzymology to work on the characterization and structure/activity relationships of small molecule coagulation inhibitors. The position requires a Ph.D. in biochemistry along with a minimum of 4 years of postdoctoral experience in enzymology.

We offer competitive salaries, outstanding benefits, attractive equity positions, and the opportunity to make significant research contributions. To apply, please reference Job #97031-SCI and send resume to: **COR Therapeutics, Inc., Human Resources, 256 East Grand Avenue, South San Francisco, CA 94080; Fax: (415) 244-9208. COR is an equal opportunity employer.**

**COR** COR THERAPEUTICS, INC.

## CHAIR

### Department of Medicine The University of Chicago

The Division of the Biological Sciences, which includes The Pritzker School of Medicine, at the University of Chicago, is seeking a Chair of the Department of Medicine. This is a multi-disciplinary department with 180 faculty in the fields of cardiology, dermatology, emergency medicine, endocrinology, gastroenterology, internal medicine, hematology/oncology, infectious diseases, nephrology, pulmonary/critical care, and rheumatology. The Chair reports to the Dean of the Division/Vice-President of the University, and is responsible for providing academic and administrative leadership in clinical care delivery, research and teaching of undergraduate, graduate, post-graduate and medical students. The successful applicant will have an outstanding record of scientific accomplishment and demonstrated teaching and administrative abilities that will qualify him or her for the rank of Professor. The University of Chicago is an Equal Opportunity, Affirmative Action Employer. Please send curriculum vitae and the names of three individuals familiar with your work to: Bruce Gewertz, M.D., Chair, Dept. of Medicine Search Committee, The University of Chicago, 5841 S. Maryland Ave., MC 1000, Chicago, IL 60637-1470. Applications should be submitted by September 30, 1997. E-mail: gewertz@surgery.bsd.uchicago.edu



THE UNIVERSITY  
OF CHICAGO

## Associate Editor

An editorial position at **SCIENCE** is available for a Ph.D. scientist with a broad range of interests and research experience in biochemistry, structural biology, and/or neuroscience. We are seeking someone with at least 2 or 3 years of postdoctoral experience in the life sciences and publications in peer-reviewed journals. Editors have varied responsibilities including solicitation, selection, and editing of manuscripts. Previous editorial experience is not required. This is a full-time position in either our Washington, DC, or Cambridge, UK, office.

Please send résumé and list of publications with cover letter and salary requirements to:

**Mr. Gregory Stokes**

**AAAS**

**1200 New York Avenue, N.W.  
Washington, DC 20005**



#### FUNDING AVAILABLE

CaP CURE, the Association for the Cure of Cancer of the Prostate, is soliciting proposals for its 1997/1998 funding year. The organization's goal is to find a cure for advanced prostate cancer.

Applications are competitive and accepted from individuals with or without institutional affiliation. Awards range from \$50,000-\$200,000 for the year. Applications (3-5 pages) can be for basic research, clinical investigations or a combination and must be relevant to the treatment of advanced prostate cancer. We encourage interdisciplinary collaborations between basic scientists and clinicians. (For-profit companies are not eligible.) Applications will be accepted August 15, 1997 through September 30, 1997. Awards will be announced by December 1, 1997.

*For consideration, please first request application guidelines:*

CaP CURE  
1250 Fourth Street, Suite 360  
Santa Monica, CA 90401  
Phone: (310) 458-2873 Fax: (310) 458-8074  
(800) 757-2873 E-mail: capcure@mcimail.com

#### RESEARCH

### ASSOCIATE SCIENTIST/RESEARCH SCIENTIST

At Amgen, you'll discover a research environment that emphasizes collaboration, intellectual honesty, scientific integrity, and a supportive culture. This unique approach has helped us grow into a global biotechnology leader in just fifteen years

You will work closely with the drug metabolism group in characterizing small molecule drug metabolites in biological matrices from both in vivo and vitro sources. Responsibilities will include identification and characterization of degradation/impurities present in newly synthesized drugs. Requirements for this position include a BS in Medicinal Chemistry, Bioanalytical Chemistry, or a related field, and typically 8-10 years' experience in metabolite and degradation product identification, and hands-on experience with LC/MS. MS degree in the Life Sciences preferred. Research Scientist requirements include a Ph.D. and completed post-doctoral training or the equivalent industrial experience. Candidates should possess strong interpersonal and communication skills and be able to interface effectively with scientists from related disciplines.

**We recognize that diverse perspectives are a key factor in the process of discovery.**

At Amgen, you'll find our approach as rewarding as it is effective. We offer a highly competitive compensation and benefits package. Please mail your resume to: Amgen, Human Resources, Job Code BNCSB11102, P.O. Box 19409, Boulder, CO 80308-2409. Please consult our Web site at [www.amgen.com](http://www.amgen.com) or call our Job Hotline at 800-446-4007 for information on other career opportunities available at Amgen. Principals only, please.

EEO/AA Employer M/F/D/V

# AMGEN

*3-Dimensional Pharmaceuticals, Inc., is a drug discovery company integrating advanced technologies in structure-based drug design, combinatorial chemistry, and chemi-informatics to discover breakthrough pharmaceuticals.*

## Enzymology/High Throughput Screening

We are currently seeking individuals to join our enzymology group to identify new targets, develop enzyme and receptor assays, characterize enzyme and inhibitor mechanisms, develop automated systems and adapt assays for high throughput screening. Qualified candidates will have a background in high throughput screening or enzymology, experience with building automated systems and developing automated enzyme and receptor binding assays. Positions are available at the following levels:

- **Director:** The ideal candidate will possess a Ph.D. in biochemistry, biology, chemistry or a related discipline with a minimum of 7 years of pharmaceutical industry experience and will have a record of accomplishment in enzymology, small molecule drug discovery and project management. Excellent communication, interpersonal, and leadership skills are essential. (Job Code: ES2)
- **Ph.D.:** Qualified candidates will have a Ph.D. in biochemistry, biology, chemistry or a related discipline with a minimum of 2 years of postdoctoral research experience. (Job Code: ES3)
- **BS/MS:** Successful candidates will have a BS or MS degree in chemistry, biochemistry or biology and 2 years of relevant pharmaceutical industry experience. (Job Code: ES4)

## Molecular Biology/Protein Expression

- **BS/MS:** Successful candidates will have a BS or MS degree in an appropriate scientific discipline and have a minimum of 3 years of relevant research experience. The individual will be responsible for cloning and expression of target proteins for x-ray crystallography and drug discovery. Special consideration will be given to candidates with a history of successful teamwork. (Job Code: MB1)

3-DP is located in Exton, PA and offers a comprehensive salary and benefits package. Qualified individuals are invited to send a resume and contact data for three references to:

**3-Dimensional Pharmaceuticals, Inc.**  
Job Code: \_\_\_\_\_, 665 Stockton Drive  
Suite 104, Exton, PA 19341



**3-Dimensional  
Pharmaceuticals, Inc.**

<http://www.3dp.com>

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**POSITIONS OPEN**

**MOLECULAR BIOLOGIST**

Kemin Industries, Inc., located in Des Moines, Iowa, is a worldwide manufacturer and distributor of specialty ingredients for the feed and food industry. Kemin Biotechnology, L.C. is a subsidiary of Kemin Industries, Inc. Kemin Biotechnology, L.C. has immediately available a research scientist position for a molecular biologist who will conduct exploratory and applied research on the engineering of microbial organisms for the production of recombinant proteins. The candidate should have a Master's degree and at least three years of experience or a Ph.D. degree in microbiology, molecular biology, or biochemistry. A strong background in microbial, recombinant DNA technology and molecular biology is required. Experience in carbohydrate chemistry and fermentation technology is a plus. No smoking is allowed on the premises.

Send résumé to: **Dr. F. Brinkhaus, Kemin Biotechnology, L.C., 2100 Maury Street, Des Moines, IA 50301.**

*Equal Opportunity Employer.*

**RENAL PHYSIOLOGIST**

Applications are invited for an appointment as a renal physiologist to lead a strong and distinguished research program in regulatory physiology in the Division of Intramural Research, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), National Institutes of Health. Candidates are sought with experience using modern molecular and cellular approaches, including functional studies in genetically modified animals, to understand intrarenal regulation of the circulation. Candidates should have a strong international reputation and record of a highly competitive and productive research program. Please send curriculum vitae and bibliography to: **Ms. Kay Place, Division of Intramural Research, NIDDK, Building 10, Room 9N222, 10 Center Drive MSC 1818, National Institutes of Health, Bethesda, MD 20892-1818.** Closing date is August 28, 1997.

**UNIVERSITY OF FLORIDA**

Seeks an **ENDOCRINOLOGIST** for the Department of Medicine, Division of Endocrinology and Metabolism, with the rank of Clinical Assistant Professor. M.D. degree, Board certified in Internal Medicine, Board eligible for Endocrinology. Responsibilities include quality patient care, teaching, and clinical research. Salary and benefits commensurate with experience. Recruiting deadline August 14, 1997. Anticipated starting date October 1, 1997. Reply with curriculum vitae to: **M. B. Grant, M.D., Associate Professor and Chief, Box 100226 JHMHC, Gainesville, FL 32610.** *An Affirmative Action/Equal Opportunity Employer.*

**SENIOR TECHNICIAN/  
LABORATORY MANAGER**

The Howard Hughes Medical Institute at Children's Hospital has an opening for an experienced individual to provide support to an active molecular biology laboratory investigating blood cell development. Strong research experience, excellent organizational and communication skills required. M.S./Ph.D. strongly preferred.

HHMI offers a competitive salary and excellent benefits package. Respond to: **Steven Barbour, HHMI/Children's Hospital, 320 Longwood Avenue, Boston, MA 02115.** E-mail: [barbours@hq.hhmi.org](mailto:barbours@hq.hhmi.org).

*Equal Opportunity Employer.*

**UNIVERSITY OF PENNSYLVANIA**

**POSTDOCTORAL POSITION** available immediately to study glycoprotein interactions with cellular receptors during herpes simplex virus entry into mammalian cells. The candidate should have a strong background in molecular or cell biology, virology, or biochemistry. Please send curriculum vitae, and names of three references with telephone numbers to: **Drs. Gary H. Cohen and Roselyn J. Eisenberg, Microbiology, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA 19104-6002.** *An Equal Opportunity/Affirmative Action Employer.*

**POSTDOCTORAL POSITION** is available with the Laboratory of Cellular and Molecular Biology, National Cancer Institute, to study growth factor-mediated signal transduction in relationship to cancer. Applicants must have a Ph.D. or M.D. and less than five years of postdoctoral experience. Submit a curriculum vitae with names and phone numbers of three references to: **Dr. Jacalyn H. Pierce, Building 37/Room 1E24, 37 Convent Drive, MSC 4255, Bethesda, MD 20892.**

**POSITIONS OPEN**

**ELECTRON MICROSCOPIST  
NATIONAL INSTITUTES OF HEALTH**

The National Institute of Child Health and Human Development (NICHD) invites applications for an **ELECTRON MICROSCOPIST** position in the Cell Biology and Metabolism Branch (CBMB). The position is at a senior technician level, although individuals with other levels of training will be considered depending on qualifications and experience. The ability to perform cryo-sectioning, gold immunolabeling, and quantitative electron microscopy is an essential requirement for this position. Salary will be commensurate with experience. The successful candidate is expected to collaborate with several groups at CBMB, a branch of NICHD that pursues studies in various areas of cell and regulatory biology. Applicants should send a curriculum vitae and three letters of reference to: **Dr. Juan S. Bonifacino (Re. EM Search), CBMB-NICHD, National Institutes of Health, Building 18T Room 101, 18 Library Drive MSC 5430, Bethesda, MD 20892-5430, U.S.A.** Deadline for receipt of applications: September 1, 1997. *NIH is an Equal Opportunity Employer.*

**ELECTRON MICROSCOPIST**

The Scripps Research Institute (TSRI) has an opening for an Electron Microscopist to carry out routine maintenance on the Hitachi/Philips microscopes; perform tissue preparation, including fixation, embedding, and sectioning. Experience in cryo-ultramicrotomy, freeze-fracturing, and confocal microscopy desirable. Qualified candidate will possess a B.S. or M.S. in a biological science and three to five years of directly related experience.

Send résumé to: **TSRI, 10550 North Torrey Pines Road, TPC11, La Jolla, CA 92037.** FAX: 619-784-8071. Reference "Science" on your cover letter. *We value and support diversity in our workforce/Affirmative Action/Equal Opportunity Employer.*

**POSTDOCTORAL POSITION  
ALZHEIMER'S DISEASE  
NEURODEGENERATION**

Available immediately to study the role of inflammation in Alzheimer's disease neurodegeneration. Candidates with strong background in immunohistochemical and molecular-neuroanatomical techniques (*in situ* hybridization) are strongly encouraged to apply. Qualified candidates should forward curriculum vitae and the names of three references to: **Giulio Maria Pasinetti, M.D., Ph.D., Department of Psychiatry, Box 1229, The Mount Sinai School of Medicine, One Gustave L. Levy Place, New York, NY 10029-5579.** Telephone: 212-241-5579. *We are an Equal Opportunity Employer fostering diversity in the workplace.*

**RESEARCH POSITION IN MAGNETIC  
RESONANCE MICROSCOPY**

Associate in Research to assist in performing small animal research in *in vivo* MR microscopy. Technical skills required in the following areas: anesthesia, surgery, and physiology of small animals (rodents); working knowledge of data acquisition and computer processing. Master's degree in animal biology/vertebrate physiology, and/or biomedical engineering with animal experience involving physiologic recording and surgery are required. Send résumé to: **H. Benveniste, M.D., Ph.D., Box 3302 Duke University Medical Center, Durham, NC 27710.** E-mail: [resa@orion.mc.duke.edu](mailto:resa@orion.mc.duke.edu).

**POSTDOCTORAL ASSOCIATE** position available at Cornell University. Position available to study genes involved in the developmental regulation of folate status and metabolism in animal models. Preference given to candidates with expertise in protein chemistry/molecular biology or murine development/transgenics. Ph.D. required. Send curriculum vitae and three letters of reference to: **Dr. P. Stover, Division of Nutritional Sciences, Cornell University, Savage Hall, Ithaca, NY 14853-6401.** E-mail: [pis13@cornell.edu](mailto:pis13@cornell.edu). *Affirmative Action/Equal Opportunity Employer.*

The Exeter Group is a medical education company whose clients are among the leaders in the pharmaceutical industry. By educating physicians, we help our clients meet their commercial goals. We seek a **MEDICAL EDITOR/WRITER** to join our team. The successful candidate will have a strong science background (Ph.D. preferred) and exceptional communication skills. This position entails significant responsibility. Salary will be competitive. Curriculum vitae, letter to: **Personnel, 400 Madison Avenue, Suite 807, New York, NY 10017.**

**POSITIONS OPEN**

**FELLOWSHIPS IN AIDS RESEARCH**

New York University, an NIH-designated Center for AIDS Research, invites applications to a multidisciplinary postdoctoral program for training in basic research related to the immunopathogenic mechanisms underlying infection. Trainees will work collaboratively with mentors specializing in immunology, retrovirology, molecular biology, anti-viral therapeutics, or pediatrics. The program is placed within a multi-institutional setting with labs located at NYU Medical Center, the Public Health Research Institute, Veterans Administration Medical Center, and Bellevue Hospital. As many as seven fellows will be accepted into this NIH-sponsored program for up to three years of training.

Individuals with an M.D., Ph.D., or M.D./Ph.D. may apply. *Candidates must be U.S. citizens or permanent residents.* Please submit a curriculum vitae with a summary of past research experience and arrange for three letters of recommendation to be sent directly to:

**Susan Zolla-Pazner, Ph.D.  
V.A. Hospital**

**423 East 23rd Street, Room 18124N  
New York, NY 10010-5050  
FAX: 212-951-6321**

*Women and minority candidates are encouraged to apply.*

**POSTDOCTORAL POSITION** available immediately to study the role of RGS (regulator of G-protein signaling) proteins in heterotrimeric G-protein-mediated signal transduction processes (*Nature* 379:742, 383:172, 1996). Studies include structure-function relationships determining biochemical interaction of RGSs with G-proteins and the role of RGSs in inflammatory and immune processes through development of transgenic animals. Experience in cellular and molecular biology is required and some familiarity with either protein biochemistry or transgenic/knockout technology is desirable. Please send curriculum vitae and the names, addresses, and phone numbers of three references to:

**Dr. Kirk Druey,  
Laboratory of Allergic Diseases  
NIAID/NIH/Twinbrook II  
12441 Parklawn Drive  
Rockville, MD 20852 U.S.A.  
E-mail: [kdruey@atlas.niaid.nih.gov](mailto:kdruey@atlas.niaid.nih.gov).**

*NIH is an Equal Opportunity Employer.*

**POSTDOCTORAL** position available immediately in the Department of Medicine, University of Florida. The NIH-sponsored project involves the development of GC-MS and other methods for drugs and metabolites labeled with stable isotopes and the application of these methods to human and animal studies of *in vivo* drug kinetics and metabolism. The applicant must hold a Ph.D. in chemistry, medicinal chemistry, pharmaceuticals, biochemistry, or a related field. Proficiency in MS and GC-MS is required and experience with the application of GC-MS or LC-MS methods to drug metabolism is preferred. Send curriculum vitae, cover letter, and name, address, and telephone number of three references before August 31 to: **Peter W. Stacpoole, Ph.D., M.D., Director, Clinical Research Center and Professor of Medicine, Biochemistry and Molecular Biology, Box 100226, University of Florida, Gainesville, FL 32610-0226.**

**POSTDOCTORAL RESEARCH POSITION IN  
CEREBROVASCULAR DISORDERS**

The Cerebrovascular Laboratory at the University of Vermont is seeking a postdoctoral research fellow for ongoing studies in stroke. Candidates must have a thorough understanding of cerebrovascular physiology. Technical expertise in whole animal models/surgery preparation and experience in immunohistochemistry required. A background in cell culture techniques is highly desirable.

Send curriculum vitae and three letters of recommendation by October 1, 1997 to: **Martin M. Bednar, M.D., Ph.D., Director of Surgical Research, Given D319, University of Vermont, Burlington, VT 05405.** FAX: 802-656-0680.

**POSTDOCTORAL POSITION** available immediately to study the physiology of oxygen chemoreceptor and intracellular calcium control in carotid body cells. Experience in ratio-metric fura-2 photometry is essential, and in calcium imaging is preferred. Send curriculum vitae and names of three references to: **Dr. Frank Powell, University of California San Diego Department of Medicine, Physiology Division 0623A, 9500 Gilman Drive, LA Jolla, CA 92093-0623.** E-mail: [fpowell@ucsd.edu](mailto:fpowell@ucsd.edu). *Equal Opportunity. Affirmative Action Employer.*

## TENURE-TRACK POSITION National Eye Institute

The Laboratory of Immunology, National Eye Institute, National Institutes of Health, Public Health Service is searching for a tenure track M.D. scientist with expertise in gene therapy and the diagnosis and treatment of retinal diseases. The candidate will be responsible for the development and implementation of ocular gene therapy trials involving retinal diseases particularly inflammatory and vascular disorders. The candidate will be expected to have expertise in basic science techniques relating to gene therapy with board-certification in ophthalmology and fellowship training in retina. Space, post-doctoral fellow support, supply budget and salary are committed. Applicants must be U.S. citizens or permanent residents. A curriculum vitae, bibliography, three letters of recommendation, and a detailed statement of research interests and selected publications should be submitted to:

**Chair, LI Search Committee**  
**NEI, c/o Cheryl Wild**  
**Building 31, Room 6A18**  
**31 Center Drive MSC 2510**  
**Bethesda, MD 20892-2510**



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## Staff Engineer

Life Technologies, Inc., a producer of scientific research products, has an immediate opportunity in Frederick, MD for a Senior or Staff Engineer specializing in the development of downstream processes for the manufacture of biological products. The selected candidate will be responsible for planning, modeling, execution, and technical transfer of projects as part of the Technical Manufacturing group. He/she will also lead technical projects interacting closely with staff from both the R&D and Manufacturing Divisions, in addition to external collaborations. The projects include process organization, scale-up, new product introduction, and new process technology introduction. The primary technical expertise sought is in Tangential Flow and Depth Filtration with a working knowledge of fermentation, cell culture, chromatography, and extraction unit operations. Management of one or more junior level engineers will be an additional responsibility of the position.

Minimum requirements are a Ph.D. with 2 years' experience or an MS with 5 years' experience in process engineering related fields. Good written and oral communication skills, as well as excellent analytical skills are essential. Candidates should have project management experience.

LTI offers a competitive salary and flexible benefits program which includes a company matched 401(k). Mail or fax resumes along with salary requirements in confidence to: **LIFE TECHNOLOGIES, INC., 7335 Executive Way, Frederick, MD 21704. FAX: 301-846-2333.**

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*Working on the molecular level  
to conquer, treat, or prevent  
debilitating diseases.*

## INFECTIOUS DISEASES DISCOVERY RESEARCH

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At the Schering-Plough Research Institute, scientists are discovering innovative therapeutic agents that challenge humankind's most debilitating diseases. If you are seeking an opportunity to be on the cutting edge of exploratory pharmaceutical discovery, become part of an advanced multidisciplinary research group focused on infectious diseases.

### ASSISTANT SCIENTIST/ MICROBIOLOGIST *Chemotherapy and Molecular Genetics*

The Microbiologist we seek will utilize bacteria and fungi to evaluate antibacterial or antifungal drugs using various *in vitro* and *in vivo* procedures. To qualify, you will need a BS degree in Microbiology, Immunology or a related scientific field and 2-4 years of laboratory experience, or an MS degree and 1-2 years of experience. Background must include sterile techniques, growing microorganisms, *in vitro* testing (e.g., MICs) and a range of *in vivo* experimental techniques. Knowledge of computer applications and molecular biology techniques is an asset.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send a scannable resume and cover letter referencing Dept. DD7124-PC, original copy only, to: Human Resources-PC, Schering-Plough Research Institute, 2015 Galloping Hill Road, K-15, Kenilworth, NJ 07033-0539. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*



**Schering-Plough  
Research Institute**

Using Science for Human Advantage

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**SCIENTIST,  
WORLD HEALTH ORGANIZATION  
GENEVA, SWITZERLAND  
VACANCY NOTICE NO. 97/76-E**

Global Programme for Vaccines and Immunization (GPV), Expanded Programme on Immunization (EPI), seeks well-qualified doctoral-level virologist. Incumbent will assist in the development and operation of a network of reference and national laboratories to support polio eradication and measles and yellow fever control activities. Ten years of experience at the national or the regional level in a diagnostic laboratory performing viral isolation and characterization, two years experience at the international level, and experience in managing a virology laboratory are desired. Additional qualifying information is available from: [www.who.org/programmes/per/vacancies/vacancy.htm](http://www.who.org/programmes/per/vacancies/vacancy.htm). Applications should be received by 22 August 1997 and sent (quoting vacancy notice number and including a detailed curriculum vitae and photograph) to: **Head, Professional Candidates, Division of Personnel, World Health Organization, 20 Avenue Appia, CH-1211 Geneva 27. FAX: 41-22-791-0746; e-mail: [vacant@who.ch](mailto:vacant@who.ch).** This vacancy is open to applicants of either sex. Applications from women are encouraged.

**POPULATION GENETICS/BIOLOGY**

The Department of Biological Sciences at Louisiana State University invites applications for a tenure-track Assistant Professor position in population genetics/biology. We encourage applicants whose research interests are at the interface between population biology and genetics and who use the study of molecular and/or quantitative trait variation to investigate population-level processes. Desired starting date January, 1998. The successful candidate will have a Ph.D. or equivalent degree and postdoctoral experience in population genetics/biology. Responsibilities include development of a strong, funded research program directing student research, and teaching at the undergraduate and graduate level. Closing date for applications: September 8, 1997 or until candidate selected. Applications, including curriculum vitae, representative publications, brief statement of research and teaching interests, and three letters of reference should be sent to:

**Dr. William J. Platt**  
Chair, Population Genetics/  
Biology Search Committee  
Department of Biological Sciences  
Life Sciences, Room 508  
Louisiana State University  
Baton Rouge, LA 70803  
E-mail: [btplat@univ1.sncc.lsu.edu](mailto:btplat@univ1.sncc.lsu.edu)

**STAFF SCIENTIST.** The Laboratory of Cellular and Molecular Biology, National Cancer Institute is seeking a Staff Scientist with a minimum of six years of postdoctoral training who has documented expertise in the area of growth factor-mediated signal in relationship to cancer. Preference will be given to candidates demonstrating a strong peer-reviewed publication record in these areas of research. Experience in construction and screening of cDNA libraries and expression vectors, transfection, Southern, Northern, PCR analysis, FACS sorting, advanced protein biochemistry, and receptor-ligand binding assays are required. The candidate will work under the supervision of a tenured investigator. *Candidates must have a M.D. or Ph.D. and U.S. citizenship.* Salary will be commensurate with experience.

Interested applicants should submit a curriculum vitae, bibliography, a one- to two-page summary of research experience, and three references to: **Patrick H. Miller, Building 41/Room A206, 41 Library Drive, MSC 5055 Bethesda, MD 20892.** Applications will be accepted for 30 days from the date of this journal issue.

*The National Cancer Institute is an Equal Opportunity Employer.*

**PROGRAMMER/ANALYST I**

A computer programmer position to lead the Infomatics group of the Arabidopsis Genome Sequencing project at the University of California at Berkeley/USDA Plant Gene Expression Center is available. The individual will be responsible for the information aspects of high-throughput DNA sequencing. Experience in UNIX-based computers and programming with Perl and C is required. Deadline: August 15, 1997. Send résumé to: **University of California, Berkeley, Campus Personnel Office #3540, Job#07-216 20/CP, 2200 University Avenue, Room 7-6, Berkeley, CA 94720-3540.** *The University of California is an Equal Opportunity/Affirmative Action Employer.*

**POSITIONS OPEN**

**PLANT MOLECULAR BIOLOGIST/RESEARCH GENETICIST (PLANTS).** U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS), Corn and Soybean Research Unit, Wooster, Ohio, has a permanent full-time position in which the incumbent will have primary responsibility to develop a research program to identify and elucidate the molecular mechanisms underlying the genetic and biological bases of virus resistance/tolerance in corn. Applicants must have professional knowledge of classical and molecular genetics, and cellular and molecular biology of plants. Applicants must have had the experience to perform techniques involved in traditional and molecular approaches to identify, map, and clone genes and determine their functions, as well as evidenced the ability to plan, conduct, and report research. Professional research experience and/or directly related education required. Research experience involving the molecular biology, genetics, and development of corn in relation to virus disease is highly desirable. Salary commensurate with experience (\$37,507 to \$58,442). *U.S. citizenship required.* For information about the research program, contact **Dr. Raymond Louie: 330-263-3834.** For application information, call the ARS Dial-A-Vacancy service: **301-344-8057** (identify announcement number ARS-D7N-0137) or access ARS Employment Opportunities: <http://www.ars.usda.gov>. Incomplete applications will not receive consideration. Applications must be postmarked by September 19, 1997. *USDA/ARS is an Equal Opportunity Employer.*

**THE JOHNS HOPKINS MEDICAL INSTITUTIONS  
IMMUNOPATHOLOGY FELLOWSHIP**

Description: This is a two-year, academically oriented, ACGME-approved fellowship leading to Board eligibility in immunopathology. The Fellow gains experience with clinical and laboratory aspects of immune-mediated diseases, becomes qualified to administer an immunopathology laboratory, and is prepared for an academic research-oriented career. Qualified students may apply for doctoral training in immunology. Requirements: Completion of residency training in pathology. Stipend: Commensurate with applicant's level of relevant postdoctoral training. Application: Please send curriculum vitae and three letters of recommendation to: **Noel R. Rose, M.D., Ph.D., Director of Immunology, Department of Pathology, Ross Research Building 659, Johns Hopkins University, School of Medicine, 720 Rutland Avenue, Baltimore, MD 21205-2196. Telephone: 410-614-4173; FAX: 410-614-3548.** Applications for the 1997-1998 academic year are being accepted now. *Equal Opportunity Employer/Minorities/Females/Disabled. Drug-free and smoke-free.*

**MANAGER OF TRANSGENIC FACILITY  
DEPARTMENT OF BIOLOGICAL SCIENCES  
COLUMBIA UNIVERSITY**

A position is available to manage a newly established transgenic/knockout mouse facility. Applicants should have a B.S. or M.S. degree and experience in blastocyst recovery, injection and implantation techniques, and ES cell culture. Experience in tissue processing, embedding, and histology is desirable but not required. Please submit a curriculum vitae and three letters of recommendation by September 12, 1997, to: **Terrance Cope, Business Manager, Department of Biological Sciences, Columbia University Mail Code 2401, 1212 Amsterdam Avenue, New York, NY 10027.**

*Columbia University is an Affirmative Action/Equal Opportunity Employer.*

**ADMINISTRATIVE DIRECTOR**

Center for Health and the Global Environment, Harvard Medical School, first Center in the United States focusing on health and global environmental change. Need M.D., M.P.H., or science Ph.D., three to five years as leader in environmental or medical organization, and fund-raising experience. \$75,000. Send résumés to: **R. Amelio, Harvard Medical School, 25 Shattuck Street, Boston, MA 02115.**

**RESEARCH FELLOW POSITION** available for a physician scientist who has research experience in animal models and gene transfer or stem cell. The projects are to develop gene therapy for cancer and HIV-1 (*Nature*, 853: 78; *Nat. Biotech.* 15:46). Competitive salary, depending on experience. Send curriculum vitae and the names of three references to: **Dr. Si-Yi Chen, Department of Cancer Biology, Bowman Gray School of Medicine, Wake Forest University, Winston-Salem, NC 27157.** *Affirmative Action/Equal Opportunity Employer.*

**POSITIONS OPEN**

**TEACHING POSITION IN  
PHARMACOLOGY/PHYSIOLOGY**

The Department of Pharmacodynamics in the College of Pharmacy at the University of Florida is seeking Assistant/Associate Scholar to join the department January 1, 1997. The position will involve full-time effort in teaching of pharmacology and physiology to undergraduate pharmacy students. The position is a 12-month, non-tenure-track faculty position which is renewable annually. Applicants must have a Ph.D. in pharmacology, physiology, or a related field and must have previous teaching experience. Applicants should submit a curriculum vitae, a statement of teaching experience and interests, and letters from three references by September 15, 1997 to: **Dr. Joanna Peris, Chair, Pharmacodynamics Search Committee, Box 100487, University of Florida, Gainesville, FL 32610. FAX: 352-392-9187.**

If any candidate needs an accommodation for this position due to disability, please contact **Dr. Joanna Peris at: 352-392-9768.** *The University of Florida is an Equal Opportunity/Affirmative Action/ADA Employer. The selection process will be conducted under the provisions of Florida's "Government in the Sunshine" and Public Records laws. Search committee meetings and interviews will be open to the public, and all applications, résumés, and other documents related to the search will be available for public inspection.*

**SENIOR SCIENTIST/TOXICOLOGIST**

The ILSI Risk Science Institute, a nonprofit scientific institute, seeks a **SENIOR SCIENTIST** broadly trained in toxicology with expertise in human health risk assessment. Position requires a Ph.D. in toxicology or related biological science and three-plus years of professional experience. Successful applicant will work with scientists from diverse disciplines on issues related to human health risk assessment. Responsibilities include organizing and staffing technical working groups, evaluating and analyzing scientific data, drafting and editing manuscripts, creation of project concepts, and identification and solicitation of funding support for projects. Strong quantitative skills and experience in exposure assessment, PB-PK modeling, uncertainty analysis, or epidemiology desirable. Position level and salary commensurate with experience. To be considered, send detailed résumé, publication names and address of four references, and salary history to: **Human Resources, ILSI, 1126 16th Street, N.W., Washington, DC 20036. E-mail: [rboyce@ilsi.org](mailto:rboyce@ilsi.org); FAX: 202-659-3859.** *Equal Opportunity Employer, Minorities/Females.*

**MODELERS**

The National Institute for Occupational Safety and Health (NIOSH), Health Effects Laboratory Division (HELD), has immediate openings for mathematicians, scientists, and engineers skilled in mathematical/computer modeling. Candidates should have an M.S. or Ph.D. degree and extensive experience in modeling research. Experience in occupational or environmental safety and health research is highly desirable for the leadership position. Specific research areas include *ab initio* quantum mechanics, analysis of complex spectroscopic data, molecular modeling, quantitative structure-toxicity relationships, toxicokinetics, complex biological systems, computational fluid dynamics, and complex engineering/physical systems. Salary range is \$31,000 to \$82,000; benefits packages available. For application information, contact: **NIOSH, HELD/EAB/MR, 1095 Willowdale Road, Morgantown, WV 26505.** Permanent positions are announced on the CDC home page at: <http://www.cdc.gov>. *U.S. citizenship required for permanent positions.* Some temporary positions also available. *CDC/NIOSH is an Equal Opportunity Employer.*

**SENIOR NATURAL SCIENCE EDUCATOR** for Natural History Museum. Plan, implement docent training. Develop, implement, monitor, and interpret conservation, environmental, natural history, evolution, and planetary science programs. Instruction and course developed with other education department training programs. M.A. in biology, Ph.D. preferred. Five or more years of teaching experience, college level preferred; curriculum/program development desirable. Excellent oral, written, interpersonal, organizational, and problem solving skills, and dynamic public speaker. Able to work evenings and/or weekends. Salary commensurate with experience, excellent benefits. Send a letter of interest, résumé, and three references to: **California Academy of Sciences, HR Department #SSE, Golden Gate Park, San Francisco, CA 94118. FAX: 415-750-7210.** No calls please. *Equal Opportunity Employer.*

**POSITIONS OPEN**

**ASSISTANT/ASSOCIATE/FULL PROFESSORS  
THE MOUNT SINAI MEDICAL CENTER  
IMMUNOBIOLOGY CENTER**

A newly formed immunobiology center has initiated a search for outstanding Assistant/Associate/Full Professor-level investigators. The center is interested in all areas of immunology but would especially encourage applications from investigators with a focus on T-cell biology, antigen presentation, cytokines, receptors/signal transduction. Individuals selected are expected to develop (or already possess) and maintain extramurally funded programs and to have already demonstrated independence in their research area.

The center is located in a new research facility adjacent to the Medical Center and this recruitment effort coincides with a general expansion of research faculty in Gene Therapy, Cancer, Genetics, Structural Biology and Molecular Medicine. Interested applicants should send their curriculum vitae, along with summary of research interests and future plans to: **Lloyd Mayer, M.D., Director Immunobiology Center, The Mount Sinai Medical Center, Box 1630, One Gustave L. Levy Place, New York, NY 10029. E-mail: lmayer@smtplink.mssm.edu. We are an Equal Opportunity Employer fostering diversity in the workplace.**

**ASSOCIATE PROFESSOR OR  
PROFESSOR—CLINICAL**

Accepting applications for a twelve-month non-tenure-track position shared between the Division of Environmental Health Sciences, the Ohio State University, and the City of Columbus Health Department. The candidate must have a doctoral degree and training and experience in environmental health and toxicology. Duties include development of graduate courses in risk estimation associated with exposure to environmental agents and mentoring of graduate students. Services to the City of Columbus Department of Health include risk estimation and communication, hazardous material modeling and waste storage issues, and dealing with issues of water quality. The candidate will serve on the Epidemiology Team of the Assessment and Health Information Cluster of the Columbus Health Department. Send a curriculum vitae and three names of references to: **Gary D. Stoner, Ph.D., 1148B James Cancer Hospital, 300 West 10th Avenue, Columbus, OH 43210-1240. The Ohio State University is an Equal Opportunity/Affirmative Action Employer. Qualified women, minorities, Vietnam-era veterans, and individuals with disabilities are encouraged to apply.**

**COLUMBIA UNIVERSITY**

The Department of Psychiatry and the Columbia Genome Center invite applications for a joint tenure-track position at the rank of **ASSISTANT PROFESSOR** or the equivalent **ASSOCIATE RESEARCH SCIENTIST**. The successful applicant is expected to develop an innovative research program in the area of functional genomics. Preference will be given to applicants who develop new technologies and apply these to the analysis of complex traits, particularly behavior. Candidates must have M.D. or Ph.D. It is desirable that the candidate have a strong background and training in molecular biology and expertise in transgenic mouse technology. Applicants should submit a curriculum vitae, a summary of research accomplishments and future research plans, and three letters of reference to: **Dr. T. Conrad Gilliam, Unit 23, 722 West 168th Street, New York, NY 10032. E-mail: tcg1@columbia.edu. Columbia University is an Affirmative Action/Equal Opportunity Employer.**

**ASSISTANT PROFESSOR  
DANA-FARBER CANCER INSTITUTE**

The Department of Pediatrics at Harvard Medical School is inviting applications for a tenure-track position in Neurobiology Research. Applicants should have a Ph.D. or M.D., postdoctoral experience, and a research program that is directly or indirectly related to the biology of brain tumors. Suitable areas of expertise include developmental neurobiology (i.e. murine, *Drosophila*, or other), neuronal cell biology, cytokine or oncogene biology, or signal transduction within the nervous system.

Please send curriculum vitae, description of research interests, and the names of three references to:

**Dr. Alan D'Andrea  
Chair, Neuro-Oncology Search Committee  
Dana-Farber Cancer Institute  
44 Binney Street  
Boston, MA 02115  
E-mail: a\_dandrea@farber.harvard.edu**

**POSITIONS OPEN**



**ARIZONA STATE UNIVERSITY  
ASSISTANT/ASSOCIATE PROFESSOR**

We invite applications for two positions at the tenure-track Assistant or tenured Associate Professor level in the Department of Biology, beginning fall 1998.

**EVOLUTIONARY BIOLOGIST:** Candidates must have primary research interest in the processes of evolution of animals, plants, and/or microorganisms.

**ENVIRONMENTAL or EVOLUTIONARY PHYSIOLOGIST:** Research and/or teaching must address fundamental questions relevant to mechanisms of physiological function in natural environments, using animal models or taxonomically broad perspectives which incorporate animals. (Teaching will include human anatomy and physiology and/or animal physiology.)

Successful candidates will be expected to establish an active research program, participate in undergraduate and graduate teaching, and perform professional service. Ph.D. required by August 1998. Applicants must submit curriculum vitae, e-mail address, selected reprints, a statement of research accomplishments and future directions, and a statement of teaching experience, interests, and philosophy, and arrange to have three letters of recommendation sent to: **Evolutionary Biology or Physiology Search Committee, Department of Biology, Arizona State University, Box 871501, Tempe, AZ 85287-1501. FAX: 602-965-2519; e-mail: biology@asu.edu.** Applications from two individuals wishing to share either appointment will be considered. Application deadline is Sept. 29, 1997, with applications reviewed weekly thereafter until the position is filled. *Arizona State University is an Affirmative Action/Equal Opportunity Employer.*

**ASSISTANT/ASSOCIATE/FULL PROFESSORS  
NEUROBIOLOGIST WITH EXPERIENCE IN  
CELL BIOLOGY OR GROSS ANATOMY**

Applications are invited for two tenure-track positions in the Department of Cell and Neurobiology at the University of Southern California School of Medicine. Both positions require that the successful candidate develop and/or maintain a vigorous, externally funded research program in cell and neurobiology. Candidates for these positions must be qualified to teach either human gross anatomy or cell biology and histology to medical and graduate students. Academic rank is open and dependent on qualifications and previous experience. Candidates at the level of assistant professor must have a Ph.D. or M.D. degree, at least three years postdoctoral training, and prior teaching experience in either gross anatomy or cell biology and histology.

Candidates should send an introductory letter addressing both their teaching experience and their research interests. Applications should include a curriculum vitae, copies of recent publications, and the names, addresses, telephone, and FAX numbers of three references. Preliminary review of applications will begin September 1, 1997; however, applications will be accepted for review through October 1, 1997. Send materials to the attention of: **Search Committee, Dr. Cheryl M. Craft, Chair, Department of Cell and Neurobiology, School of Medicine, University of Southern California, 1333 San Pablo Street, BMT 401, Los Angeles, CA 90033.**

*USC is an Equal Opportunity/Affirmative Action Employer.*

**INDIANA UNIVERSITY  
SENIOR FACULTY POSITION  
ORGANIC CHEMISTRY**

The Department of Chemistry at Indiana University invites applications for a senior position in organic chemistry at the level of Full Professor. Outstanding, established teacher-scholars are sought among individuals who have achieved international recognition in their field. All areas of organic chemistry will be considered with particular emphasis on natural product synthesis and methodology development. Applicants should submit a curriculum vitae, a list of publications, and a brief discussion of on-going research projects to: **Professor Gary M. Hieftje, Chairman, Department of Chemistry, Indiana University, Bloomington, IN 47405. FAX: 812-856-5050; e-mail: chemchair@indiana.edu.** The deadline for receipt of applications is October 31, 1997. *Indiana University is an Equal Opportunity/Affirmative Action Employer and especially encourages applications from women and members of minority groups.*

**POSITIONS OPEN**

**ASSISTANT/ASSOCIATE PROFESSOR  
PATHOGENIC BACTERIOLOGY**

The Department of Microbiology and Immunology at the East Carolina University School of Medicine invites applications for a tenure-track faculty position at the Assistant Professor or Associate Professor level. An individual utilizing modern molecular approaches in the general area of bacterial pathogenesis related to human health and disease is sought. Major responsibilities will include establishment and direction of an independent research program and participation in teaching of medical and graduate courses. Salary and rank will be commensurate with qualifications. Appointment at the Associate Professor level requires a strong record of continuous research funding including current extramural support and evidence of leadership in teaching and service. The Department has 14 full-time faculty, an active doctoral studies program, and is fully equipped with advanced facilities for bacteriology, molecular biology, genetics, virology, immunology, and animal research. Applicants should provide curriculum vitae, a letter describing research and teaching goals, and names and complete addresses of three references by mail to: **Bacteriology Search Committee, Department of Microbiology and Immunology, School of Medicine, East Carolina University, Greenville, North Carolina 27858-4354.**

*East Carolina University is an Equal Opportunity/Affirmative Action University. Accommodates individuals with disabilities. Applicants must comply with the Immigration Reform and Control Act.*

**ASSISTANT OR ASSOCIATE PROFESSOR  
INTEGRATIVE PHYSIOLOGY**

Integrative Physiologist with research interests in environmental and/or evolutionary physiology. The position will be shared between the Department of Zoology and the Program in Biology. Preference will be given to individuals whose research interests complement those of the faculty. Qualifications include a Ph.D. and postdoctoral training in a relevant biological science. The successful candidate will be expected to maintain a vigorous, funded research program. Teaching responsibilities will include the systems physiology component of an introductory biology course, selected parts of an advanced undergraduate physiology course, and a graduate course in area of specialization. Appointment is tenure-track and may be made at the Assistant or Associate level; candidates should indicate at which level they wish to be considered. Review of applications will start on October 1, 1997. Send letter of application, three letters of recommendation, and a curriculum vitae to: **Dr. Mary E. Murphy, Chair, Integrative Physiologist Search Committee, Department of Zoology, Washington State University, P.O. Box 644236, Pullman, WA 99164-4236. Washington State University is an Equal Opportunity/Affirmative Action Educator and Employer. Members of protected groups are encouraged to apply.**

**FACULTY POSITION:  
RHEUMATOLOGY/IMMUNOLOGY**

The Rheumatology Section of the Department of Medicine at The University of Chicago seeks applications for appointment as **ASSISTANT PROFESSOR** from physician-scientists using molecular and/or genetic approaches to examine basic mechanisms of relevance to the field of Immunology. The Section is closely interfaced with the Committees on Cancer Biology and Immunology and the Gwen Knapp Center for Lupus and Immunology Research. This investigative community consists of more than 30 immunologists and molecular and cell biologists with expertise in lymphocyte activation and development, tumor immunology, and transplantation. The candidate should have demonstrated significant research accomplishment and outstanding promise and should hold an M.D. or M.D./Ph.D. Please forward a curriculum vitae, bibliography, and statement of research interest to: **Marcus R. Clark, M.D., The University of Chicago, 5841 South Maryland Avenue, MC 0930, Chicago, IL 60637. The University of Chicago is an Affirmative Action/Equal Opportunity Employer.**

**GRANTS/TECHNICAL WRITER**

Mosaic Technologies, Inc., a pioneering biotechnology company, seeks a grants and technical writer for full-time position or as consultant. Experience writing SBIR, R01 grants and scientific papers/articles required. A background in molecular biology preferred. Mosaic offers an above-average salary and benefits package. Please send resume and writing sample to: **Personnel Department, Mosaic Technologies, Inc., 1106 Commonwealth Avenue, Boston, MA 02215.**

Biotechnology

APRC 1998-1999

section 4 of 6



## UCSF-MDI Meeting "Computational Methods in Combinatorial Chemistry"

UNIVERSITY OF CALIFORNIA SAN FRANCISCO  
Laurel Heights Conference Center  
San Francisco, California  
October 9, 1997

The MOLECULAR DESIGN INSTITUTE of the University of California San Francisco announces a one day meeting to address "Computational Methods in Combinatorial Chemistry" organized by Professor I.D. Kuntz. Computational experts and organic chemistry experts who evaluate library designs in synthesizing libraries are invited to attend. The meeting is co-hosted by the UCSF-CORPORATE SCHOLARS PROGRAM\*.

### Keynote Speaker

David Floyd, VP of Discovery Chemistry,  
Bristol-Myers Squibb  
"Automated Synthesis in Drug Discovery"

### Speakers and Panelists

Jeff Blaney, Chiron Corporation  
Jon Ellman, University of California Berkeley  
Simon Kearsley, Merck Research Laboratories  
Atsuo Kuki, Alanex Corporation  
I.D. Kuntz, University of California San Francisco  
John Mount, Arris Pharmaceuticals  
Mark Murcko, Vertex Pharmaceuticals  
Diana Roe, Sandia National Laboratories  
Ray Salemme, 3D Pharmaceuticals  
Yax Sun, Bristol-Myers Squibb  
Peter Willett, University of Sheffield

### Registration

Registration is US\$500 (corporate) or US\$250 (academic) including food.

To register contact Dr. Judith C. Hempel  
tel: 415-502-8396; fax: 415-502-8397;  
email: [jhempel@cgl.ucsf.edu](mailto:jhempel@cgl.ucsf.edu) or visit the  
UCSF-MDI web site at <http://mdi.ucsf.edu>.

\*Conference fees are waived for CORPORATE SCHOLARS PROGRAM members and affiliates.

### Upcoming Events

The next UCSF meeting in this series is "Molecular Recognition: Docking and Scoring" (February '98) organized by Professor Peter Kollman. Future meeting topics include proteases, parasitology, bioinformatics, and gene delivery.



UNIVERSITY OF CALIFORNIA SAN FRANCISCO  
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## IMMUNOLOGY RESEARCH

### AT SCHERING-PLOUGH

At the Schering-Plough Research Institute in Kenilworth, NJ, scientists are discovering innovative therapeutic agents that challenge humankind's most debilitating diseases. If you are seeking an opportunity to be on the cutting edge of exploratory pharmaceutical discovery, become part of advanced multidisciplinary research teams focused on immunological research.

### ASSISTANT SCIENTIST Molecular Immunology

As a member of our Immunology Research Department, you will join a group of scientists involved in molecular immunology projects. To qualify, you will need a BS degree in Molecular Biology, Cell Biology or Biochemistry and 2-4 years of experience, or an MS degree and 0-2 years of experience. Research experience in a range of molecular and cellular biology techniques including tissue culture, cloning and protein expression is required. To be considered for this position, please reference Dept. DD97-63-BG.

### ASSOCIATE SCIENTIST Transgenic Model Development

The scientist we seek will be part of a team involved in the development of transgenic and knock-out models *in vivo*. To qualify, you will need a BS degree in Molecular Biology and 4-7 years of experience, or an MS degree and 2-4 years of experience. Background must include embryo collection, pronuclear and/or blastocyst injection, and expertise in a variety of molecular biology techniques such as PCR, Northern blot, Southern blot and cloning. Experience in ES-cell culture, derivation of ES cells and aggregation techniques is highly desirable. To be considered for this position, please reference Dept. DD71-05-BG.

### SCIENTIST Histotechnology

We seek a talented scientist to be part of a team responsible for histotechnology analysis of transgenic and knock-out disease models. To qualify, you will need a BS degree in Biology or a related field and at least 7 years of experience, or an MS degree and at least 5 years of experience. Background must include extensive, hands-on research in histology involving microtomy of either paraffin-embedded or cryo-protected tissues, immunohistochemistry and *in situ* hybridization. Additional experience in molecular biology, pathology, genetics or immunology is highly preferred. To be considered for this position, please reference Dept. DD71-20-BG.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send a scannable resume and cover letter, original copy only, referencing the Dept. Code for your position of interest, to: Schering-Plough Research Institute, MS #1250, 2015 Galloping Hill Road, Kenilworth, NJ 07033-0539. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*



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Neurogen Corporation is a leading neuropharmaceutical company engaged in the design and development of drugs promising improved treatment for a broad variety of neuropsychiatric disorders.

## SENIOR SCIENTIST - PHARMACOLOGIST/BIOCHEMIST

### HIGH-THROUGHPUT SCREENING

We are seeking a scientist for our High-Throughput Screening (HTS) effort. Responsibilities of the position include development of radioligand binding assays and cell-based assays for HTS, optimization of ongoing HTS assays including application of statistical Experimental Design methods, and coordination with Biochemistry, Molecular Biology, Cell Culture, and Pharmacology groups.

The successful candidate will have a Ph.D. in pharmacology or biochemistry with 2-5 years of post-graduate experience. This person should have expertise in radioligand binding and a working knowledge of the pharmacology of major classes of receptors including ion channel, G-protein coupled and cytokine. Experience in quantitative pharmacology and the application of rigorous statistical methods for Quality Control of ongoing assays would be a plus as would be a background in receptor stimulated second messenger systems to help design functional assays. Good collaborative and mentoring skills are essential.

## RESEARCH ASSOCIATE

### HIGH-THROUGHPUT SCREENING

Qualified candidates must possess a BS or MS in biological sciences with at least 2 years of academic or industrial postgraduate experience. Experience in recombinant DNA techniques including molecular cloning, transfections and PCR is essential.

Neurogen is located in Branford, CT close to New Haven. We offer a comprehensive compensation program consisting of competitive salary, equity participation, 401(k) plan, health and medical programs. Scientists interested in either position should send a resume and a cover letter stating career goals and noting "HTS" to: **Human Resources, Neurogen Corporation, 35 Northeast Industrial Road, Branford, CT 06405.**

We regret we are unable to acknowledge each resume; only those candidates selected for an interview will be contacted. EOE.

Neurogen Corporation



Roche

## Scientists Senior Scientists Principal Scientists

Roche Molecular Systems, an Alameda, CA company involved in human diagnostics and research products utilizing the polymerase chain reaction technology, has openings for Scientists, Sr. Scientists and Principal Scientists in our Research & Product Development Departments.

For Scientists, a BA/BS & min of 2 yrs additional exp req. For Sr. Scientists, a BA/BS or MS or equiv & min 5 yrs addt'l exp req. For Pr. Scientist, Ph.D. pref & min 5 yrs addt'l exp is req. All degrees should be in one or more of the biological sciences. All positions req exp w/PCR. Exp w/MS Office pref. Check our jobs phone line at (510) 865-5400.

### Roche Molecular Systems

Attn: HR Dept.

1145 Atlantic Avenue  
Alameda, CA 94501-1145  
EEO/M/F/D/V



## MEETINGS

TIGR Science Education Foundation, Inc.  
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A new annual conference exploring how computational tools lead to discovery in biology

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Conference Cochairs:

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David B. Searls, Ph.D., SmithKline Beecham Pharmaceuticals

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**Abstract Deadline Extended to August 15**

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science\_displayads@aaas.org

# POSTDOCTORAL SCIENTIST, PHARMACOLOGY

SmithKline Beecham, a world-wide leader in pharmaceutical research and development, is currently seeking a Postdoctoral Scientist, Pharmacology to join our team.

The selected candidate will have a background in molecular and cell biology for our Pharmacological Sciences division. The scientist will investigate organ remodeling with particular emphasis on renal and prostrate diseases. Experience in evaluating the mechanisms involved in apoptosis would be an advantage. The ideal candidate will be intent on gaining recognition in the scientific community through publication of scientific results and participation in national meetings.

A PhD in Molecular Biology, Biochemistry, Pharmacology or related discipline, up to 3 years postdoctoral experience, and knowledge of standard molecular biology techniques are required. Experience with standard techniques in cell biology, biochemistry, *in situ* hybridization, and immunohistochemistry are preferred.

Located in a state-of-the-art research facility in suburban Philadelphia, SmithKline Beecham offers a competitive compensation/benefits package as well as a stimulating work environment. For confidential consideration, please forward a resume and salary requirements to:  
SmithKline Beecham  
Pharmaceuticals, Job Code H7-0424, P.O. Box 2645, Bala Cynwyd, PA 19004. **Indicating Job Code is essential.** For more information on SmithKline Beecham, visit our Web site at [www.sb.com/careers](http://www.sb.com/careers). We are an Equal Opportunity Employer, M/F/D/V.



**SmithKline Beecham**  
Pharmaceuticals

Challenging the natural limits.

# Genentech, Inc.

*incredible people*  
**extraordinary science**

*What does your work mean to you? At Genentech, our work represents a commitment to progress, a quest for discovery. What matters to us? Something incredibly simple - bettering human health. Whether experimenting with a next-generation medicine, or producing one of our five marketed products in manufacturing, you'll play a critical part in making our vision a reality. Each day, we make it more real. If you share that passion for life, imagine what we could do with your help. It's incredible, and extraordinary.*

## **Scientist - Cell Biologist/Biochemist**

We are currently seeking a PhD/MD level Cell Biologist/Biochemist to establish and operate the Fluorescence Cytometry Core Lab and support Genentech's drug development projects in our Bioanalytical Methods Development Group. In this role, you will be responsible for developing methods to support pre-clinical and clinical studies for recombinant protein drug development. You will also quantify recombinant proteins and enable the characterization of their activity *in vivo* utilizing cellular, biochemical, immunochemical and molecular methods. Proven expertise in flow cytometry and fluorescence microscopy is required.

In addition, you will ensure that state-of-the-art technology and reagents are used for the development of suitable flow cytometry and fluorescence microscopy methods. Experience with fluorophores and knowledge of labeling procedures and cell morphology are essential. Familiarity with immunoassays applicable to the measurement of pharmacokinetic and pharmacodynamic properties of biopharmaceuticals is a plus. This role requires a great deal of collaboration with your team scientists and with colleagues in other disciplines, and requires excellent interpersonal and communication skills. Job Code SCI0514

## **Scientist/Senior Scientist - Immunology**

Our Department of Immunology has an exciting opportunity for a highly motivated, versatile Scientist with a strong interest in the discovery of potential therapeutic molecules for immune-mediated disorders and the desire to develop an interactive research program that complements ongoing drug discovery efforts.

Qualified applicants will have a PhD, MD or equivalent, post-doctoral training (preferably in the research area of Cellular/Molecular Immunology or Biochemistry of the immune system) and 5+ years of research experience in basic immunological sciences with an outstanding record of scientific productivity as demonstrated by publications and accomplishments. Job Code SCI0640

## **Scientist/Group Leader - Pharmaceutical R&D**

Our cutting edge Pharmaceutical R&D Department, the first to commercialize protein therapeutics in specialized delivery systems, is seeking a Scientist/Group Leader. The successful candidate will manage the development of new state-of-the-art dosage forms/delivery systems for protein drugs from proof of concept to successful manufacturing implementation and regulatory filing. You will also supervise laboratory studies, including the physical and chemical characterization of protein with regard to compatibility with pharmaceutical excipients and delivery systems, as well as the assessment of dosage form stability.

To qualify, you must have a PhD in Physical Chemistry, Biochemistry, Pharmaceutical Chemistry or equivalent and 6+ years of industrial experience in protein formulation development. Strong communication skills and the ability to collaborate in a multidisciplinary group setting are required. An ability to evaluate and implement technologies along with a track record of visionary leadership is highly desirable. Job Code SCI0808

Join us and enjoy our exciting success and progressive benefits package that includes fully paid medical/dental/vision coverage, 3 weeks paid vacation, a paid sabbatical program, stock purchase opportunities for full time employees, and free health club membership. For consideration, send your resume, indicating Job Code, to Genentech, Inc., Human Resources, P.O. Box 1950, South San Francisco, CA 94083-1950. Please avoid bold, underline or italic typefaces. We cannot accept faxed resumes. You may also e-mail your resume, indicating Job Code to [jobs@gene.com](mailto:jobs@gene.com) (ASCII files only with a maximum line width of 76 characters). Genentech is an Equal Opportunity Employer. We value the contributions of our diverse workforce.

[www.gene.com](http://www.gene.com)

# BIG CHALLENGES. GREAT SCIENCE.

Agouron Pharmaceuticals, Inc., a recognized leader in the field of rational drug design in La Jolla, CA has several opportunities with its research and development teams. Building upon the success of our first product, an HIV protease inhibitor launched in March, Agouron Pharmaceuticals, Inc. continues in the forefront of research and development of therapeutic products in the fields of oncology, virology, inflammation, ophthalmology and other serious diseases. Join us in the challenge of great science in one of the following multidisciplinary positions:

## MOLECULAR BIOLOGISTS

We have an immediate opportunity for a molecular biologist to initiate new projects in support of high-throughput screening and crystallography. Successful candidates should be experienced in cDNA cloning, in vitro mutagenesis, PCR, recombinant protein expression with an emphasis on Baculovirus/insect cell system. A PhD and 2-3 years postdoctoral or industrial experience are required. Code: 105/CCK

We are currently seeking a molecular biologist/cell biologist to be responsible for large scale Baculovirus/insect cell and mammalian cell culture systems in support of recombinant protein production. Expertise in optimizing cell culture to produce recombinant protein using 20-L or larger bioreactors is required. Applicants should have a PhD in molecular biology or cell biology with 2-3 years' post-doctoral or industrial experience. Code: 105/CCK2

In addition, we have an opening for an individual with a background in molecular biology and cell culture. A BS/MS in molecular biology or biology is preferred with at least 1-2 years laboratory experience in cDNA cloning, PCR, and in vitro mutagenesis is essential. Code: 105/CCK3

## BIOCHEMISTS, HIGH-THROUGHPUT SCREENING

We are currently seeking an experienced PhD biochemist to design and develop a variety of high-throughput assays. The successful candidates will have experience with innovative screen development and adapting novel techniques to HTS, strong expertise in enzymology, data management, and direct knowledge of robotics. Requirements include several years of postdoctoral and industry experience, willingness to work on several projects simultaneously and excellent communication skills. Code 135/ZH1

We have an additional position for a MS/BS biochemist to support our high-throughput screening lab. A degree in biochemistry or related field is preferred. Experience with assay development, data management and robotics expected. Code 135/ZH2

## CELL BIOLOGIST, POSTDOCTORAL POSITIONS

We are seeking creative individuals who can make significant contributions to identification and validation of new drug targets in the areas of oncology and inflammation. Postdoctoral positions are available to study processes related to induction of the transcription factor NF- $\kappa$ B, their involvement in protection from apoptotic cell death or inflammatory responses. A strong basic research background and experience in advanced techniques of cell cycle regulation and apoptosis would be major assets. Possibility exists for regular full-time position upon completion of post-doctoral training. Code: 102/ZHPD

## VIROLOGISTS

We are seeking experienced PhD, MS and BS level virologists to plan and implement research aimed at the discovery, evaluation and development of novel therapeutic antiviral agents. Candidates should have experience in infectious virus cell-based assays, molecular biology, biochemistry, and should be able to work effectively with individuals of varied backgrounds and disciplines in a highly motivated research team setting. Prior experience with HIV, herpesvirus, and hepatitis C infection systems would be advantageous. Code: 125/VR

## RESEARCH SCIENTIST, PHARMACOKINETICS & DRUG METABOLISM

As part of an interdisciplinary team you will provide pharmacokinetic expertise (in-vitro, in-situ and in-vivo) to help select compounds and formulations in discovery phase. Responsibilities will include early assessment of absorption using in-vitro transport studies, intestinal permeability studies and in-vivo pharmacokinetic and oral bioavailability studies. A key responsibility will be interpreting and communicating results to the project teams. Qualifications include a PhD in Pharmaceutical Sciences along with a background in pharmacokinetics and at least 2 years of industrial experience in the design, conduct and interpretation of in-vitro, in-situ and in-vivo pharmacokinetic experiments. The candidate must have a proven ability to work in a team environment, excellent communication skills and the ability to write reports for regulatory submissions. Code 420/BS

## ASSOCIATE SCIENTIST, CRYSTALLOGRAPHER

We have an immediate opening for a BS/MS level scientist to join our protein crystallography group. Experience with proteins and protein crystallization would be a plus. The successful candidate will work as part of an interdisciplinary drug discovery team and will be responsible for crystallization of target proteins and preparation of crystals for x-ray structural analysis. Code: 110/DM

We offer a competitive salary and benefits package. For immediate consideration, please forward your resume and salary history to: Human Resources Department, Code (see above), Agouron Pharmaceuticals, Inc., 3301 N. Torrey Pines Court, La Jolla, CA 92037; e-mail: [jobs@agouron.com](mailto:jobs@agouron.com). For more information visit our web site: <http://www.agouron.com>. EOE.



**Agouron**  
Pharmaceuticals, Inc.

# IN IT FOR LIFE.

Improving life by advancing science.

Genetics Institute has been a leader in the biotechnology industry in discovering, commercializing and collaborating with academia and the pharmaceutical industry on novel protein therapeutics. To date, nine of these have advanced to human clinical evaluation or commercialization, and the outlook for continued innovation is unprecedented.

On December 31st, 1996, Genetics Institute became a wholly-owned subsidiary of American Home Products (NYSE:AHP). American Home Products is one of the world's largest research-based pharmaceutical and healthcare products companies, and is a leading developer, manufacturer and marketer of prescription drugs and over-the counter medication.

Our success as one of the largest biotechnology employers in Massachusetts has been fueled by our collaborative work environment focused on the future. This culture attracts and inspires some of the brightest minds whose ideas sustain us as a leader in the industry.

Join us in making even more advancements that improve quality of life for all of us:

## ANDOVER, MA MAMMALIAN AND MICROBIAL CELL SCIENCES LAB

### Molecular Biology/Virology

An exceptional opportunity ... an outstanding environment for a scientist with excellent organizational, communications, and computer skills who enjoys benchwork and performs well in a team-oriented, multi-disciplinary setting. You will develop and implement PCR-based assays for the detection of potential viral contaminants of production cell cultures and participate in a comprehensive program to ensure the viral safety of recombinant therapeutic proteins produced in mammalian cells. To qualify, you must have a Ph.D. and hands-on experience in molecular biology, including extensive involvement with PCR. Formal training and experience in virology is preferred. (Job Code: SC81-PL-TC)

To be considered for current or future job openings, please send resumes, suitable for scanning (see below), indicating job code to: Human Resources, Genetics Institute, Inc., 87 CambridgePark Drive, Cambridge, MA 02140. Fax: (617) 876-8847.

Scannable resumes should be forwarded on plain white bond paper, using standard types and fonts, and no bold or italic print. When faxing resumes, please also mail an original copy.

Genetics Institute offers competitive salaries and benefits, including comprehensive health care, dental and life insurance, three weeks' paid vacation, 401(k), pension plan, relocation assistance, tuition assistance, and an on-site exercise facility.

Genetics Institute is an equal opportunity, affirmative action employer, M/F/D/V, dedicated to building strength through diversity.

For additional opportunities, visit our web site at:

[www.genetics.com](http://www.genetics.com)

GENETICS  INSTITUTE®

*Harnessing the Body's Power to Heal™*

## The feel of a *start-up*. The force of a leader.

Genome Therapeutics Corp. is looking to build upon our current functional genomics expertise by formally establishing a multi-disciplinary team charged with evaluating and developing novel therapeutic targets to further our efforts in the fields of genomics. We are looking for the following key professionals to contribute to this venture.

### OPPORTUNITIES IN FUNCTIONAL GENOMICS

- RESEARCH SCIENTISTS
- POSTDOCTORAL SCIENTISTS
- SENIOR SCIENTISTS

Several positions are available immediately to expand the existing genomics program at Genome Therapeutics toward the systematic analysis of gene function and signal transduction pathways as a prerequisite for rational drug target identification and drug development strategies. Qualified candidates will have a strong background in molecular biology, cellular biology and/or protein biochemistry with a Bachelor's or Master's degree in a related discipline and 2-5 years' experience. Senior Scientist candidates should have extensive experience in protein biochemistry and/or drug discovery research.

You'll find our salaries to be highly competitive and our benefits comprehensive. For immediate consideration, please send your resume to: **Human Resources, Genome Therapeutics Corporation, 100 Beaver Street, Waltham, MA 02154; FAX: (617) 893-9535; Email: michelle.bell@genomecorp.com.**

Additional opportunities available in Human Genetics, Pathogen Genetics, and Bioinformatics.

Discover even more about us at:  
[WWW.GENOMECORP.COM](http://WWW.GENOMECORP.COM)



We are an equal opportunity employer discovering the strength diversity brings to the workplace M/F/D/V.



St. Jude Children's  
Research Hospital

ALSAC • Danny Thomas, Founder

### Postdoctoral position in molecular mechanisms of carcinogenesis in ataxia telangiectasia

A postdoctoral position is available to investigate the role of ATM in lymphomagenesis and signal transduction. ATM (the product of the gene mutated in the human syndrome ataxia telangiectasia) is a critical component required for the normal cellular response to a variety of agents that compromise genomic integrity. Mice deficient for ATM are characterized by a pronounced propensity to develop lymphomas. Using these mice we will investigate the underlying processes that contribute to lymphoma formation in the absence of ATM.

This postdoctoral position would be ideally suited to someone with a strong molecular biology background who has recently obtained a Ph.D. and/or M.D.

The research environment at St. Jude Children's Research Hospital is outstanding and offers state of the art training and facilities for all aspects of molecular biology. To be considered for this position please send a C.V. and three letters of reference to Peter McKinnon, Ph.D., Department of Genetics, St. Jude Children's Research Hospital, 332 North Lauderdale, Memphis, TN 38101. E-mail: peter.mckinnon@stjude.org

AA/EOE

# CHIRON

## A GLOBAL LEADER IN BIOTECHNOLOGY

CHIRON CORPORATION's mission is to end human suffering caused by disease through the development of products that transform the practice of medicine. Since 1981, we have been at the forefront of biotechnology, using genetic engineering and other tools to develop products for the diagnosis, prevention and treatment of human disease. Currently, we seek the following individuals to join our global team in the beautiful San Francisco Bay Area.

*Featured opportunities: MD Director to develop and oversee gene therapy and clinical trials and Director/Associate Director to work on clinical research as a member of our Vaccine team. Pharmaceutical experience is strongly preferred for both positions. Respond to Job Code: JC*

### POSTDOCTORAL SCIENTIST Bioorganic Chemistry

As a member of the Chiron Technologies team, you will investigate the synthesis and biological applications of structured non-natural biopolymers. State-of-the-art combinatorial synthesis technologies will be used to investigate new functions of sequence-specific heteropolymers, primarily N-substituted glycines or peptoids. Your PhD in synthetic organic or bioorganic chemistry should be supported by strong organic synthesis skills and some experience in either solid-phase synthesis or automated instrumentation. Job Code: 2742

### PROJECT MANAGEMENT - MANAGER Drug Development

You will manage cross-functional, product-specific drug development teams with responsibility for all aspects of development strategy and implementation. You will facilitate team productivity and coordinate, prepare and implement the Quality Development Plan to achieve specified timelines and budgets. You will also ensure excellent communication among team members and collaborators as well as coordinate project presentations to management. You must have previous project management experience with 5+ years of healthcare-related experience, preferably in therapeutic drug development. An advanced degree in a scientific discipline desired. Strong interpersonal communication and matrix management skills essential. Job Code: 2244

### PROJECT MANAGER Nucleic Acid Diagnostics

Join us as we pioneer the emerging field of Nucleic Acid Diagnostics (NAD) technology. You will manage cross-functional teams and be responsible for planning and controlling all project aspects according to the

project plans, project design goals, project schedules (with well defined deliverables and milestones) and FDA and worldwide regulatory requirements related to medical diagnostics. This may involve new product/system development, product/process improvements and/or product applications. You will need a related Bachelor's degree or an advanced degree with 9+ years of progressively responsible project management experience, including 5 years in a supervisory/managerial role. Must be an effective planner, communicator, and team builder capable of optimizing the product development cycle. Job Code: 2740

### SR. SCIENTIST/ASSOCIATE DIRECTOR - DEVELOPMENT Biological & Immunological Assays

Develop biological and immunological assays to support therapeutic product development programs. This will include generating SOP/validation reports, presenting results and supervising staff. Requires a PhD in a related field with 8 years' experience and proven skill in developing biological and immunological assays, including ELISA, and prior supervisory/management experience. Knowledge of GLP/GMP required. Familiarity with assay automation preferred. Job Code: 2650

### RESEARCH ASSOCIATE II DNA Sequencing/Synthesis

This pivotal role performs DNA sequencing, data analysis and annotation, and documentation functions. Requires BA degree or equivalent and 2 years' relevant experience, including familiarity with all aspects of DNA sequencing using ABI instruments and computers to analyze/track data. Accurate documentation skills a must. Job Code: 2715

We welcome those with the dedication, spirit and flexibility needed to rise to the ambitious challenge of our mission. To learn more, send your resume, referencing Job Code corresponding with the position of your interest, to: Chiron Corporation, Human Resources, 4560 Horton Street, Emeryville, CA 94608. We are an equal opportunity employer. Visit our Web site at: [www.chiron.com](http://www.chiron.com).

# CHIRON

## The Search For Cures Begins With A Search For The Best.

At Pfizer, we entrust the enormous task of discovering treatments and cures for major diseases to some of the world's most gifted scientific talents. We challenge our scientists to practice leading-edge science in our collaborative, multi-disciplinary scientific community. Our Fortune 100 company maintains a commitment to R&D that's unrivaled in our industry, as we've invested a total of \$9.4 billion since 1990 and expect a 1997 R&D investment of approximately \$2 billion. The only other investment that comes close, is the one we make in our people.

Here, we realize that to attract the best, we must offer the best. That's why we provide a collegial environment that lets you create new professional opportunities, advance your education and balance your work and personal life, all while making the fullest contribution possible to the drug discovery process at Pfizer. If you've been searching for the chance to shape the future of the pharmaceutical industry, join us at Pfizer.

### Postdoctoral Fellowship Statistical Molecular Biology

Your experience in molecular biology and interest in mathematics could qualify you for this unique opportunity to apply statistical methods to molecular biology problems. You will spend 18 months with Dr. Françoise Seiller-Moiseiwitsch at the University of North Carolina at Chapel Hill, developing expertise in the field of statistical molecular biology. Following this didactic work, you will work on molecular biology problems in the Statistical Research Group at Pfizer Central Research in Groton, CT for an additional 18 months. An M.D. or Ph.D. in molecular biology, or equivalent field, and laboratory experience in molecular biology are required. Applicant must have the full sequence of calculus and linear algebra that are prerequisites for mathematical statistics and fluency in one or more programming languages.  
**Job Code: 2224**

### Ph.D./MS Bioinformatics

As part of our Genetic Technologies group, the selected candidates will develop and apply computational sequence analysis methods for database searching, protein structure/function prediction and pattern discrimination from complex data. Experience in molecular biology research, applied statistical analysis, WWW development and RDBMS design is required. Excellent communication skills and the ability to work in a dynamic team environment are essential. **Job Code: 2231**

### MS/BS Scientists New Lead Discovery

We are seeking self-directed scientists to be responsible for a significant part of the early in vitro discovery of new chemical leads. Duties include optimizing enzyme and binding assays, adapting them to microtiter format, executing and following up high-throughput screens and verifying and determining the selectivity of leads in dose-response assays. An MS/BS in Biology or a related discipline and experience with mammalian cell culture, automated instrumentation, radioisotopes and computerized data handling are required. Additionally, experience in protein purification and molecular biology, and knowledge of chemistry are desirable. Given the nature of this position, good communication and recordkeeping skills are essential. **Job Code: 2225**

In addition to providing competitive salaries, we offer an excellent compensation package, comprehensive flexible benefits and generous relocation support. For immediate consideration, please forward your resume, a description of relevant research, interest and experiences, publication record, undergraduate and graduate transcripts and 3 letters of recommendation to: **Employee Resources, Pfizer Inc, Central Research Division, Job Code # \_\_\_\_\_, Eastern Point Road, Groton, CT 06340.** For more information on career opportunities available at Pfizer, please visit our Web site: <http://www.pfizer.com>. We are an equal opportunity employer dedicated to diversity M/F/D/V.



We're part of the cure.

### Postdoctoral Research Associate Position

Postdoctoral position available to participate in studies directed toward the identification and characterization of genes involved in primary immunodeficiencies, particularly genes controlling B cell development. The applicant should have a PhD or MD/PhD and experience in molecular biology and/or tissue culture. Please send curriculum vitae, statement of research interests, and three letters of reference to: **Dr. M. E. Conley, Department of Immunology, St. Jude Children's Research Hospital, 332 N. Lauderdale, Memphis, TN 38105.** Equal Opportunity/Affirmative Action Employer.

**EBI**<sup>®</sup> Medical  
Systems

Enhancing Bone Healing  
through Applied Science

### Research Scientist

EBI, a leader in the field of electromagnetic and direct current bone growth stimulators, seeks a highly motivated research scientist to join a team involved in new product development. The applicant should have a Ph.D. in cell biology, physiology, biomedical engineering or a related field, preferably with expertise in orthopedic research. An applicant with an M.S. degree and several years experience in a medical device related field will also be considered.

The successful applicant will help in the design and execution of cellular and animal experiments leading to new clinical applications of biophysical stimuli for soft tissue, cartilage, and bone repair. They will play a major role in all aspects of product development including basic research, design and implementation of clinical trials, data analysis, and extensive interaction with orthopedic surgeons.

EBI offers competitive compensation including a substantial corporate benefits program. For confidential consideration please send a recent résumé to **Human Resources, Electro-Biology, Inc., 6 Upper Pond Rd., Parsippany, NJ 07054,** or FAX to (201) 402-1396.

## EXECUTIVE DIRECTOR

The Association of Systematics Collections (ASC) invites applications for the position of chief executive officer in Washington, D.C. Duties include: establishing and maintaining relationships within the community of natural history collections through direct contact with members, organization of national meetings, representing constituency to Congress, federal agencies, and other organizations; program development and implementation; and supervising business operations of ASC office (including finances, fund raising for the organization's activities, and administrative support for organization). **Required skills:** Demonstrated abilities relevant to working with private, public, federal and state institutions and agencies in affecting regulations and legislation; a background in natural history collections and/or working in the Washington, D.C., environment. Prior professional experience in a relevant scientific field of organismal, collection-based research (e.g., systematics, conservation, community or species ecology, etc.) will be useful but not required. Send a letter of application, resumé or curriculum vitae, and names, addresses, and telephone numbers of at least three references to: **Association of Systematics Collections; 1725 K Street, NW; Suite 601, Washington, DC, 20006-1401.** E-mail may be used for preliminary inquiries: [asc@ascoll.org](mailto:asc@ascoll.org). Review of applicants will begin 1 September 1997 and continue until a suitable candidate is hired. *Equal Opportunity Employer.*

Merck Research Laboratories – Department of Biochemistry, has several immediate opportunities for highly motivated BS/MS scientists in the following areas:

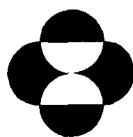
### BIOCHEMISTRY

The qualified candidates will have significant experience in biochemistry, enzymology, chemistry, or related subject and have interest in a career investigating enzymatic targets in order to identify novel chemotherapeutic agents. Additional experience in receptor biochemistry, molecular biology, lipid biochemistry and/or cell biology (including cell culture) is highly desirable. (AD# 48)

### MICROBIOLOGY

The qualified candidate will be a microbiologist with *in vitro*, animal model or clinical experience. (AD# 49)

Merck Research Laboratories is located in Rahway, NJ, approximately 25 miles from New York City. Our salaries, benefits, and growth potential are excellent. Qualified candidates should send resume, transcripts, and three letters of reference to: **Merck Research Laboratories, Human Resources, AD# \_\_\_\_, P.O. Box 2000, RY80A-3, Rahway, NJ 07065.** EEO/AA/VH Employer.



**MERCK**  
Research Laboratories

## *Plant Gene Expression Principal Investigator and Post-Doctoral Fellow*

DuPont is a world leader in research in the chemical and biological sciences, from fundamental and applied research programs ranging from industrial bioprocess to genetically improved crops, and faster routes to environmentally friendly crop protection chemicals.

As part of a major expansion in biotechnology, DuPont Central Research and Development is seeking highly motivated individuals for a Principal Investigator (PSS 0258) and Post-Doctoral Fellow (PSS 0259) position in the area of plant gene expression. The successful candidates will join the Plant Gene Expression Group, which includes scientists from both Central Research and the Agricultural Biotechnology groups, located at the DuPont Experimental Station in Wilmington, Delaware.

The Plant Gene Expression Group is aimed at understanding and manipulating factors affecting the expression of transgenes in plants. Areas of research for these positions may include stability of transgene expression, developmentally- or environmentally-controlled gene expression, transcription factors, promoters and enhancers, mRNA processing, stability, transport, and translation, or other related topics. Previous work in these areas need not have focused on plant systems. Post-doctoral experience is preferred for applicants for the Principal Investigator position.

Whether you are just starting your career or looking for growth opportunities, we encourage you to apply. We are looking for highly motivated individuals who can become members of our research teams to enhance both our success as well as their own. You will enjoy our state-of-the-art Experimental Station facilities. These positions offer a highly competitive salary and an excellent benefits package. We are located in Wilmington, DE, an area that offers an attractive lifestyle with easy access to all the cultural, academic and recreational activities on the Eastern Seaboard.

**Interested candidates should submit their C.V. including a list of references to DuPont Human Resources, PSS 0258 or PSS 0259, 1007 Market Street, N12419, Wilmington, DE 19898, or you may fax to: 800-631-2206. DuPont is an equal opportunity employer. Please make reference to the job code when responding.**



**DuPont Central Research  
and Development**



# Want to get your foot in the door?

Then let SCIENCE open some doors for you by attending the **SCIENCE Career Fairs**. SCIENCE Career Fairs offer the perfect opportunity for scientific professionals to meet in person with representatives from top biotechnology and pharmaceutical companies, universities, governmental agencies, and institutions.

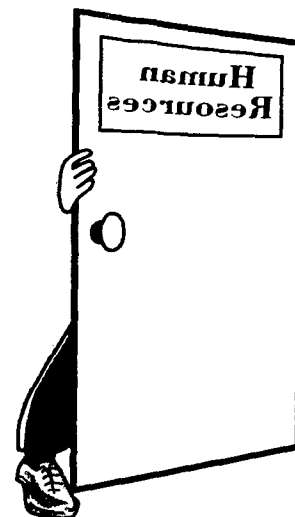
## UPCOMING 1997 SCIENCE CAREER FAIRS

|                                                                                                                                                                                  |                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Cambridge, MA</b> on the MIT Campus<br>84 Massachusetts Ave., Stratton Building<br>Student Center, 2nd Floor, La Salla Room<br>5 Sept.: 11 am – 4 pm<br>6 Sept.: 11 am – 3 pm | <b>Palo Alto, CA</b><br>on the Stanford Campus<br>Tresidder Memorial Union<br>3 Oct.: 11 am – 4 pm<br>4 Oct.: 11 am – 3 pm |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|

### To pre-register:

Please submit your résumé or CV via FAX: (202) 289-6742, or via e-mail: [careerfairs@aaas.org](mailto:careerfairs@aaas.org). Indicate the career fair location for which you are submitting. **Remember to bring multiple copies of your CV or résumé with you to the Career Fair; a copy will be necessary to gain admission to the hall. Admission to all of the events is FREE.**

Do not contact MIT or Stanford directly. They are not responsible for organizing these events.



## SCIENCE CAREER FAIRS

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**For more information contact Jill Steinberg**  
Phone: 202-326-6543  
Fax: 202-289-6742  
[science\\_displayads@aaas.org](mailto:science_displayads@aaas.org)

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#### Postdoctoral Research Positions

#### Viral Exanthems and Herpesvirus Branch Division of Viral and Rickettsial Diseases Centers for Disease Control and Prevention

The VEHB Molecular Epidemiology Group addresses pathogenesis of fatiguing and chronic disease. We are looking for scientists with a strong desire to apply state-of-the-art molecular technology to important biologic questions of public health significance. Experience with both DNA and RNA molecular protocols is necessary. Postdoctoral positions are available in the following areas:

**Molecular Profiling:** Studies to demonstrate alterations in gene expression, demonstrate genotoxic events, and search for novel infectious agents in patients with fatiguing illnesses. Current studies include application of cDNA array technology and differential display to elucidate the pathogenesis of Chronic Fatigue Syndrome and Persian Gulf War related illnesses. For additional information contact **Dr. Suzanne Vernon** at 404/639-2181 or e-mail [sdv2@cdc.gov](mailto:sdv2@cdc.gov).

**Molecular Pathology:** Studies of viral gene expression and molecular markers of prognosis in cervical cancer and other chronic illnesses. Current studies include development of sensitive and novel techniques of nonisotopic *in situ* hybridization to study alterations in gene expression in a morphologic context. For additional information contact **Dr. Elizabeth Unger** at 404/639-3533 or e-mail [eru0@cdc.gov](mailto:eru0@cdc.gov).

Address replies with curriculum vitae, names and contact information for three references, and statement of interests to: **Janie L. Oddy, Personnel Generalist, Human Resources Management Office, Centers for Disease Control and Prevention, 4770 Buford Highway, MS K-15, Atlanta, GA 30341-3724. E-mail: [jlo0@cdc.gov](mailto:jlo0@cdc.gov).**



CALYDON, a new biopharmaceutical company, is developing Attenuated Replication Competent Adenoviruses (ARCA™). We are seeking a viral immunologist with interests in clinical applications.

**Ph.D.**

**Viral Immunologist**

We are also seeking Research Associates with experience in virology for product development.

**M.S., B.S.**

**Product Development**

Our candidates are highly-motivated individuals who wish to make a significant contribution to the development of cancer therapeutics.

CALYDON offers an exciting research and corporate opportunity, with competitive salaries, stock options and benefits. Send your CV to:

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Menlo Park, CA 94025

Incyte Pharmaceuticals, Inc., is a leader in the design, development and marketing of genomic database products, software tools and related services. Our database products integrate bioinformatics software with both proprietary and publicly available genetic information to create information-based tools used by pharmaceutical and biotechnology companies in drug discovery and development.

#### Scientific Programmer, Senior Scientific Programmer, Bioinformatics

You will develop large scale UNIX-based DNA sequence analysis software used in Incyte's products. Requires solid experience in scientific computation and proven programming skills with UNIX (C/C++, Perl) and SQL databases. Requires BS in science or engineering with 2+ years in UNIX software development. Exposure to bioinformatics or molecular biology desired. REF: 971, 975.

#### Scientific Programmer - Image Analysis, Bioinformatics

You will develop Windows based image analysis tools for high-throughput gene expression analysis. Requires 3+ years programming experience in the Windows environment, demonstrated fluency with C++ and MFC on Win95/NT4, additional familiarity with Unix programming, and prior experience developing interactive imaging packages. Strong plusses include experience with ID and 2D DSP algorithms and toolkits, programming experience with SQL databases, and a background in molecular biology. REF: 970.

#### Director, Biostatistics

You will provide biostatistical experience for several product areas. Proven professional with strong biostatistical experience required. You should be support statistical needs for new product efforts. REF: 845.

#### Scientist/Bioinformatics

You will help develop large scale UNIX-based DNA/Protein sequence analysis software, and implement various analytical methods in new products. Requires proven programming skills with UNIX (C/C++, Perl) and a strong background in sequence analysis methods and molecular biology. Requires Ph.D. in science or engineering (or equivalent experience) and 2+ years exposure to bioinformatics, SQL database programming experience a plus. REF: 976.

#### Data Flow Engineer, Bioinformatics

You will perform data processing, data analysis and quality control support for large DNA sequence databases. Requires working knowledge of molecular biology and genetics, good command-line UNIX skills, some exposure to DNA sequence analysis methods, and strong communication and organizational skills. BS in science or engineering and appropriate experience required. REF: 853, 953, 972, 973, 974.

#### Scientist, Data Analysis

Ph.D Biologist with excellent analytical skills needed to provide scientific leadership for Genomics Tools software products. Ability to work effectively with multi-disciplinary teams an important ingredient to success. Minimum 2 years postdoctoral experience and strong background in molecular biology required, genomics experience a plus. Extensive experience with sequence search tools and UNIX knowledge required, programming skills highly desirable. REF: 846

#### Research Associate, Data Analysis

MS/BS level Biologists with strong analytical skills and a broad background in eukaryotic systems to provide data quality control for Incyte database products. Ability to work independently and a strong background in molecular biology required, experience in the Genomics field highly desirable; experience with sequence search tools and assembly software, familiarity with biology resources on the internet, and UNIX skills preferred. REF: 978.



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If you recognize these qualities in yourself, we want to hear from you. Incyte offers competitive salaries, an outstanding benefits package and significant opportunities for professional growth. Mail/Fax your resume to:

Incyte Pharmaceuticals, Attn; HR, REF: \_\_\_\_, 3174 Porte Dr.,  
Palo Alto, CA 94304 FAX: (415) 845-4176.

E-mail: [employ@incyte.com](mailto:employ@incyte.com) EOE. Website: [www.incyte.com](http://www.incyte.com)

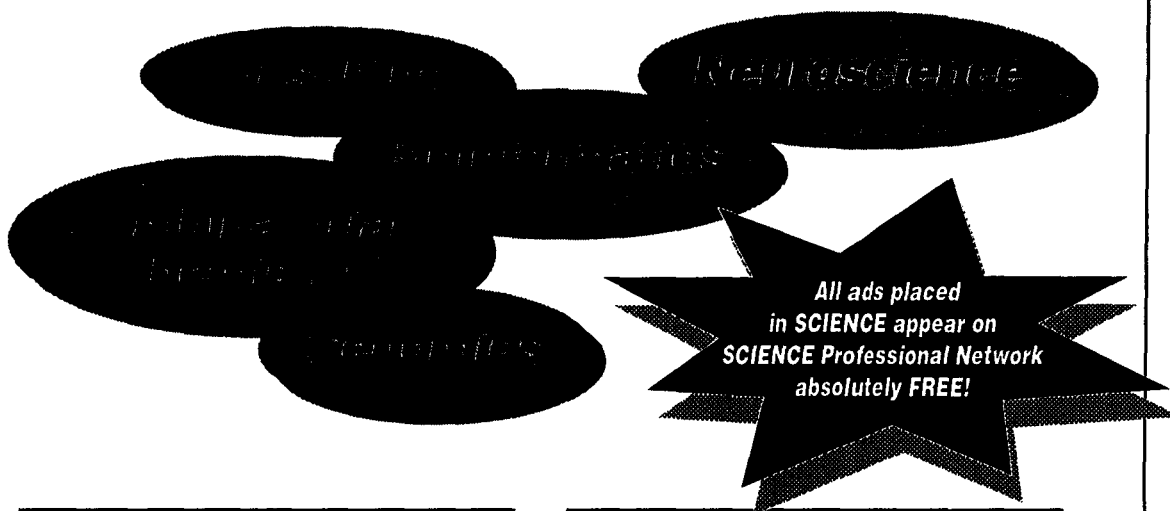
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Ernest & Julio Gallo Winery, the largest winery in the world, is seeking a Postdoctoral Research Associate to work on a challenging research project in their Genetics Group.

You will participate in current group research projects that include germplasm evaluation, disease resistance, genomic mapping and fingerprinting, gene isolation and characterization. This position requires a Ph.D. in Plant Genetics/Biochemistry or related field with a strong background in molecular biology and biochemistry. Experience with gene discovery techniques is highly desirable.

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## INNOVATIVE TECHNOLOGY ACCELERATING DISCOVERY

Alanex Corporation, a subsidiary of Agouron Pharmaceuticals, Inc., is a rapidly expanding drug discovery company in the La Jolla scientific hub of San Diego, California. We have created an innovative combinatorial chemistry technology that accelerates the drug discovery process by integrating the automated design, high speed synthesis, and high throughput screening of small molecule libraries.

We currently have openings for motivated scientists at several levels in all departments.

Successful candidates will be competent in both written and oral communication, will have excellent organizational skills, and will be able to work both independently and as members of multidisciplinary project teams. Experience in the pharmaceutical industry is preferred.

### HIGH THROUGHPUT SCREENING RESEARCH SCIENTIST

We have an opening in our High Throughput Screening Group for a creative research scientist. This high profile position requires a PhD with 3-5 years' postdoctoral experience and at least 2 years HTS experience. The successful candidate will have extensive experience in developing both enzyme and cell based assays for HTS applications. Excellent data management skills are essential, and supervisory experience is desired. Code: 125/JMM/S

### METABOLISM AND PHARMACOKINETICS RESEARCH SCIENTIST

The successful candidate will be responsible for the development of rapid in vitro assays and in vivo pharmacokinetic models to help guide our lead optimization efforts. This position requires a PhD and 2-5 years' postdoctoral experience in characterizing the metabolic transformation of novel compounds. Experience in metabolite identification is also desired. Code: 125/JMM2/S

Alanex Corporation offers competitive salaries and an excellent benefits package, including stock options. Please mail a detailed resume to: Human Resources, Attn: Code (see above), Alanex Corporation, 3301 North Torrey Pines Court, La Jolla, CA 92037-1022, or email to hr@alanex.com. EOE



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**CORVAS INTERNATIONAL**, a biopharmaceutical company, is engaged in the design and development of next-generation therapeutic agents for the prevention and treatment of major cardiovascular and inflammatory diseases.

We have several important new career opportunities in the areas of vascular and tumor biology. These new positions will play a prominent role in the development of a new and exciting technology focused on the identification and characterization of endothelial surface proteins as part of a new multidisciplinary approach in developing new drug delivery strategies based on vascular targeting. We are looking for creative, enthusiastic and dedicated people with a proven ability to work independently who will move this technology forward toward the discovery and development of a new generation of therapeutic modalities to treat a broad spectrum of diseases, including cancer and cardiovascular disorders.

### PROTEIN ANALYTICAL CHEMIST

Candidates must have extensive experience in multidimensional protein separations. Strong preference will be given to those individuals with specific experience in two dimensional gel electrophoresis and associated densitometric data analysis. Additional experience in microsequencing and/or mass spectrometric analysis of proteins and peptides is desired.

### EXPERIMENTAL TUMOR BIOLOGISTS

We are looking for two individuals who have extensive experience in the establishment, implementation, and analysis of experimental models of solid tumor growth. The ability to use both conventional and immunohistochemical approaches to tissue analysis is required. A knowledge of vascular biology with an emphasis on the vasculature of solid tumors is highly desirable.

### MOLECULAR BIOLOGISTS

We are looking for several individuals to form a core group in molecular biology that will be responsible for the molecular cloning and expression of novel protein targets. Proven experience in the areas of cDNA cloning (conventional and expression-based methodologies), sequencing and analysis is required. Additional experience in the area of heterologous gene expression in mammalian cell systems is highly desirable.

For all of the positions described above, a BS, MS, and/or Ph.D. or equivalent is required. Prior experience in an industrial research environment is preferred.

We offer an attractive compensation package, equity participation, and a highly interactive, stimulating scientific environment. For consideration, please send/fax CV with letter to: **Corvas International, HR, 3030 Science Park Road, San Diego, CA 92121; Fax (619) 455-5169; www.corvas.com. EOE.**

**CORVAS**  
INTERNATIONAL

# Sequana Therapeutics, Inc.

Sequana Therapeutics, Inc. is a leading genomics company dedicated to the discovery of genes associated with the pathology of common human diseases. We are currently seeking senior-level scientists for our gene discovery programs. Sequana has strategic alliances with Glaxo Wellcome, Boehringer Ingelheim and Corange International, and research programs in NIDDM, asthma, osteoporosis, obesity, schizophrenia, CNS and cancer. We are presently seeking the following talented individuals to contribute to these programs:

## BIOCOMPUTATIONAL SCIENTIST AND ANALYST

We seek a motivated Ph.D. level scientist with proven experience in protein sequence analysis to develop algorithms of large-scale automated data processing and curation. Programming experience in C, C++ and Perl is required. Understanding of the relational and object-oriented database technology is a plus. Minimum of MS in a relevant scientific discipline required. (Job code: Sci/97-38)

## LEAD SCIENTIST

We seek a motivated Ph.D. level scientist with proven experience in protein sequence analysis to develop algorithms of large-scale automated data processing and curation. Programming experience in C, C++ and Perl is required. Understanding of the relational and object-oriented database technology is a plus. Minimum of MS in a relevant scientific discipline required. (Job code: Sci/97-39)

## SENIOR SCIENTIST

Responsible for directing a team of researchers to clone complex disease genes using positional cloning, sequencing, and sequence analysis technologies. We require a Ph.D. or MS in Genetics or Biology with 3+ years experience in automated DNA sequencing and sequence analysis. The selected candidate must be familiar with positional cloning and gene identification techniques. (Job code: Sci/97-37)

## SCIENTIST I

As a member of our biology group, you will be responsible for generating monoclonal antibodies and assist in ES cell culture. This will involve cell fusions, screening hybridomas, and homologous recombination screening. A BS degree in Biology or related field with experience in generating monoclonal antibodies or 2-3 years experience in tissue culture is required. (Job code: Sci/97-40)

## UNIX SYSTEMS ADMINISTRATOR

We seek a UNIX Systems Administrator that will be responsible for server maintenance, workstation hardware setup/installation, software installation/support, and modification of systems configurations and operating systems. Required background must include a minimum of 2 years of Sun Solaris experience, Bachelors Degree in Computer Science (or equivalent), and 2 years of general networking experience. (Job Code: Sci/96-16)

## ENGINEER II (SYBASE DBA)

We are looking for an Engineer II that will be responsible for database performance and maintenance. Our database system is integral to the operation of our genetics and DNA sequencing laboratories, developed using Sybase 11 technologies. Will maintain the schema and all source code as well as perform backups, DBCC checks, and provide Sybase expertise to a staff of application developers. The selected candidate must have a minimum of 5 years of SQL and Sybase experience, Bachelors Degree in Computer Science or related fields and 3-4 years of general programming experience. Familiarity with ERWIN or a like tool a plus. (Job code: Sci/96-34)

Sequana Therapeutics is a publicly-held corporation headquartered in La Jolla, CA. Our executive offices and laboratory facilities are located in a science park across from the Scripps Research Institute, about one mile from UCSD and The Salk Institute. We offer a highly competitive salary, excellent benefits package, and relocation assistance where appropriate. Please mail or fax resume to: Sequana Therapeutics, Inc., Att: HR/ Code (see above), 11099 North Torrey Pines Road, Suite 160, La Jolla, CA 92037. Fax: (619) 452-7420. We are an equal opportunity employer.  
[www.sequana.com](http://www.sequana.com)



Pfizer scientists are involved in some of the most critical research in the world today. As a Fortune 100 company, we have established a product pipeline that is unparalleled, and an intellectual, collaborative environment that inspires scientific achievement. Join us and become a part of the cure.

In addition to a fast-paced, yet collegial environment, we offer very competitive salaries and excellent benefits including relocation assistance. For confidential consideration, please forward resume to: Employee Resources, Pfizer Inc, Job Code # \_\_\_\_\_, Central Research Division, Eastern Point Road, Groton, CT 06340. For more information about Pfizer, see us on the Internet at <http://www.pfizer.com>. We are an equal opportunity employer M/F/D/V.

## Ph.D. Cardiac Biochemist

Join a multidisciplinary team of highly enthusiastic investigators in the discovery of novel therapeutics for the treatment of cardiovascular disease. Ph.D. in Biochemistry or related discipline with experience in cardiac energetics, signal transduction enzymology and/or receptor function. Research experience in the areas of heart failure and myocardial ischemia/reperfusion injury highly desirable. Requires a minimum of 3 years' postdoctoral training and the ability to work effectively in a team environment; drug discovery experience a significant asset. **Job Code: 2234**

## BS/MS Scientist — Immunology/Biology

Our Immunology drug discovery project team is looking for a scientist to profile compounds in *in vitro* cellular functional assays, receptor binding assays and enzymatic assays. Work will include validation studies of potential immunological targets and new assay development. BS/MS in immunology or cell biology and laboratory experience with assays of immunological function, biochemistry and/or enzymology are desired. **Job Code: 2235**

## BS/MS Scientist — Antibody Development

In this position, you will be a member of a team responsible for the discovery and characterization of antibodies obtained from hybridomas and antibody phage display libraries. The successful candidate will have 1-5 years' experience in BIAcore assay development and kinetic analysis, including antibody affinity determinations. Additional experience in at least one of the following areas would be advantageous: tissue culture, protein purification, analytical biochemistry or antibody engineering. **Job Code: 2236**



We're part of the cure.



## PARKE-DAVIS POSTDOCTORAL POSITIONS IN SIGNAL TRANSDUCTION

Our drug research and scientific discoveries have reached around the globe to make Parke-Davis Pharmaceutical Research an industry leader. We've redesigned the process of drug discovery, development and marketing to insure even more advancements in the next century and beyond. Currently, we are seeking individuals to join our team in Ann Arbor, MI.

Postdoctoral positions are available in the Department of Cell Biology at Parke-Davis for highly motivated, independent Scientists in the area of intracellular signaling. The department is highly interactive with interests in basic and applied aspects of signal transduction. Opportunities are available in the laboratories of:

**Alan R. Saltiel:** Mechanisms of insulin action; regulation of protein kinases and phosphatases

**Stuart Decker:** Growth factor receptor signaling, cell cycle regulation by Raf/MEK/MAP kinase pathway

**Roman Herrera:** Regulation of signaling events involved in cell adhesion and differentiation of leukocytes and epithelial cells

**Judy Sebolt-Leopold:** Cell signaling mediated by Ras and the MAP kinase cascade; application of signal transduction biology to the discovery of anti-cancer agents

**David Dudley:** Novel mechanisms of kinase inhibition; peptide receptor signaling

**Robert MacKenzie:** Central and peripheral molecular mechanisms of body weight regulation; regulation of G protein-coupled signaling by RGS proteins

Applicants should be recent M.D. or Ph.D. graduates with a strong background in cell biology, molecular biology, biochemistry or related area. The Department of Cell Biology provides exceptional research facilities and support services.

Join a team of professionals and broaden your scientific career with Parke-Davis. Enjoy a new level of research freedom, competitive salaries and benefits. Interested individuals should mail, fax or e-mail a CV\* and list of references to:

**Human Resources, Job Code 974164, Parke-Davis Pharmaceutical Research Division, 2800 Plymouth Road, Ann Arbor, MI 48105. Fax: (313) 998-3394. E-mail: [resume@aa.wl.com](mailto:resume@aa.wl.com)**

\*Submit CV on laser-quality white paper, with legible 10 point or larger type, and avoid bold-face, italics, borders, etc.

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## CLAUDE BERNARD CHAIR

### Biochemistry/Molecular Biology/ Molecular Genetics/Nutrition Research

The Pennington Biomedical Research Center and the LSU Medical Center, both of Louisiana State University, are seeking a candidate at a senior level as holder of the Claude Bernard Endowed Chair. Any relevant area of biochemical and molecular or genetic research, including the broadly defined areas of nutrition and metabolic diseases, is acceptable. The applicant is expected to bring along a currently active research program in his/her area of expertise. The Pennington Center has 223,000 square feet and \$14.2 million research funding in nutrition and preventive medicine. The successful candidate may have a teaching appointment, if desired. Space, transition funds, salary, and fringe benefits present an extremely attractive package. Applicants should send a curriculum vitae, bibliography, a brief description of future research plans, and the names of three (3) references to:

**William Hansel, Ph.D.**  
Chairman, Search Committee  
Ref. CB/WH  
Pennington Biomedical Research Center  
6400 Perkins Road  
Baton Rouge, LA 70808-4124

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# Astra Research Center Boston

Astra is a rapidly expanding international leader in pharmaceutical research and development, responsible for creating the #1 selling drug in the world, Prilosec®.

With over \$5 billion in sales and 20,000 employees worldwide, Astra's mission is to improve human health and the quality of life.

Astra Research Center Boston, an integral part of Astra, is initially focusing its research on the development of small molecule drugs and vaccines to improve therapies against *Helicobacter pylori*. Working on a broad range of international collaborations, our excellent scientists are exploiting *H. pylori* genomic information to identify targets for pharmaceutical and biological intervention. With a long-term commitment to the research and development of novel therapeutics in additional disease targets, we offer you the opportunity to be part of innovative, creative multidisciplinary project teams.



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## **Principal Scientist Protein Biochemist for Vaccine and Process Research**

The candidate will develop the methods for purification and characterization of proteins which are candidate vaccine antigens. Perform process research for antigens and vectored vaccines. Work closely with scientists in molecular biology, fermentation, biochemistry and formulation research to assure interdisciplinary approach to vaccine design, process and development. Collaborate in the identification of analytical assays and assure that developed processes can proceed to support clinical evaluations and requirements for development and manufacturing. Develop appropriate documentation for regulatory filings and for process transfer and lead other scientists in these efforts. Requires Ph.D. plus 5 years (beyond postdoctoral) of independent research experience and scientific management in protein isolation and characterization; desire to research processes for new future proteins also necessary. (Code: S97-30)

## **Research Scientist Protein Biochemist for Vaccine and Process Research**

Establish purification processes and design in-process assays for recombinant vaccine antigens, including membrane proteins and vectored vaccines. Develop appropriate process methods and documentation. Analyze antigenic and macromolecular structure. Requires Ph.D. in Biochemistry plus postdoctoral experience in protein purification and analysis and desire to research processes for new future proteins. (Code: S97-31)

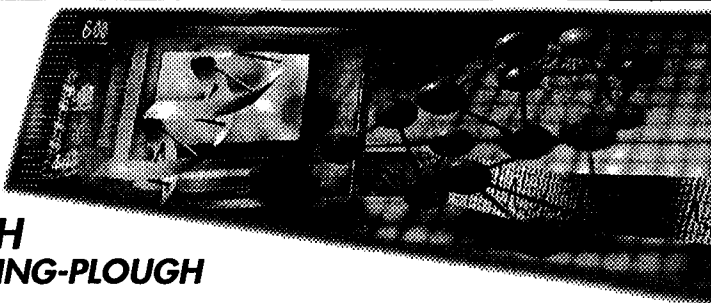
## **Research Associate Biochemistry**

Work in different areas of vaccine projects involving protein purification, analysis, development of assays, and formulation in novel physical systems. BS/MS in Biochemistry or related scientific field with experience in protein biochemistry and associated assays required. (Code: S97-32)

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Qualified candidates please send your C.V., indicating appropriate job code, to: Astra Research Center Boston, Human Resources, 128 Sidney Street, Cambridge, MA 02139; FAX (617) 576-4668.

Working on the molecular level  
to conquer, treat, or prevent  
debilitating diseases.



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### LEADERSHIP OPPORTUNITY IN COMPUTATIONAL CHEMISTRY

We seek a talented Senior Molecular Modeler to lead our Computational Chemistry group. This group is well-equipped and housed in a state-of-the-art research facility at the Schering-Plough Research Institute in Kenilworth, NJ. Members of the Computational Chemistry group work closely with synthetic chemists to discover molecules suitable for advancement as drug candidates. Computational Chemists utilize all appropriate information including structural data from in-house x-ray crystallographic and NMR analyses of target:drug complexes. Opportunities also exist to work with biophysical chemists utilizing techniques such as titration calorimetry.

The successful candidate must have demonstrated experience in the application of computational techniques to both proteins and

small molecules. A PhD, knowledge of advanced 3-dimensional OSAR methods and experience with iterative structure-based drug design are required. Expertise in the analysis of combinatorial libraries, data generated by high throughput screening and industrial experience are preferred, but not required. Demonstrated leadership ability, good communication skills and supervisory experience are also required.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send a scannable resume and cover letter, original copy only, referencing Dept. MMCT/BP, to: Schering-Plough Research Institute, MS #1250, 2015 Galloping Hill Road, Kenilworth, NJ 07033-0539. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*



**Schering-Plough  
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Department of Commerce  
National Oceanic and Atmospheric Administration (NOAA)  
Director, National Climatic Data Center (NCDC)  
\$101,666 - 121,265 Annually

The candidate selected for this position will be responsible for the direction and administration of the National Climatic Data Center, National Environmental Satellite, Data and Information Service (NESDIS).

#### Mandatory Professional/Technical Qualification Requirements:

1. Experience in the planning, development, implementation, management of suitable and valid methods/procedures for preserving/organizing a voluminous and varied quantity of meteorological and climatological records utilizing computer technology.
2. Experience coordinating meteorological/climatological exchange and information services through interaction with scientists and other officials of Federal agencies, academic institutions, research foundations, private sector and international organizations.
3. Professional experience which demonstrates full knowledge and application of methods, techniques and theory utilized in decision making for observing standards and quality assurance levels of meteorological data.
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for an announcement package, including  
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### PROFESSOR OF INGESTIVE BEHAVIOR

The Pennington Biomedical Research Center, a research facility of Louisiana State University, invites applications for an academic/research position. The successful candidate will have an M.D., Ph.D., D.V.M., or Sc.D. in Behavioral Science, and a research background in central mechanisms of feeding behavior. There should be a substantial record of scientific productivity; individual should have independent grant support, and leadership ability. Teaching and administrative opportunities are available but not required. Applications, including cover letter, curriculum vitae, bibliography, names, addresses, and telephone numbers of three references will be accepted until **September 1, 1997**. Please send applications to:

George A. Bray, M.D.  
Ref. #015218  
Pennington Biomedical  
Research Center  
6400 Perkins Road  
Baton Rouge, LA 70808  
FAX: (504) 763-0935

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*If you are a highly motivated scientist with strong cross-functional expertise hoping to apply your talents to the discovery and commercialization of products for the treatment of human infectious diseases, your future leads straight to Lilly's Division of Infectious Diseases Research.*



## **Ph.D. and BS/MS**

### **Biochemists**

We are seeking scientists with proven expertise in biochemistry and molecular biology. Individuals with experience with microorganisms (bacteria, fungi, yeast and viruses) would be preferred. These individuals will become colleagues on multidisciplinary teams committed to identifying, characterizing, purifying and exploiting novel antimicrobial/antifungal targets. Experience purifying and characterizing proteins, developing functional assays for proteins, and study the kinetics and mechanisms of inhibition of enzymes and proteins is critical. Knowledge of microbiology, microbial physiology, and protein biochemistry is highly desirable.

## **Ph.D. and BS/MS**

### **Microbiologists (Bacteriologists, Virologists)**

We are seeking several Microbiologists to enhance our infectious disease efforts. Successful candidates will be involved in a multidisciplinary team effort directed at the discovery, characterization and exploitation of new antimicrobial targets. Positions available will be focused on bacteria or viruses. Significant efforts are ongoing into Hepatitis C virus and antibiotic resistant Gram-positive bacteria. Positions include opportunities for scientists with both in vitro and in vivo experience.

## **Ph.D. and BS/MS**

### **Fungal Molecular Geneticist**

We are seeking highly motivated scientists to enhance our fungal genetics effort. Successful candidates will join our interdisciplinary effort directed at the discovery, characterization and validation of novel antifungal targets. Background must include expertise in genetics of fungal pathogens or filamentous fungi model systems as well as a solid knowledge of current molecular biology and biochemical techniques (PCR, cloning, library construction, gene expression, mutant construction and analysis). Working knowledge in bioinformatics is an added asset. Demonstrated ability to work both independently and as an effective team member is critical.

## **Ph.D. Team Leader Bacterial Genomic Research**

We are seeking a team leader to enhance and lead the antibacterial discovery effort to identify and exploit novel targets from Gram-positive bacteria. The candidate should have proven expertise in molecular biology, prokaryotic expression vectors, and biochemical assay development. An established publication record and significant scientific network is required. This individual is to provide scientific and technical leadership to a multidisciplinary team of motivated scientists who are taking a genomic approach to new target identification and validation. Experience with microbial databases and microbial sequencing projects would be very beneficial.

## **Post Doctoral Scientists**

We are looking for creative individuals in a variety of scientific areas to explore emerging aspects of human infectious diseases. A Ph.D. in Biology, Virology, Mycology, Biochemistry, Microbiology or related field is required. Focus areas in Infectious Diseases Research include hepatitis viruses, important human fungal pathogens, and antibiotic-resistant Gram-positive bacteria. Lilly Postdoctoral scientists gain sound practical experience and focus training that will significantly expand their scientific knowledge and abilities in drug discovery.

We provide the salary, compensation and advancement opportunities you would expect from an industry leader. For confidential consideration, please send your resume and cover letter indicating the position of interest to: **Eli Lilly and Company, Division of Infectious Diseases, US Recruiting and Staffing, Lilly Corporate Center, Indianapolis, IN 46285.**

We are an equal opportunity employer dedicated to diversity and the strength it brings to the workplace. For other opportunities at Eli Lilly and Company, please access our Job Bank at: <http://www.lilly.com>.

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Eli Lilly and Company

KNOWLEDGE IS POWERFUL MEDICINE



## St. Jude Children's Research Hospital

ALSAC • Danny Thomas, Founder

St. Jude Children's Research Hospital, a premier center for biomedical investigation ([www.stjude.org](http://www.stjude.org)), has established a new Department of Structural Biology, which offers excellent opportunities in all areas of biophysical research. A number of positions at the postdoctoral and technician levels are available within the Department to work with recently hired faculty. **Dr. Stephen White** (one postdoc and one technician) is working on crystallographic analyses of protein-RNA and protein-DNA complexes involved in replication, transcription and translation. **Dr. Richard Kriwacki** (one postdoc and one technician) is performing nuclear magnetic resonance and biophysical studies of proteins and protein complexes involved in cell-cycle control, including cell-cycle inhibitors, tumor suppressors, and oncogenes. **Dr. Hee Won Park** (one postdoc and one technician) is interested in using X-ray crystallography to study receptor-mediated effects of transforming growth factor-beta and to study structure/function relationships of mammalian DNA repair enzymes.

Postdoctoral applicants should ideally have experience in several of the following areas: protein crystallography, protein crystallization, multi-dimensional, multi-nuclear NMR of macromolecules, molecular biology, protein over-expression and purification, protein-protein binding studies and protein folding studies. Research technician applicants should ideally have a M.S. or a B.S. with 3-5 years experience, and have an interest in original research and an aptitude for the use of complex instrumentation, such as UV/VIS and CD spectrophotometers. Activities include molecular biology (PCR, DNA sub-cloning), protein over-expression and purification, protein crystallization, stable-isotope labeling of proteins, and laboratory management.

State-of-the-art equipment for protein crystallography, NMR and computer graphics has recently been installed in the Department, and facilities are also available for biochemistry and molecular biology. The Department occupies approximately 7,000 square feet on adjacent floors of the new Danny Thomas Research Facility. Danny Thomas founded St. Jude Children's Research Hospital and the hospital continues to receive support through the fund-raising efforts of the American Lebanese Syrian Associated Charities.

Please send a curriculum vitae and the addresses of three references to:

**Dr. Stephen W. White, D. Phil**  
**Chairman, Department of Structural Biology**  
**St. Jude Children's Research Hospital**  
**332 North Lauderdale**  
**Memphis, TN 38105**

AA/EOE

## GLOBAL CAREER OPPORTUNITIES

# SCHERING



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You and*

*Your competence"*

**Our Central Nervous System Research Department  
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Acute Neurodegeneration  
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### Your tasks:

You will be engaged in the development of novel treatments, discovering new target mechanisms and developing novel biological methods to evaluate the therapeutic potential of new compounds which will lead to better understanding and improved therapy.

### Your qualifications:

This position requires an experienced background in CNS biology and pharmacology. Furthermore a good working knowledge in that area with regard to experimental animal models (e. g. MCAO) is needed. The successful applicant will have a distinguished record of research achievements in the field of neurodegeneration, experience in leading a research team and good interpersonal communication skills. Requirements include a Ph. D in Neurobiology, with at least 3-6 years of productive research, preferably in a pharmaceutical research environment.

### We offer you:

Generous research resources, including personnel and instrumentation to establish a research team and close collaboration with a group of pharmacologists, biochemists, molecular biologists, chemists and a good salary and benefits.

***We are a research-oriented pharmaceutical company. Our objective is to make a lasting contribution to the progress of medical science and to improve the quality of human life via the medium of innovative ideas. We are engaged in the development of highly advanced medical specialities: contrast media, hormone preparations and therapeutic drugs for the treatment of severe illnesses. More than 21,000 employees worldwide are engaged in the pursuit of these objectives. Health care is our primary objective which we approach with due responsibility to man and the environment for the establishment of a future worth living.***

Interested individuals should submit a curriculum vitae, statement of research interests, salary requirements, copies of selected publications, and names of 3 references to: Schering Aktiengesellschaft, Personalabteilung FO, D-13342 Berlin

An initial reply will be provided by: Dr. Seilheimer  
Telephone No.: (030) 4 68-1 20 84

The application should be marked "Neurobiologist 2000"  
Additional positions we offer in the internet at:  
<http://www.schering.de>

**Schering: Ideas in action**

**POSITIONS OPEN**

The California Science Center, Biological Resources Division (BRD), U.S. Geological Survey, invites applications for a **PERMANENT POSITION** to be headquartered at its Sequoia-Kings Canyon Field Station, southern Sierra Nevada. The Station, established in 1968, has a rich history of research in populations, communities, and ecosystems; ongoing research programs focus on global change, watershed chemistry, invasive species, and fire history and effects. The core of the successful applicant's position will be to plan, coordinate, facilitate, and conduct high-priority research identified in the Sierra Nevada Ecosystem Project's recent Report to Congress. Applicants should have a strong commitment to the mission and a strong commitment to working closely with the land managers (primarily in the Department of the Interior) who will apply their research findings. This position will be a GS-13, FT, at a salary range of \$53,456 through \$69,492 per annum. Apply to: **The Office of Personnel Management, 700 Fifth Avenue, Suite 5950, Seattle, WA 98104-5012.** Announcement and application is available on the Internet at: <http://www.usajobs.opm.gov>, or call OPM Career America Connection at: 206-553-0888. Complete materials must be postmarked by the closing date shown on the OPM announcement. If interested, contact the Office of Personnel Management for the closing date of this announcement. *An Equal Opportunity Employer.*

The Institute of Medical Psychology and Behavioral Neurobiology invites applications for the **HEAD OF A JUNIOR RESEARCH GROUP** Cortical Reorganization and Learning in Humans to be established by the Volkswagen Foundation. Qualifications include Ph.D. or M.D. in behavioral neuroscience or behavioral neurology or psychophysiology. Applicants should have a strong background in neuroimaging (including MEG/EEG and fMRI/PET). Through its programme Junior Research Groups at German Universities the Volkswagen Foundation provides young and excellent scientists with the opportunity to lead a group of several coworkers or graduate students, thereby enabling them to carry out independent research work at an early stage in their career. A funding period of five years is envisaged. Interested applicants should send their curriculum vitae, list of publications, a description of previous, research activities, and names of three references to:

**Niels Birbaumer, Ph.D.**  
**Institute of Medical Psychology and Behavioral Neurobiology**  
**University of Tübingen**  
**Gartenstraße 29**  
**D-72074 Tübingen**

**POSTDOCTORAL FELLOWSHIP** is available to study the effects of mechanical deformation on gene expression and tumor biology of transformed cells. Expertise in cell biology and molecular biology is preferred. The successful applicant will work with a growth factor research group (laboratory of Jung San Huang) in the Department of Biochemistry and Molecular Biology. Send curriculum vitae and the names and addresses of three references to: **Frank E. Johnson, M.D., Department of Surgery, St. Louis University Medical Center, 3635 Vista, St. Louis, MO 63110-0250.** Telephone: 314-577-8316; FAX: 314-771-1945. *St. Louis University is an Equal Opportunity Employer.*

**POSTDOCTORAL POSITIONS** available immediately in an NIH-funded project to determine the structure and signal transduction mechanism of the ANF receptor. Experience in protein chemistry (e.g., chemical modification, affinity-labeling, mapping, mass spectrometry), biophysical techniques (e.g., BIAcore, CD, fluorescence, light scattering), and site-directed mutagenesis would be desirable. Send curriculum vitae and names of three references to: **Dr. Kunio Misono, Department of Molecular Cardiology, The Lerner Research Institute, Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195-5071.** FAX: 216-444-9263; e-mail: [misonok@cesmtp.ccf.org](mailto:misonok@cesmtp.ccf.org).

**POSTDOCTORAL POSITION** available immediately for research on the ecophysiology of calcium nutrition in temperate trees. Potential topics include bases for interspecific differences in uptake and use of calcium, and effects of calcium on sapling survival. Successful applicant will join a large, collaborative study of feedbacks between canopy tree dynamics and calcium cycling in northeastern forests. Send letter of interest, curriculum vitae, and names of three references to: **Dr. Charles D. Canham, Institute of Ecosystem Studies, Box AB, Millbrook, NY 12545.**

**POSITIONS OPEN**

**SANDIA NATIONAL LABORATORIES  
 POSTDOCTORAL POSITIONS IN  
 COMPUTATIONAL CHEMISTRY**

Sandia National Laboratories in Livermore, California, has an ongoing program in computational chemistry which has immediate openings for Postdoctoral Researchers. Areas of research include the modeling of proteins, organic polymers, and small molecules; using a variety of computational methods such as molecular mechanics, molecular dynamics, and *ab initio* quantum chemistry. We have a mix of methods and software development and applications work. Successful candidates shall have a Ph.D. in chemistry, biophysics, or a related field, and proven experience in software development or application of computational chemistry methodologies. Knowledge of C and C++ is highly desirable. Experience in one of the following modeling areas would be of particular interest: proteins (including antibody modeling), polymers (mechanical and chemical properties), small molecule/macromolecule interactions. The applicant must also have good communication skills, both oral and written. The research group has extensive computing resources including high-end graphics workstations, high-performance clusters of multiprocessor PC's, SMP workstations, as well as massively parallel machines including an Intel Paragon and teraflop MPP. We feel that this position will provide especially exciting prospects for candidates with a strong background in computational methods who are interested in developing innovative solutions to applied problems. Salary and fringe benefits are extremely competitive. Candidates should send curriculum vitae, reprints, statement of research expertise and interests, and uncertified copies of college transcripts to:

**Dr. Diana Roe**  
**Sandia National Laboratories**  
**c/o Anna Isham, MS 9111**  
**Human Resources Department CA0037**  
**P.O. Box 969**  
**Livermore, CA 94550**

Deadline is October 1, 1997. *U.S. Citizenship is normally required. Equal Opportunity Employer/Affirmative Action Employer.*

**POSTDOCTORAL POSITION** available for *in vivo* studies of memory B cell development and somatic mutagenesis of antibody genes at the single cell level. Candidates should have a strong background in molecular immunology. Studies will involve high-resolution cell sorting by FACS and optical trapping technology, single-cell/molecule PCR, transgenic construction, and RNA processing. Send curriculum vitae to: **Dr. Lawrence J. Wysocki, Division of Basic Sciences K902, National Jewish Medical and Research Center, 1400 Jackson Street, Denver, CO 80206.** FAX: 303-270-2182; e-mail: [wysockil@njc.org](mailto:wysockil@njc.org). *Equal Opportunity/Affirmative Action Institution.*

The University of Pennsylvania has an immediate opening for a **POSTDOCTORAL FELLOW/RESEARCH ASSOCIATE** with strong background in molecular biology and protein chemistry for investigation of novel regulators of the plasminogen activator system. Please contact: **Dr. Doug Cines, Coagulation Department, 7 Founders Pavilion, Hospital of the University of Pennsylvania, 3400 Spruce Street, Philadelphia, PA 19104-4283.** FAX: 215-662-7945. *Equal Opportunity Employer.*

**POSTDOCTORAL POSITIONS** are available to study synexin interaction with biological membranes, and regulation of surfactant protein expression in fetal lungs. Previous training in cellular and molecular biology and understanding of protein chemistry required. Please send résumé and names and addresses of three references to: **Dr. Avinash Chander, Department of Pediatrics, Division of Neonatology, Jefferson Medical College, Suite 700, 1025 Walnut Street, Philadelphia, PA 19107.**

**POSTDOCTORAL POSITION** available to study ion channels in the microcirculation. Experience in electrophysiology and/or vascular cell physiology preferred. Send curriculum vitae and names of three references to: **Dr. William F. Jackson, Department of Biological Sciences, Western Michigan University, Kalamazoo, MI 49008.** FAX: 616-387-2849; e-mail: [jackson@wmich.edu](mailto:jackson@wmich.edu). *Affirmative Action/Equal Opportunity Employer.*

**POSITIONS OPEN**

**POSTDOCTORAL ASSOCIATE/RESEARCH FELLOW  
 CENTER FOR WATER AND THE ENVIRONMENT  
 Natural Resources Research Institute  
 University of Minnesota, Duluth**

The Natural Resources Research Institute (NRRI) has an opening for a Postdoctoral Associate/Research Fellow to work on the integration of a forest landscape and succession model with forest bird habitat and landscape information. The work is part of a comprehensive effort to predict current and future populations of forest birds in Minnesota and forests in the Great Lakes region in response to scenarios of change due to logging, natural disturbance, and potential climate change.

Qualifications: Postdoctoral Associate—Ph.D. in the biological sciences or related area and experience in modelling, geographic information systems, and multivariate statistical analysis. Research Fellow—Master's degree in the biological sciences or related area by date of hire.

In addition to minimum qualifications, education and experience in forest and landscape ecology, animal biology, and conservation biology is desired, as well as experience working as an effective member of professional work teams.

Starting date is fall 1997. Verification of degree status will be required of all finalists for the position. To apply send a letter of application, résumé, and the name, address, and telephone number of three references. Applications must be postmarked by 30 August 1997. Send applications to: **Postdoctoral Associate/Research Fellow Search Committee, NRRI Box SCI, 5013 Miller Trunk Highway, Duluth, MN 55811.** Website: [www.nrri.umn.edu](http://www.nrri.umn.edu).

*The University of Minnesota is an Equal Opportunity Educator and Employer.*

**POSTDOCTORAL POSITIONS  
 MOBILE SELF-SPLICING INTRONS**

Dynamics of self-splicing introns are studied at the levels of RNA, DNA, and protein accessories. Projects include analysis of catalytic RNAs and DNA-based intron mobility using genetic, biochemical, and structural approaches. Broad choice of projects. Experience in genetics, DNA recombination mechanisms, RNA splicing, protein structure and/or nucleic acid chemistry desirable. Competitive, federally-funded salary (through Health Research, Inc.). Interested candidates should forward their curriculum vitae and have three letters of reference sent to: **Dr. Marlene Belfort, Wadsworth Center, New York State Department of Health and Department of Biomedical Sciences, State University of New York, Box 22002, Albany, NY 12201-2002.** *Equal Opportunity/Affirmative Action Employer.*

**IMMUNOLOGIST/MOLECULAR BIOLOGIST**

**POSTDOCTORAL POSITION** available to study MHC Class I in humans and non-human primates. Ph.D. or M.D. with experience in molecular biology and/or cellular immunology. Send curriculum vitae, description of previous research experience, and three letters of recommendation to: **David I. Watkins, University of Wisconsin-Madison, Wisconsin Regional Primate Research Center, 1220 Capitol Court, Madison, WI 53715-1299.** Telephone: 608-265-3380; FAX: 608-263-4031. Deadline: August 31, 1997. *The University of Wisconsin is an Affirmative Action/Equal Opportunity Employer.*

**POSTDOCTORAL POSITION** available immediately to: 1) use molecular and cellular approaches to study mechanisms of cell death in oligodendrocytes; 2) study the role of these mechanisms in the pathogenesis of oligodendrocyte injury in cerebral palsy and in stroke. Send curriculum vitae, a letter describing research background and interests, and the names and telephone numbers of three references to: **Dr. Joseph Volpe or Dr. Paul Rosenberg, Children's Hospital, 300 Longwood Avenue, Boston, MA 02115.** FAX: 617-730-0416. *An Equal Opportunity Employer.*

**POSTDOCTORAL POSITIONS.** To study regulation of gene expression during fat synthesis and adipogenesis. Research areas include 1) mode of action and d regulation of an inhibitor of adipocyte differentiating nuclear factors that interact with the response elements of lipogenic enzyme genes for insulin regulation and its signal transduction pathway. Send curriculum vitae and names of references to: **Dr. Hei Sook Sul, Department of Nutritional Sciences, University of California, Berkeley, CA 94720.**

## Genentech, Inc.

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### Research Assistant/Necropsy Specialist

You will support necropsy activities for the Pathology department and other investigations not requiring pathologic examination. Your responsibilities will include performing necropsies on various species, assisting with blood collections, performing perfusion techniques, using anesthesia and euthanasia techniques according to company guidelines, utilizing gross photographic skills, trimming tissues and performing whole body cryotomy.

Requirements include experience with and applied knowledge of necropsy techniques. A BS in a life science is preferred, but an AA with 2-5+ years of experience is acceptable. Excellent communication, organization and problem-solving skills are essential. You must have a willingness and enthusiasm for learning new methods and techniques and be a strong team player.

Our progressive benefits package includes full medical/dental/vision, 3 weeks vacation, a sabbatical program, a stock purchase plan and health club membership. Send your resume, indicating Job Code SCI722, to: Genentech, Inc., Human Resources, P. O. Box 1950, South San Francisco, CA 94083-1950. Please use plain typewritten resumes, we cannot accept faxes. You may e-mail your resume indicating Job Code to [jobs@gene.com](mailto:jobs@gene.com) (ASCII files only with a maximum line width of 76 characters). Genentech is an Equal Opportunity Employer. We value the contributions of our diverse workforce.

[www.gene.com](http://www.gene.com)

## Apoptosis/Cell Death

IDUN Pharmaceuticals is an early stage biopharmaceutical company focused on the biochemical mechanisms of cell death, with therapeutic applications to neurodegenerative diseases, cancer, and inflammation.

Positions are available to join a research team evaluating novel compounds which modulate apoptosis. Opportunities are available in the following areas:

**Pharmacology:** Ph.D. in Pharmacology, 3-5 years industry experience required. Background in inflammation, including experience with a variety of disease models, is preferred. Skills in developing animal models for efficacy testing are required. Job Code: PI.

**Drug Metabolism:** Ph.D. or experienced M.S. with background in drug metabolism/pharmacokinetics to join active small-molecule discovery group. Experience with analytical methodology, assay development, and PK modeling required. Job Code: DM

**Cellular Immunologist:** Ph.D. with experience in the isolation and functional characterization of subpopulations of lymphocytes and hematopoietic cells to support preclinical evaluation of small molecule modulators of apoptosis. Experience with assays to measure apoptosis and proliferation, FACS analysis, and a strong desire to play a key role in therapeutic drug discovery are required. Job Code: CI.

IDUN Pharmaceuticals offers the excitement of a rapidly growing company in La Jolla, CA. We offer an attractive compensation and benefits package including equity participation. For confidential consideration, please send your curriculum vitae (refer to job code) to:

IDUN Pharmaceuticals  
11085 N. Torrey Pines Rd. #300  
La Jolla, CA 92037

EOE

# Want to get your foot in the door?

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### UPCOMING 1997 SCIENCE CAREER FAIRS

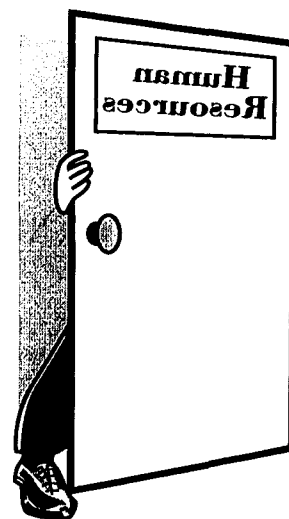
**Cambridge, MA** on the MIT Campus  
84 Massachusetts Ave., Stratton Building  
Student Center, 2nd Floor, La Salla Room  
5 Sept.: 11 am - 4 pm  
6 Sept.: 11 am - 3 pm

**Palo Alto, CA**  
on the Stanford Campus  
Tresidder Memorial Union  
3 Oct.: 11 am - 4 pm  
4 Oct.: 11 am - 3 pm

### To pre-register:

Please submit your résumé or CV via FAX: (202) 289-6742, or via e-mail: [careerfairs@aaas.org](mailto:careerfairs@aaas.org). Indicate the career fair location for which you are submitting. **Remember to bring multiple copies of your CV or résumé with you to the Career Fair; a copy will be necessary to gain admission to the hall. Admission to all of the events is FREE.**

Do not contact MIT or Stanford directly. They are not responsible for organizing these events.



## SCIENCE CAREER FAIRS

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# Head, Genomics Technologies Unit, Center for Genomics Research at Karolinska Institute

In May of 1997 the most extensive university-industry collaboration in Sweden was announced. At that time, Pharmacia & Upjohn agreed to support a new Center for Genomics Research at Karolinska Institute in Stockholm. This new Center has Departmental status at Karolinska Institute and has secured existing laboratory space from September of 1997. In addition to the Center itself, collaborations with leading preclinical as well as clinical research groups throughout the Karolinska Institute are currently being established.

Center scientists will receive appropriate academic appointments and there seems to be a tremendous interest for joining this new entity expressed spontaneously in the mail received. Certain positions will be filled through employment at Pharmacia & Upjohn's Stockholm research campus, located near the Karolinska Institute, with leave of absence to conduct work at the Center.

- The mandate of the Genomics Technologies Unit is to develop core competencies in Gene Sequencing Technologies, DNA Chip Technologies, Display Technologies and Gene Mapping.
- The work is expected to be of front-line exploratory nature.
- The successful candidate is a leading scientist who is familiar with the challenges of academia and the realities of pharmaceutical industry environment.

Letters of interest and Curriculum Vitae may be directed to :

Dr. Claes Wahlestedt, Director  
Center for Genomics Research  
Karolinska Institute  
SE-171 7 7 Stockholm, Sweden  
Fax: + 46 8 32 39 50  
E-mail: [claes.wahlestedt@cgr.ki.se](mailto:claes.wahlestedt@cgr.ki.se)



Pharmacia  
& Upjohn



**CLINICAL AND BASIC SCIENCES  
RESEARCH OPPORTUNITIES**

The Institute for Cellular Therapeutics (ICT) at Allegheny University of the Health Sciences is currently accepting applications for clinical and experimental research positions. The research focus is in the development of safe and effective bone marrow transplantation for the treatment of a number of disease processes. The laboratory has been fully established with Clinical Phase I Trials underway. The ICT has integrated and multidisciplinary programs in Immunology, Autoimmunity, Cell Imaging, Molecular Biology, Bone Marrow Processing, and Stem Cell Biology. Located in Philadelphia, the ICT has extensive research space, new instrumentation, and a competitive salary/benefit structure.

**DIRECTOR OF CLINICAL TRIALS:** Tenure-track academic appointment. You will coordinate and direct multi-center clinical trials involving bone marrow transplantation and cell-based therapies. Must have a demonstrated and sustained scientific activity through publications in peer-reviewed journals and receipt of external funding. *U.S. citizen or permanent resident* and eligible for a position on an NIH grant. M.D. or Ph.D. with previous experience.

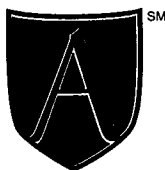
**ASSOCIATE/ASSISTANT PROFESSORS:** Tenure-track positions in the Immunology and Stem Cell Biology research programs. Candidates must have strong technical skills in their area of expertise, proven ability to obtain external research support, and publications in peer-reviewed journals. Excellent career opportunity to develop independent research program. *U.S. citizen or permanent resident* and eligible for a position on an NIH grant. M.D., Ph.D., or D.V.M. with equivalent experience.

**RESEARCH ASSOCIATES & POSTDOCTORAL FELLOWS:** Positions in Immunology, Molecular Biology, Bone Marrow Processing, Flow Cytometry, and Monoclonal Antibody Production/Purification for candidates with advanced technical expertise in area of specialization. *U.S. citizen or permanent resident* and eligible for a position on an NIH grant. B.S. or M.S. (Associates) or Ph.D., M.D., or D.V.M. (Fellows).

**CLINICAL RESEARCH ADMINISTRATOR:** Administrative management of multi-center Clinical Phase I Trials including fiscal management of clinical budget, personnel, data management, and regulatory compliance. Nursing degree with 7 years' related experience in clinical trials management.

**CLINICAL NURSE COORDINATOR:** Coordination, execution, and documentation of all clinical research studies within the Institute. You will ensure that appropriate protocols are used, process and maintain patient records and data, ensure compliance with internal/external regulatory agencies, generate reports, and ensure financial compliance within the clinical program. Nursing degree with 2-4 years' related experience. Please submit a CV and two letters of recommendation to:

Frances A. Chapman,  
Department Administrator,  
Institute for Cellular  
Therapeutics, Allegheny  
University of the Health  
Sciences, Broad & Vine,  
Mail Stop 490,  
Philadelphia, PA 19102



EOE/Affirmative Action Employer.



**SIMON FRASER UNIVERSITY**  
Burnaby, British Columbia, Canada

**PHYSICIAN-SCIENTIST**  
Tenure-Track Faculty Position

The School of Kinesiology at Simon Fraser University seeks an outstanding physician-scientist to fill a tenure-track faculty position. This appointment is intended for an academically trained physician with a proven record of research accomplishments who is qualified to practice medicine in Canada. The initial appointment may be made with or without tenure, at any level up to senior associate professor or equivalent. Applications from physicians with a strong interest in research and teaching but with less experience will also be accepted. If a suitable tenure-track candidate is not found through this search process, a limited-term lecturer appointment may be made.

The preferred candidate will be expected to establish an independent, externally funded research program, teach undergraduate and graduate courses in his/her areas of expertise and serve as the Medical Officer for the School and its programs. Appropriate areas of research focus and teaching expertise include: environmental physiology; neurology/neuroscience; psychiatry; rehabilitation medicine; prevention and/or rehabilitation of disorders of major societal concern such as cardiovascular disease, stroke, degenerative disorders of the nervous system, diabetes, or musculoskeletal disorders; or any other area relevant to the field of kinesiology.

Simon Fraser University, located on top of Burnaby Mountain in Greater Vancouver, is renowned for the high quality of its programs. Tenure-track appointments are for an initial probationary period of three years and include an excellent benefits package, a mortgage assistance package and a generous moving allowance.

The School of Kinesiology has the mission to study human structure and function and their relation to health and movement. Its 22 tenure-track faculty members and 5 laboratory instructors cover a wide range of disciplines and teach approximately 500 students enrolled in the B.Sc. program in Kinesiology and 50 graduate students enrolled in M.Sc. or Ph.D. programs. Our website: <http://fas.sfu.ca/kin> has further description of the School.

Priority will be given to applications received by 15 September 1997, but the search will continue until the position is filled. Starting date is negotiable. To apply, please submit your curriculum vitae; three publications that you consider most important; a cover letter outlining your clinical, teaching, and research experience; anticipated research directions; your philosophy and commitment to teaching; and the name, address, and telephone of three references who you have arranged to send confidential letters of reference to: **Physician-Scientist Search Committee, School of Kinesiology, Faculty of Applied Sciences, Simon Fraser University, Burnaby, British Columbia V5A 1S6, Canada.**

*Simon Fraser University is committed to the principle of equity in employment and offers equal employment opportunities to qualified applicants. In accordance with Canadian Immigration requirements, this search is directed to Canadian citizens and permanent residents of Canada. All appointments are subject to budgetary authorization.*



**RESEARCH ASSOCIATE/  
POSTDOCTORAL FELLOW**

An established research program at the Mayo Clinic is seeking a research associate/postdoctoral fellow with molecular biology experience to conduct studies on antibody function as part of a concerted effort to determine the molecular basis of antibody-induced repair of demyelinated lesions in the central nervous system. The successful applicant will join a team of molecular immunologists and neurobiologists in a well-funded program which provides unique opportunities to work interactively with two established laboratories. This multidisciplinary project brings a blend of molecular, biochemical, cellular, genetic, and medical perspectives to the investigation of remyelination in animal models of CNS injury, with the specific goal of extending these concepts to the treatment of human disease. Applications from investigators with a Ph.D. degree or M.D./D.V.M. degree with a laboratory-based research experience in molecular biology or molecular immunology are invited. Send c.v. and the names of three references to: **Larry R. Pease, Ph.D. (Pease.Larry@Mayo.edu), Department of Immunology, Department of Biochemistry and Molecular Biology or Moses Rodriguez, M.D. (Rodriguez.Moses@Mayo.edu), Department of Neurology, Department of Immunology, Mayo Clinic, 200 1st Street SW, Rochester, MN 55905.**

*Mayo Foundation is an affirmative action and equal opportunity educator and employer.*

**CONFERENCE**

**National Institutes of Health  
(NIH)  
1st Gene Therapy Policy  
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**Human Gene Transfer:  
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For further information contact:

Telephone: (301) 946-9790  
FAX: (301) 946-1911  
e-mail: [alldredg@reda-intl.com](mailto:alldredg@reda-intl.com)



WILLIAM  
& MARY

### MARINE AQUACULTURE GENETICIST

THE COLLEGE OF WILLIAM AND MARY  
VIRGINIA INSTITUTE OF MARINE SCIENCE  
SCHOOL OF MARINE SCIENCE

The Department of Fisheries Science continues to seek applicants for an Associate or Assistant Professor. This announcement is intended to supersede and broaden an earlier announcement for the position in a new state-supported program in aquaculture genetics and breeding technology of coastal and marine species including molluscan shellfish. A Ph.D. in genetics, fisheries science or a related field is desirable. A strong background in cyto-, molecular, or quantitative genetics as applied to the culture of marine species is preferred. The successful candidate will be expected to develop a vigorous, grant supported research program and provide advice to federal and state management agencies and to industry; support of commercial aquaculture development will be expected. The position may be filled as either: (1) a non-tenure eligible, but fully enfranchised research faculty or (2) a tenure track teaching and research faculty. To qualify for a tenure track appointment, applicants will be expected to have a commitment to graduate education and provide evidence of strong teaching abilities. Tenure track faculty would be expected to teach graduate level courses and mentor M.A. and Ph.D. students in addition to fulfilling the research and extension functions described above.

Review of applicants will begin immediately and continue until the position is filled. A letter of application and curriculum vitae accompanied by the names, addresses and telephone numbers of three references should be sent to:

Dr. William D. DuPaul  
Associate Director for Advisory Services  
Virginia Institute of Marine Science  
The College of William and Mary  
Gloucester Point, VA 23062

*The College of William and Mary is an equal opportunity, affirmative action employer. Members of under represented groups (including people of color, persons with disabilities, Vietnam Veterans and women) are strongly encouraged to apply.*

### PRIZE



### POTAMKIN PRIZE FOR RESEARCH IN PICK'S, ALZHEIMER'S AND RELATED DISEASES

A prize of \$100,000 will be awarded by the American Academy of Neurology to a person(s) in recognition of major contributions to the understanding of the causes and the prevention, treatment, and ultimately the cure for Pick's, Alzheimer's and related diseases.

Candidates may be nominated on a world-wide basis from any of the biological disciplines including bio-chemistry, molecular biology, molecular genetics, pharmacology, immunology, physiology, cell biology, neuropathology or epidemiology.

A nomination application, nominating letter citing the scientific accomplishments of the candidate in detail, two supporting nominating letters, a curriculum vitae, and up to six (6) selected reprints in twelve (12) complete sets are required.

The deadline for receipt of materials is **November 3, 1997**. No nomination will be considered unless it is complete. The awardee(s) must be present for the AAN Scientific Program, at its annual meeting in Minneapolis, Minnesota on Tuesday, April 28, 1998.

#### REQUEST APPLICATION AND SUBMIT NOMINATION TO:

**American Academy of Neurology**  
Potamkin Prize for Research In Pick's, Alzheimer's and Related Diseases  
1080 Montreal Avenue  
St. Paul, MN 55116  
Phone: 612/695-1940

*The Potamkin Prize is funded through the Potamkin Foundation.*

# HOT CAREERS

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## NATIONAL INSTITUTES OF HEALTH

### Undergraduate Scholarship Program (UGSP)

Qualified undergraduates can train and be mentored at the cutting edge of biomedical research while receiving scholarship support.

The UGSP is sponsored by the National Institutes of Health (NIH), the Federal Government's lead biomedical research and research training agency. NIH offers scholarships to qualified individuals who are committed to a career in biomedical research.

Scholarships up to \$20,000 per year support tuition, educational, and qualified living expenses (room, board, transportation) while students pursue an undergraduate degree.

During each year of the award, scholars serve for 10 weeks (with salary/benefits) as employees in NIH research laboratories. They are assigned mentors, participate in seminars and programs available to all NIH researchers, and are provided with housing and transportation. After graduation, they serve 1 year of full-time employment at NIH for each year of scholarship support.

#### Interested students should apply if they:

- Are committed to a career in biomedical research;
- Are from a disadvantaged background;
- Have a GPA of 3.5 or are in the top 5 percent of their class;
- Are a U.S. citizen, national, or permanent resident;
- Are enrolled or accepted for enrollment as a full-time student at a qualified accredited institution.

**This is a special opportunity for special students.**

#### For more information, contact

NIH/OD/OIR/OLRS

UGSP

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Bethesda, MD 20892-9121

Phone: 800-528-7689

Fax: 301-402-8098

e-mail: [ugsp@nih.gov](mailto:ugsp@nih.gov)

TTY: 1-888-352-3001

<http://ugsp.info.nih.gov>



Rhône-Poulenc Rorer, a global leader in the pharmaceutical industry, is seeking highly motivated, team-oriented scientists to join our research group located in Collegeville, Pennsylvania.

#### CARDIOVASCULAR

##### Research Assistant/Assistant Scientist

BS in Biology. Previous experience in basic research environment performing biochemical, cellular or molecular techniques is desirable. (SD-KC)

##### Scientist/Associate Research Scientist

BS or MS in Biology with a minimum of 2 years basic research experience performing cellular and molecular techniques with a high level of independence. Previous experience in cardiovascular research and/or cell signaling research is preferred. Experience in working with myocytes or smooth muscle cells in culture would be advantageous. (SD-KC)

##### Assistant Scientist/Associate Research Scientist

BS or MS in Biochemistry or Biology with 1-5 years research experience in the areas of hematologic or coagulation assays. Working knowledge of flow cytometry or tissue culture techniques would be beneficial. (SD-VC)

##### Assistant Scientist/Associate Research Scientist

BS or MS in Pharmacology, Molecular Biology, or a related field of science with 3-5 years experience in vascular biology (atherosclerosis, thrombosis, hemostasis). Expertise in cell and molecular biology along with in situ hybridization/histology techniques is desirable. (SD-RL)

##### Research Scientist

Ph.D. in Biochemistry, Pharmacology, or related field of science underlying thrombosis/hemostasis research with 0-3 years experience. Expertise in enzymology, cell biochemistry, molecular biology and in the development and application of novel assays for the discovery of antithrombotic drugs. (SD-VC)

#### CELL BIOLOGY

##### Associate Research Fellow

Ph.D in Cell Biology or related field with a minimum of 5-7 years post doctoral experience. Expertise in cell biology of monocytes/macrophages is essential; experience in signal transduction biology, and in vitro analysis of adhesion, activation and/or apoptosis is also required. Candidate will be responsible for identifying novel signaling pathways/ molecules involved in macrophage adhesion and activation; collaborating with other scientists to validate potential therapeutic targets; and supervising/training staff. Duties also include writing research reports and presenting results at internal and external meetings. (SD-MJ)

#### BIOINFORMATICS

##### Bioinformatics Research Scientist Gene Medicine Department

BS/MS in Life Science or Computer Science with 3-5 years of biocomputing experience. Demonstrated experience in DNA and protein sequence analysis and in the design, implementation, and maintenance of annotated sequence databases. Programming experience in C++, SQL, PERL (and/or CGI), UNIX, Java, as well as HTML page design. Background in scientific database development (Oracle). Familiarity with the Macintosh and Windows operating systems. Candidate will perform sequence and structural searches related to proprietary DNA and protein information generated within the department. Liaison with the Information Services Department to coordinate the scientific design and implementation of applications for search and analysis of genomic and biological data. Design proprietary database structures for the storage and manipulation of genomic and proteomic information. (SD-SF)

Rhône-Poulenc Rorer offers a competitive salary, excellent benefits, a highly challenging work environment, and opportunities for advancement. Qualified candidates should send their resume, indicating position of interest, to: Rhône-Poulenc Rorer Research & Development, Human Resources, Mailstop H37, Position \_\_\_\_\_, P.O. Box 5096, Collegeville, PA 19426-0800. Equal Opportunity Employer, M/F/D/V.



**RHÔNE-POULENC RORER**



**POSITIONS OPEN**

**ASSOCIATE PROFESSOR/PROFESSOR,  
CELL SIGNALING**

Applicants are invited for a tenure-track faculty position at the level of Associate Professor/Professor (position number: 673N). We are seeking an established investigator with expertise and productivity in the general area of cell signaling. The successful candidate will be expected to direct an innovative and externally funded research program and to participate in the teaching responsibilities of the Pathobiology and Molecular Medicine Graduate Program. Preference will be given to applicants with a documented record of research funding and whose interests complement departmental research activities in carcinogenesis, apoptosis, or endothelial/vascular cell biology.

Interested applicants should send a curriculum vitae, description of research interests, and the names of three references. Applications will be accepted until the position is filled. Applications and inquiries should be directed to:

**Dana Brindley**

Department of Pathology and Laboratory Medicine  
University of Cincinnati College of Medicine  
231 Bethesda Avenue  
P.O. Box 670529  
Cincinnati, OH 45267-0529

**CENTER FOR RADIOLOGICAL RESEARCH  
COLUMBIA UNIVERSITY  
ASSISTANT PROFESSOR/POSTDOCTORAL  
RESEARCH SCIENTISTS**

Immediate opening for a tenure-track faculty position as well as Postdoctoral Research Scientists. Candidates should have a Ph.D. and/or M.D./Ph.D. in radiation biology, molecular genetics, or other related disciplines. Faculty candidates must have an outstanding track record for independent research and extramural support. Postdoctoral candidates should have experience in cell biology and molecular genetics to study 1) mechanisms of radiation-induced neoplastic transformation of human cells; 2) radioresistance and cell cycle checkpoint control in mammalian cells and yeast; or 3) mechanisms of mineral fiber-induced mutagenesis in mammalian cells. Send curriculum vitae, names and addresses of three references, and, for faculty candidates, a statement of current and future research plans to: **Dr. Eric J. Hall, Center for Radiological Research, Columbia University, 630 West 168th Street, New York, NY 10032.** *Columbia University is an Affirmative Action/Equal Opportunity Employer. Women and minority candidates are encouraged to apply.*

**MODELERS**

The National Institute for Occupational Safety and Health (NIOSH), Health Effects Laboratory Division (HELD), has immediate openings for mathematicians, scientists, and engineers skilled in mathematical/computer modeling. Candidates should have an M.S. or Ph.D. degree and extensive experience in modeling research. Experience in occupational or environmental safety and health research is highly desirable for the leadership position. Specific research areas include *ab initio* quantum mechanics, analysis of complex spectroscopic data, molecular modeling, quantitative structure-toxicity relationships, toxicokinetics, complex biological systems, computational fluid dynamics, and complex engineering/physical systems. Salary range is \$25,000 to \$82,000; benefits packages available. For application information, contact: **NIOSH, HELD/EAB/MR, 1095 Willowdale Road, Morgantown, WV 26505.** Permanent positions are announced on the CDC website: <http://www.cdc.gov>. *U.S. citizenship required for permanent positions. Some temporary positions also available. CDC/NIOSH is an Equal Opportunity Employer.*

**BIOCHEMIST.** New College of the University of South Florida. Tenure-track **ASSISTANT PROFESSOR** for August 1998. Ph.D. required; postdoctoral desirable. Strong commitment to undergraduate teaching including undergraduate research is essential. Teaching responsibilities include development of a biochemistry lecture and lab and participation in related courses and tutorials. New College is a small, highly ranked honors college. New Natural Sciences Complex expected in 1999. Send curriculum vitae with teaching experience, three letters of reference, statement of teaching philosophy, research plans, transcripts, and one or two research papers by October 9 to: **Search Committee, Nat Sci, New College of USF, 5700 North Trail, Sarasota, FL 34243-2197.** *USF is an Equal Opportunity Employer/Affirmative Action/ADA institution. Women and minority candidates encouraged.*

**POSITIONS OPEN**

**DIRECTOR/RESEARCH  
ADMINISTRATION  
AND EDUCATIONAL PROGRAMS**

The Marine Biological Laboratory has an opening for a person responsible for the direction of educational programs and grant and contract administration. This position is also responsible for the development of relations with private enterprise. Ph.D. in a scientific discipline highly desirable. Must have held a major administrative position with at least four years of experience in grant and contract preparation as well as involvement in biology education. Must have working knowledge of federal regulations and funding agencies' regulations and an understanding of science education, especially at the graduate and postdoctoral level. Must have record of effective grant submissions and superior written and verbal skills. Submit curriculum vitae and names and addresses of three references to: **Susan Goux, Director of Human Resources, MBL, 7 MBL Street, Woods Hole, MA 02543.** E-mail: [resume@mbi.edu](mailto:resume@mbi.edu) (We can accept e-mail attachments in MIME and binhex for Microsoft Word 6.0 or lower versions). Review will begin on September 22, 1997.

*Equal Opportunity/Affirmative Action/Nonsmoking environment.*

**JILA**

JILA (operated jointly by the National Institute of Standards and Technology and the University of Colorado) is devoted to research and applications in the fields of laser technology, optoelectronics, precision measurement, surface science and semiconductors, information and image processing, materials and process science, as well as basic research in atomic, molecular and optical physics, precision measurement, gravitational physics, chemical physics, astrophysics, and geophysical measurement. At JILA there is interest in fostering further interaction with industry research efforts in order to identify new, industrially relevant applications of the technologies developed. Applications are invited for two programs:

**RESEARCH ASSOCIATESHIPS** for advanced research by recent Ph.D.'s. Applications are accepted and considered anytime throughout the year.

**VISITING FELLOWSHIPS** for advanced research by senior scientists. Deadline for completed applications is November 1, 1997.

Further information may be obtained from: **Secretary, Visiting Scientists Program, JILA, Box 440, University of Colorado, Boulder, CO 80309-0440.**

*The University of Colorado at Boulder strongly supports the principle of diversity in all its forms. We are interested in receiving applications from women, ethnic minorities, persons with disabilities, veterans, and veterans of the Vietnam era.*

**ASSISTANT PROFESSOR OF BIOLOGY.** The University of Pittsburgh at Bradford invites applications for a tenure-track position beginning January 1998 or September 1998. Ph.D. required. Applicants must be able to teach introductory biology, botany, genetics, ecology, and courses in area of expertise. Excellence in teaching, academic advising, and the ability to direct undergraduate research are essential. (For Pitt-Bradford information see website: [www.upb.pitt.edu](http://www.upb.pitt.edu).) Please provide curriculum vitae, letter of application stating teaching experience and research interests, official transcripts, and three letters of recommendation by October 30, 1997, to: **Dr. Francis Mulcahy, Chair, Biology Search Committee, University of Pittsburgh at Bradford, Bradford, PA 16701-2898.** *Affirmative Action/Equal Opportunity Employer.*

**CALIFORNIA INSTITUTE OF TECHNOLOGY** invites applications for a position as **ASSISTANT PROFESSOR** of chemical physics with an initial appointment for four years. Outstanding individuals with a Ph.D. and strong commitment to research and teaching excellence are encouraged to apply. Submit by November 15, 1997, curriculum vitae, publication list, a description of proposed research, and three letters of recommendation to: **Professor B. Vincent McKoy, Arthur Amos Noyes Laboratory of Chemical Physics, 127-72, California Institute of Technology, Pasadena, CA 91125.** *The California Institute of Technology is an Equal Opportunity/Affirmative Action Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.*

**POSITIONS OPEN**

**IMAGE PROCESSING STAFF**

The Department of Biomedical Engineering in The Lerner Research Institute at The Cleveland Clinic Foundation invites applications for a faculty position in the field of breast or cardiovascular image processing. The successful candidate must be an independent investigator who has successfully established his/her own research program. The appointee is expected to maintain an active research program, contribute to existing research programs, and supervise graduate student research. Presently, image processing research in the Department of Biomedical Engineering includes evaluation of cardiovascular disease using novel histochemical techniques and clinical imaging modalities, automated detection and diagnosis of breast cancer in X-ray mammograms, and characterization and temporal tracking of multiple sclerosis in magnetic resonance images of the brain. The Biomedical Image Processing group consists of a multidisciplinary team of engineers, research scientists, and physicians. For further information, please refer to the Image Processing website: <http://www.ccf.org/ri/bme/image>. Applicants must have (1) a Ph.D. or equivalent in biomedical engineering, computer science, or related discipline; (2) a history of publications in his/her specialization area; and (3) demonstrated ability to pursue and secure extramural research funding. Excellent verbal and written communication skills are required. Qualified candidates should submit a curriculum vitae, a brief statement detailing research interests, and three references to: **J. Fredrick Cornhill, D. Phil., Chairman, Department of Biomedical Engineering, Wb3, The Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195.** *Affirmative Action/Equal Opportunity Employer.*

**DIRECTOR  
ENVIRONMENTAL STUDIES PROGRAM  
MACALESTER COLLEGE**

Macalester College is seeking an experienced and broadly trained **ENVIRONMENTAL SCIENTIST** to assume the Directorship of the College's interdepartmental Environmental Studies Program. The position is expected to be a joint appointment with one of the college's science departments (biology, chemistry, geology, physics) and hiring is expected to be at the Associate or Professor level. The successful candidate will be able to collaborate across disciplines, will have an interest in global/international environmental problems and environmental issues involving the upper Midwest, and will possess prior experience in an academic leadership position. To apply, send a curriculum vitae, cover letter describing teaching philosophy and experience and research/professional background, and three letters of reference to: **Professor Mark Davis, Director, Environmental Studies Program, Macalester College, St. Paul, MN 55105.** E-mail: [davis@macalester.edu](mailto:davis@macalester.edu). Review of applications will begin on October 20, 1997. *Macalester College is an Affirmative Action/Equal Opportunity Employer.*

**SCIENTIFIC COMMITTEE MANAGER**

A nonprofit scientific foundation working in the areas of health and environmental sciences seeks a scientific committee manager with scientific consulting/association background and understanding of basic toxicology, risk assessment, and regulatory issues. Position requires experience in all aspects of committee management: research project development and management, literature review, technical writing, conference organization, arranging committee meetings, minute writing, monitoring and preparing budgets, and correspondence and reports. Master's degree in scientific field such as chemistry, toxicology, environmental health, etc., required. WordPerfect for Windows helpful. Send résumé and salary history to: **Human Resources, ILSI, 1126 Sixteenth Street, N.W., Washington, DC 20036.** FAX: 202-659-3859. *Equal Opportunity Employer/Minorities/Females.*

**EXPERIENCED ELECTRON MICROSCOPIST**

To participate in a highly interactive and motivated lab of molecular biologists; analysis of gene knockout mice with emphasis on the cytoskeleton. Ph.D. is desirable; expertise in immuno EM is essential. Long-term position.

Submit résumé and list of three references to:  
**Dr. Elaine Fuchs  
Howard Hughes Medical Institute  
The University of Chicago  
5841 South Maryland Avenue  
MCI028 Room N314  
Chicago, IL 60637**  
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## Talented People...Rewarding Results.

At Parke-Davis Pharmaceutical Research Division of Warner-Lambert Company, inspired science and a strategy of innovation has made us a leader in the pharmaceutical industry. Currently, we have exciting opportunities for a Senior Associate Scientist Research/Safety Pharmacology and two Postdoctoral Fellows in our research headquarters in Ann Arbor, Michigan.

### Senior Associate Scientist Research/Safety Pharmacology

The selected individual will assist in the planning, conduct and summarization of studies primarily intended for assessment of safety pharmacology parameters of candidate therapeutic compounds; contribute to development and validation of experimental methodology for safety pharmacology testing. Responsibilities to include veterinary surgery and anesthesia, compound dosing by various routes, observation and accurate recording of experimental data and other procedures as required. The candidate will assist in maintaining studies during off duty hours including weekends and holidays.

A Bachelor's degree with 5-7 years of experience related to the field of safety pharmacology or a Master's degree with 2-4 years is required. Cardiovascular, pulmonary and CNS pharmacologic assessment techniques are particularly relevant. Familiarity with advanced computerized data acquisition systems is highly desirable. Job Code: RJB-970110

### Postdoctoral Fellow

The Molecular Toxicology section has an immediate opening for a Postdoctoral Fellow to investigate both genotoxic and cellular mechanisms of carcinogenicity. A Ph.D. in Toxicology, Molecular Biology or related discipline and up to 2 years of postdoctoral experience are required.

Familiarity with cell culture, biochemical and molecular techniques as applied to assessing mechanisms or carcinogenicity and/or cellular injury is essential. JOB CODE: CJM973205

### Postdoctoral Fellow CE-MS Characterization of Proteins

An immediate opening is available in the Analytical Research section of our Chemistry Department for a recent graduate in Biochemistry, Analytical Chemistry or related fields to develop CE-MS separation and analytical characterization methods to study novel protein targets. This individual will be expected to work independently and communicate experimental results at national meetings and through publication. Preference will be given to candidates with a publication record demonstrating experience in protein/peptide separation by capillary electrophoresis and/or analytical analysis of proteins by mass spectrometry. This fellowship is available for one year and may be renewed for a second year upon mutual agreement. Job Code RJB-974171

Members of our world-class pharmaceutical team enjoy competitive salaries, benefits and career growth potential. For consideration please mail, fax or e-mail a CV with a minimum of three references\*, indicating the Job Code of interest, to: **Parke-Davis, Human Resources Department, 2800 Plymouth Road, Ann Arbor, MI 48105. Fax: (313)998-3394. E-mail: resume@aa.wl.com**

\*Submit resume on laser-quality white paper, with legible 10 point or larger type, and avoid boldface, italics, borders, etc.



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## Scientists Senior Scientists Principal Scientists

Roche Molecular Systems, an Alameda, CA company involved in human diagnostics and research products utilizing the polymerase chain reaction technology, has openings for Scientists, Sr. Scientists and Principal Scientists in our Research & Product Development Departments.

For Scientists, a BA/BS & min of 2 yrs additional exp req. For Sr. Scientists, a BA/BS or MS or equiv & min 5 yrs addtl exp req. For Pr. Scientist, Ph.D. pref & min 5 yrs addtl exp is req. All degrees should be in one or more of the biological sciences. All positions req exp w/PCR. Exp w/MS Office pref. Check our jobs phone line at (510) 865-5400.

### Roche Molecular Systems

Attn: HR Dept.  
1145 Atlantic Avenue  
Alameda, CA 94501-1145  
EEO/M/F/D/V



## MOLECULAR BIOLOGIST

Supelco, Inc., a leading manufacturer of chromatography supplies, has an immediate opening in our Liquid Separation Research and Development area.

Responsibilities include long range planning of the separations opportunities within molecular biology, as well as short-term product development for nucleic acid purification, protein expression, DNA analysis, mutation analysis and DNA diagnostics products. Requirements include a Ph.D. or equivalent in Molecular Biology or Biochemistry. Experience with laboratory automation is a plus. Candidates with industrial experience will be given preference.

Supelco, Inc. is a Sigma-Aldrich Company located in scenic central Pennsylvania. We are ISO 9001 registered. We offer excellent benefits, competitive pay and a modern work facility. To apply, please send resume to:

**SUPELCO, INC.**  
Supelco Park  
Bellefonte, PA 16823  
Attn: Human Resource Office, #10082

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## IF YOU ARE READING THIS AD

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This month, surf the 'Net with John and his guests, Gerry Crispin of Shaker Advertising and Mark Mehler of MMC Group. The topic is "Developing an Electronic Resume," and our experts are eager to help you negotiate the often-dangerous waters of online job-seeking. You'll learn how employers are using new technologies to search for and evaluate candidates. We'll also offer helpful tips so you can find career opportunities using the World Wide Web, e-mail, and other communications tools. Don't be afraid to get your feet wet - jump in and join the conversation!

CAREER 

SCIENCE  
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**Ergoscience Corporation**, located in the metropolitan Boston area, is a biopharmaceutical company which is committed to the discovery, development, and commercialization of novel products for treatment of metabolic and immune systems disorders such as diabetes, obesity, and cancer.

We are currently looking for several scientists and research associates to join our existing multidisciplinary team. Scientists will interact with a multidisciplinary group of organic chemists, cell biologists, immunologists, physiologists, neuroscientists, biochemists, molecular biologists, and chronobiologists to study circadian neuroendocrine regulation of metabolism relating to diabetes, obesity, and atherosclerosis.

**Position:** Two Scientists/Senior Scientists in Metabolism

Two Scientists are required to join our Metabolism and Endocrinology Group. The successful candidates will be expected to develop an independent research program investigating physiological/biochemical mechanisms by which the neuroendocrine system regulates food consumption, whole body fuel homeostasis, and liver, adipocyte, or skeletal muscle metabolism. The research program is expected to lead to the development of drugs that will be useful for the treatment of obesity and type II diabetes.

**Requirements:** A Ph.D. and a minimum of 3 years postdoctoral experience and proven research track record and specific expertise in lipid and carbohydrate abnormalities associated with insulin resistance in liver, adipocyte, and/or muscle tissue. Experience working in a team environment is an advantage.

**Position:** Fluorescence Microscopist

Successful candidate will work with our new Nikon Diaphot 300 inverted microscope, which is fully equipped for state-of-the-art epifluorescence measurements, to help elucidate a broad range of questions dealing with intracellular biochemistry in both *in vitro* and *in vivo* systems.

**Requirements:** M.S. degree in life sciences and minimum 3 years experience with the practical use and theory of fluorescence microscopy.

**Position:** Neuropharmacologist

Successful candidate will work with other neuropharmacologists, neurophysiologists, and electrophysiologists to study receptor and 2nd messenger systems involved in hypothalamic monoamine and peptide regulation of metabolism.

**Requirements:** P.h.D. with 3 years postdoctoral experience and proven research track record in neuropharmacology relating to metabolic disorders such as obesity and diabetes. Strong background in techniques associated with neuropharmacologic analysis of drug action, such as autoradiography, receptor ligand binding assays, 2nd messenger analysis, and molecular biology.

Ergoscience Corporation offers a competitive salary, stock option program, and comprehensive benefits in a fast-paced, team-oriented, highly stimulating environment. Qualified applicants are invited to send a résumé with a cover letter to: **Anthony H. Cincotta, Ph.D., Ergoscience Corporation, Research Department, 100 First Ave., Fourth Floor, Charlestown, MA 02129 or fax to: (617) 241-6858 or e-mail to: jobs-research@ergo.com.**

## GLOBAL CAREER OPPORTUNITIES

### JOHN INNES CENTRE Project Leader in Genetics of Plant-Virus Interactions

A plant geneticist is required to investigate plant and plant cell responses to virus infection, preferably in Arabidopsis or brassica systems. The postholder will develop an active research group, with opportunities to form active collaboration with other geneticists and virologists at the Centre working with crucifers, legumes or cereals. The appointment is for a period of five years.

Candidates should have postdoctoral experience in plant genetics and molecular genetics research with interests in plant pathology or cell biology. The ability to lead a viable programme and initiate collaborations in novel areas of plant virus disease research is essential.

The salary will be in the scale of £17,317 to £30,591 per annum (pay award pending), depending on experience. Staff have the opportunity to join a non-contributory superannuation scheme.

For an application form and further particulars write to the Personnel Officer, John Innes Centre, Norwich Research Park, Colney, Norwich, Norfolk, NR4 7UH, quoting reference number VIR/283.

The closing date for completed application forms will be 19th September 1997.

The John Innes Centre is a registered charity (No. 511709) grant-aided by the Biotechnology and Biological Sciences Research Council and is an Equal Opportunities Employer



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### PARTNERSHIP IN CANCER RESEARCH SIX SENIOR APPOINTMENTS

### FULL PROFESSORS/READERS/SENIOR LECTURERS

UMIST, the Paterson Institute for Cancer Research (PICR) and the Cancer Research Campaign (CRC) have recently entered into an alliance to build a high quality, interactive research effort that will further strengthen the international standing of cancer studies in Manchester. The appointments will be at either Professorial, Reader or Senior Lecturer level depending on experience and achievement and will be permanent posts. The appointees will be based in PICR where there is substantial support from the CRC and dedicated research laboratories. However, complementary expertise, facilities and equipment are also available at UMIST as appropriate.

Although we encourage all candidates with an interest in cancer research to apply, there are several areas in which UMIST/PICR are particularly interested in developing their research portfolio.

- Peptide therapeutics (ref: BIO/A/98)
- Viruses and Vectors (ref: BIO/A/99)
- Signal Transduction (ref: BIO/A/100)
- Post Genome Functional Analysis (ref: BIO/A/101)
- Pharmaco Kinetics (Including Tumour Imaging) (ref: BIO/A/102)
- Molecular Diagnostics (ref: BIO/A/103)

If you are interested please either make informal contact with

**Professor Mike Dexter**  
(email: exhtmd@picr.cr.man.ac.uk)  
Director,  
Paterson Institute for Cancer Research,  
Wilmslow Road,  
Manchester, M20 9BX.

**Professor Tony Whetton**  
(email: Tony.Whetton@umist.ac.uk)  
Department of Biomolecular Sciences,  
UMIST,  
PO Box 88,  
Manchester, M60 1QD.

or alternatively, application forms and further details are available from: The Personnel Office, UMIST, PO Box 88, Manchester, M60 1QD.

Please quote the appropriate reference number and state at which level you wish to be considered.

UMIST is an equal opportunity employer

*Cadus Pharmaceutical Corporation, a leader in the discovery of drugs which regulate G protein-mediated signaling pathways, is expanding its discovery programs based upon its unique proprietary yeast and mammalian cell based screening technologies and has openings for motivated scientists in the following areas:*

## DRUG DISCOVERY/ CELL BIOLOGY

**Code: S-DD BS/MS** scientists with a minimum of 2 years laboratory experience with strong background in molecular biology, mammalian cell culture, and receptor signal transduction research. Previous experience in molecular target-based drug discovery is also desirable. Qualified individuals will work within the drug discovery group exploring cellular signaling pathways and designing/implementing secondary assay systems to analyze potential therapeutics.

*AND*

**Code: S-DD2 BS/MS** scientists with a minimum of 2 years experience in mammalian cell biology to join our drug discovery group. Experience with mammalian cell culture signal transduction analyses, biochemistry, molecular biology, flow cytometry and microscopy is desirable. Qualified individuals will work on projects focusing on the regulation of cell activation and growth by G protein-coupled receptors.

## MAMMALIAN CELL BIOLOGY

**Code: S-M BS/MS** scientists with a minimum of 2 years experience or Ph.D. scientists with a minimum of 3 years postdoctoral research in mammalian cell biology and gene expression to join our assay development group. Expertise with mammalian cell culture, signal transduction analysis and strong molecular biology skills are essential. These individuals will be working with projects involving novel whole cell assay systems for G protein-coupled receptor signaling.

## MOLECULAR/YEAST BIOLOGY

**Code: S-MYB Ph.D.** scientists with a minimum of 3 years postdoctoral research experience in molecular biology for a project expressing mammalian signal transduction proteins in yeast. Background in cellular and molecular biology or biochemistry is required. Experience with yeast and protein analysis is preferred.

## NEW LEADS DISCOVERY

**Code: S-NL BS/MS** scientists with a minimum of 2 years experience in assay development or screening. Experience with yeast and/or mammalian cell culture techniques, cell-based screening assays and/or HTS robotics/automation is desirable. Responsibilities include pilot and implementation of novel cell-based screens for G protein-coupled receptor targets, performing selectivity assays and identifying lead compounds in support of internal drug discovery efforts.

*Cadus offers competitive salaries and benefits as well as excellent opportunity for career growth in a stimulating collaborative environment. Send CV and List of References, indicating job code to: Cadus Pharmaceutical Corporation, 777 Old Saw Mill River Road, Tarrytown, NY 10591-6705; or email at: [hr@cadus.com](mailto:hr@cadus.com). Cadus is an Equal Opportunity Employer.*

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PHARMACEUTICAL CORPORATION



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Coordinate submissions of transgenic plants and biologicals for US Government (USDA, EPA, FDA) and occasional outside US clearances. Participate within North America Biotech Regional Team to achieve global clearances as required by business plans.

Responsibilities include completing regulatory submissions in correct government approved format; responding to questions from government agencies; assisting in data development; assisting in preparation of written materials regarding the communication of biotech safety info to the public and establishing and maintaining positive working relationships with key government regulators to ensure timely acceptance, review and processing of submissions.

Position will report to Regulatory Manager, Biotechnology, AgrEvo USA Company. Requirements include a minimum of a Master's degree in biological science or biochemistry with established knowledge of basic central issues in the biotech regulatory arena. Strong written/verbal communications, interpersonal and organizational skills essential.



Submit resume to:  
Human Resources Department  
AgrEvo USA Company  
Little Falls Centre One, 2711 Centerville Road  
Wilmington, DE 19808  
Fax: 302-892-3027



### DIRECTOR OF BASIC RESEARCH, DEPUTY DIRECTOR

The University of California, Davis, Cancer Center is seeking a Director of Basic Research at the Professor level. This individual will also serve as the Deputy Director of the Cancer Center. Candidates must possess a doctoral degree and should have outstanding scientific accomplishments in the molecular and basic biology of cancer with demonstrated administrative ability to focus research programs in cancer biology. The University has committed substantial funds for the development of basic cancer research, including four new faculty positions. This program will be housed in the newly opened state-of-the-art Research Building. The Cancer Center, a priority program for UC Davis, intends to fulfill NCI requirements to become a designated cancer center. The candidate should have an outstanding record of publications and a substantial past and current level of extramural research funding. This position will be "Opened Until Filled"; however, for full consideration, applications should be received by October 31, 1997. Please forward the following: 1) letter describing research, teaching, and administrative background; 2) curriculum vitae; and 3) names and addresses of five references to:

Ralph W. deVere White, M.D.  
Chair, Search Committee  
UC Davis Cancer Center  
4501 X Street, Room 3003  
Sacramento, CA 95817

*The University of California is an Affirmative Action/Equal Opportunity Employer.*

RPI, a leader in the development of ribozyme-based pharmaceutical and agricultural products, is currently seeking an experienced scientist to join our Biochemistry group in our state-of-the-art facility in Boulder, Colorado.

## Ph.D. Scientist, Biochemistry

The successful candidate will identify and characterize novel nucleic acid catalysts. Qualifications include a Ph.D. in Biochemistry or related field and 2+ years of related experience. Hands-on experience in combinatorial chemistry or in vitro evolution is highly desirable. Knowledge of enzyme kinetics is required. The successful candidate will also possess excellent communication skills together with the ability to work within a multi-disciplinary team.

We offer a competitive salary and benefits package, including a stock option plan and flexible benefits program. For consideration, please send a curriculum vitae and the names of three references to:

Ribozyme Pharmaceuticals, Inc., Job #062,  
2950 Wilderness Place, Boulder, CO 80301. Fax:  
(303) 449-6995. E-mail: jobs@rpi.com.

Web site: <http://www.rpi.com>

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## Scientist – Process Development

Somatogen, a biopharmaceutical company located in Boulder, Colorado, currently engaged in the clinical and preclinical development of a recombinant human hemoglobin, has an exciting opportunity available for a Process Development Scientist.

This position will be responsible primarily for developing new and enhanced methods for analyzing process intermediate streams in Somatogen's recombinant hemoglobin manufacturing process. There is also significant opportunity for working on new product developments. The position works closely with process and analytical development scientists.

This position requires a Ph.D. in Biochemistry or an equivalent combination of education and experience. Prior work experience is not essential. To be successful, candidates will need strong skills in practical problem solving through the application of analytical methods. Personal qualities must include good communication skills and a preference for a highly collaborative, team-based work environment. Somatogen offers a competitive salary and benefits package, and relocation assistance. Interested candidates please submit their resume to:

Somatogen  
Human Resources  
2545 Central Avenue  
Boulder, CO 80301

Females and minorities are encouraged to apply.  
An Equal Opportunity Employer

# SOMATOGEN

## DIRECTOR UWS/UWM Great Lakes WATER Institute University of Wisconsin-Milwaukee Graduate School

The Graduate School of the University of Wisconsin-Milwaukee is seeking applications and nominations for the position of Director of the newly organized UWS/UWM Great Lakes Wisconsin Aquatic Technological & Environmental Research (WATER) Institute. The WATER Institute supports scientific research, education, and outreach programs related to the preservation and development of aquatic resources within the State of Wisconsin and in the Great Lakes region.

**Responsibilities:** The Director is responsible for the administration of WATER Institute resources to foster and enhance the research and outreach activities of investigators, educators, and staff. The Director is expected to pursue the development of existing and new cooperative research initiatives, outreach activities, and federal, state, and private sector funding opportunities, and to create an environment that stimulates and supports a broad spectrum of multidisciplinary aquatic research and education.

**Qualifications:** A minimum of 10 years of relevant experience administering an environmental research organization; a record of productive interaction with government agencies; a doctoral degree in a relevant discipline; and a record of involvement on issues relevant to the WATER Institute mission.

**Terms:** This is a full-time, 12-month limited title appointment with excellent fringe benefits. Salary commensurate with qualifications and experience.

**Expected Start Date:** January 2, 1998

**Application Procedures:** Submit a letter of application, résumé or vitae, and the names, addresses, and phone numbers of three references, postmarked by October 1, 1997, to: Robert A. Jones, Associate Dean, Graduate School, P.O. Box 340, University of Wisconsin-Milwaukee, Milwaukee, WI 53201. Phone: 414-229-5920/e-mail: rajones@csd.uwm.edu.

Names of nominees and applicants who have not requested that their identities be withheld and names of all finalists will be released upon request.

EOE/AAM/F/H/V

## CARDIOVASCULAR PHARMACOLOGY

### GROUP LEADER

SmithKline Beecham is at the forefront of cardiovascular research and innovation in drug discovery. We have an excellent research opportunity for a leading scientist to join a department committed to cardiovascular disease. We are seeking an independent, accomplished individual with strong molecular biology techniques and strategies and special emphasis on transcription regulation/factors. This leader will join the strategic initiative within Cardiovascular Pharmacology and establish independent basic research incorporating functional genomics, transcription regulation and gene profiling toward novel therapeutic opportunities. These efforts will continue to result in breakthrough discoveries with 21st century technology. Specific areas of interest include atherosclerosis, vascular and cardiac remodeling and matrix formation, smooth muscle and endothelial cell biology and vascular function.

The successful candidate will be a recognized leader in the scientific community with a significant record of publications in high quality, peer-reviewed journals, along with a PhD in Biological Sciences, and at least 10 years' experience with a successful career in a pharmaceutical or academic research organization.

Located in a state-of-the-art research facility in Bala Cynwyd, Philadelphia, SmithKline Beecham offers a competitive compensation/benefits/relocation package as well as a stimulating work environment. For confidential consideration, please forward a resume and salary requirements to: SmithKline Beecham Pharmaceuticals, Job Code H7-CVLE, P.O. Box 2645, Bala Cynwyd, PA 19004. **Indicating Job Code is essential.** For more information on SmithKline Beecham, visit our Web site at [www.sb.com/careers](http://www.sb.com/careers). We are an Equal Opportunity Employer, M/F/D/V.



**SmithKline Beecham**  
Pharmaceuticals  
Challenging the natural limits.

A Commitment To  
**EXCELLENCE.**  
The Pursuit Of  
**INNOVATION.**  
A Sense Of  
**ACCOMPLISHMENT.**

**A**s part of the cardiovascular discovery team, you will be involved in finding ways to help patients live better, longer lives through innovative cardiovascular pharmaceutical products and services. You will become a member of a multi-disciplinary team focused on one of the following: Atherosclerosis, Congestive Heart Failure, Stroke, or Thrombosis.

**Ph.D. - Thrombosis Research  
(Pharmacology or Physiology)**

A multidisciplinary team of scientists is seeking a highly motivated senior *in vivo* cardiovascular investigator to join in their search for novel antithrombotic agents. Primary responsibilities include direction of a laboratory program toward development of small animal models of thrombotic disease to study etiologic mechanisms and novel pharmacologic interventions focused upon coagulation. A Ph. D. in Pharmacology or Physiology with 5 years of independent research is preferred. The individual must be sufficiently creative and flexible to effectively address issues ranging from pharmacodynamics to animal modeling of problems that arise during clinical evaluation of drug candidates.

**Ph.D. - Bioinformatics**

Bioinformatics Scientists and Software Engineers work closely with discovery teams and Genome Scientists to ensure effective use and management of information in biological databases throughout Lilly. An outstanding individual is sought for a number of functions including utilization and integration of gene expression data as well as exploitation of novel software technologies in computational functional analysis. Candidates should have a degree and substantial experience in Bioinformatics and/or Molecular Biology.

**Ph.D. - Atherosclerosis Research  
(Biochemistry)**

A position is available at the senior scientist level for a Biochemist with extensive background in the biochemistry of metabolic pathways involved in the development of Atherosclerosis and/or Insulin resistance. Demonstrated expertise in molecular pathways involved in lipoprotein metabolism and expertise in lipid biochemistry and/or enzymology are required together with an experience in the development of whole animal metabolic studies. Experience with insulin signaling would be preferred.

**Ph.D. - Congestive Heart Failure  
(Biochemistry)**

A position is available at the senior scientist level (Ph.D. or equivalent) for a Biochemist with extensive background in experimental protein biochemistry of cardiac cells associated with the development of heart failure. The scientist should have significant experience with the *in vitro* models (cardiac myocytes, fibroblasts) and the molecular and signaling pathways associated with cardiac contractility changes and fibroplasia. The scientist should have proven experience in the routine use of protein biochemistry, DNA-protein interaction, viral transfection, and tissue culture techniques. The capacity to develop functional assays and to interpret functional assays in cardiac cells would be preferred.

**Ph.D. - Thrombosis Research  
(In Vitro Biochemist)**

We are seeking a Biochemist with experience in blood coagulation, specifically with the biology and chemistry of coagulation factors and anticoagulants. We expect the scientist to conduct research toward the elucidation of antithrombotic mechanisms and the discovery of novel antithrombotic agents. A qualified candidate would have the ability to integrate basic scientific knowledge and experience into problem solving relevant to drug discovery; interest or experience in the discovery of novel anticoagulant mechanisms and pharmaceutical candidates; interest or experience in the study of mechanisms of thrombosis/antithrombotics/anticoagulants; interest or experience in the development of biochemical assays for use in study of antithrombotic agents and for screening and testing compounds as candidates for anticoagulant drug discovery.

**Ph.D. - Thrombosis  
(Biochemistry)**

We are looking for a senior scientist to join an exciting and novel approach in our thrombosis research group. A qualified applicant will need a strong background in enzymology and kinetics with additional experience in hemostasis/thrombosis and/or molecular biology being highly desirable. Skill sets should include enzymology, kinetic analysis with allosteric modulators with enzymes, cell culture, coagulation assays, platelet biology, expressing point mutation of recombinant proteins in mammalian cells, and protein purification.

**Ph.D. - Cardiovascular Research  
(Molecular Biologist)**

We are seeking a scientist with focus on and expertise in the area of cardiovascular research. The successful candidate should have skill sets including cDNA cloning, library construction, mRNA isolation, and gene expression in *E. Coli* and eukaryotic systems. Candidates with experience in DNA and protein database exploration are preferred. Biological interests of the candidate should include receptors (alpha-adrenergic), inflammation (including phospholipase A2, IL 1), and endocrine (including insulin, growth hormone).

**BSIMS - Cardiovascular Research  
(Biochemistry, Molecular Biology)**

Multiple positions exist in the cardiovascular research group in several disciplines related to the research and positions described above.

*All candidates are expected to contribute creatively to basic and applied research directed at drug discovery and should also show excellent interpersonal and communication skills as well as being a team player in a multidisciplinary and challenging environment. Ph.D. applicants should have a minimum of three years postgraduate experience or its equivalent. All candidates with previous industrial experience are strongly encouraged to apply.*

*Lilly*  
**Cardiovascular  
discovery**

**A**n excellent salary. A comprehensive benefits package. A sense of pride. You'll enjoy all this and more when you join us at Eli Lilly and Company. For immediate consideration, please send your resume to: Eli Lilly and Company, US Recruiting and Staffing, Division of Cardiovascular Research, Lilly Corporate Center, Indianapolis, IN 46285. For more information, please visit our Web site: <http://www.lilly.com>. We are an equal opportunity employer dedicated to diversity and the strength it brings to the workplace.

**Knowledge Is Powerful Medicine**

**POSITIONS OPEN**

**CELL BIOLOGIST  
THE UNIVERSITY OF MICHIGAN  
ASSISTANT PROFESSOR**

The Department of Biology at the University of Michigan solicits applications for a faculty position in cell biology. We seek individuals who use molecular approaches to study fundamental problems in cell biology. The successful candidate must have a Ph.D. in biology, cell biology, molecular biology, or a related field, as well as postdoctoral experience. The successful candidate will join an active and expanding group of cellular and molecular biologists interested in a variety of fundamental biological questions. In addition to establishing a successful research problem, the candidate will be expected to participate in undergraduate and graduate teaching of the department. To apply, send a curriculum vitae, copies of reprints, brief summaries of present research and future research plans, and arrange to have three letters of reference sent directly by October 10, 1997, to:

**Chair, Cell Biology Search Committee  
Department of Biology  
University of Michigan  
Natural Sciences Building  
Ann Arbor, MI 48109-1048**

*The University of Michigan is an Affirmative Action/Equal Opportunity Employer.*

**ASSISTANT/ASSOCIATE PROFESSOR  
INFECTIOUS DISEASES**

The Division of Infectious Diseases in the Department of Internal Medicine is seeking outstanding scientists for tenure-track faculty positions. Successful candidates should have an M.D. or Ph.D. with strong postdoctoral research experience in infectious diseases. Special consideration will be given to those involved in studies of the molecular biology, immunology, or pathogenesis of HIV infection or opportunistic pathogens related to HIV. Must have strong record of research publications and show obvious potential for establishing and maintaining an externally funded basic research program. M.D. candidates should be board-certified in Internal Medicine and board-eligible in Infectious Diseases. Submit covering letter, list of three references, and curriculum vitae to:

**Dr. Richard A. Koup  
Professor and Chief  
Division of Infectious Diseases  
The University of Texas  
Southwestern Medical Center  
5323 Harry Hines Boulevard  
Dallas, TX 75235-9113**

*The University of Texas Southwestern Medical Center is an Equal Opportunity Employer.*

**UNIVERSITY OF KENTUCKY  
ATHEROSCLEROSIS RESEARCH PROGRAM**

An opening is available for an ASSISTANT PROFESSOR (tenure-track) level Investigator with research interests in atherogenic mechanisms. This new program will bring together a group of researchers with interests in many aspects of atherosclerotic lesions, with emphasis on plaque vulnerability and rupture. Investigators using mouse models of atherosclerosis will benefit from outstanding animal facilities adjacent to newly constructed laboratory space. Send applications and inquiries to: **Dr. Alan Daugherty, Director of Atherosclerosis Research, Division of Cardiovascular Medicine, Room L-543, KY Clinic, University of KY Medical Center, Lexington, KY 40536-0284. E-mail: jmuller@pop.uky.edu; FAX: 606-323-6475.** *The University of Kentucky is an Equal Opportunity Employer.* Applications should include curriculum vitae, three references, and recent publications.

The Department of Physiology and Biophysics at the University of Alabama at Birmingham invites applications for two tenure-track ASSISTANT PROFESSORS. First position—expertise needed in intracellular signaling, molecular biology, and/or electrophysiology of ion channels and other transporters related to cardiovascular function. Second position—expertise in intracellular signaling/inflammation, molecular biology, and/or electrophysiology of ion channels and other transporters. Exceptional individuals with demonstrated ability to integrate molecular and whole-animal studies should apply. Please send curriculum vitae, statement of research plans, and three letters of recommendation by October 15, 1997, to: **Dale J. Benos, Ph.D., 1918 University Boulevard, BHSB 706, Birmingham, AL 35294.** *The University of Alabama at Birmingham is an Affirmative Action/Equal Opportunity Employer.*

**POSITIONS OPEN**

**MOLECULAR BIOLOGIST**

The Department of Biology at Willamette University invites applications to fill a tenure-track ASSISTANT PROFESSOR position beginning August 1998. A Ph.D. is required. Evidence of successful undergraduate teaching and postdoctoral research experience is highly desirable. The successful applicant is expected to engage undergraduate students through classroom teaching and to develop a research program appropriate for a liberal arts institution. Teaching responsibilities will include 1) participation in introductory courses for majors and non-majors; 2) development of courses in area of speciality and a research methods class; and 3) direction of senior research. Applicants are invited from individuals who use a wide array of molecular techniques to investigate contemporary questions in biology. Broadly trained developmental biologists and immunologists with an organismal background are especially encouraged to apply. The successful candidate will occupy spacious teaching and laboratory facilities in the new Olin Science Center.

Candidates should submit a statement of teaching and research philosophies, curriculum vitae, copies of all transcripts, and names with e-mail addresses of three references by October 1, 1997, to: **Dr. Scott D. Hawke, Search Chair, Department of Biology, Willamette University, Salem, OR 97301. Telephone: 503-370-6181; e-mail: shawke@willamette.edu; FAX: 503-375-5425.** *Willamette University is an Equal Opportunity Employer and embraces excellence through diversity.*

**FACULTY POSITIONS IN PHARMACOLOGY**

The Department of Pharmacology of The University of Texas Southwestern Medical Center seeks applications for a tenure-track position at the level of ASSISTANT PROFESSOR. Applicants must have a relevant Ph.D. or M.D. degree, postdoctoral training, and show evidence of firm commitment to a career in independent research. We are particularly interested in considering individuals with an appropriate background who wish to apply techniques of molecular or cellular biology, biochemistry, or physiology to fundamental problems of pharmacological interest. A superb start-up package and excellent facilities are available. Responsibilities will also include teaching of medical and/or graduate students after the first year of employment.

Send curriculum vitae and a brief description of proposed research to:

**Dr. Alfred G. Gilman, Chairman  
Department of Pharmacology  
University of Texas Southwestern Medical Center  
5323 Harry Hines Boulevard  
Dallas, TX 75235-9041**

*An Equal Opportunity/Affirmative Action Employer.*

**PENNSYLVANIA.** The Division of Neonatology at the University of Pennsylvania and The Children's Hospital of Philadelphia is currently recruiting two Investigators. The first position is for a Ph.D. Researcher at the RESEARCH ASSISTANT PROFESSOR level with experience in the chemistry and physiology of nitric oxide who is interested in both basic research on nitric oxide chemistry and collaborative clinically related studies of oxidant stress and inhaled nitric oxide. Applicant should have demonstrated expertise in the field and potential for obtaining independent research funding. The second position is for an established clinician/scientist with strong clinical experience and a commitment to basic laboratory. This candidate must be BC in neonatology and committed to teaching in an NICU setting. The university faculty rank for this position is expected to be at the ASSOCIATE PROFESSOR or PROFESSOR level. Please send curriculum vitae to: **Dr. Roberta Ballard, Chief, Neonatology, The Children's Hospital of Philadelphia, 34th Street and Civic Center Boulevard, Philadelphia, PA 19104. FAX: 215-590-3051.** *The University of Pennsylvania is an Equal Opportunity/Affirmative Action Employer. Women and minorities are encouraged to apply.*

**MOLECULAR CARDIOLOGIST  
UCLA SCHOOL OF MEDICINE**

The Department of Pediatrics is seeking an ASSISTANT or ASSOCIATE PROFESSOR for tenured, state-funded position. Candidate must have demonstrated the ability to lead a productive research program in molecular cardiology. Send curriculum vitae to: **Glenn Wetzel, M.D.-Ph.D., UCLA Pediatric Cardiology, 10833 Le Conte Avenue, Los Angeles, CA 90095. FAX: 310-825-7458; e-mail: gwetzel@pediatrics.medsch.ucla.edu.** *UCLA is an Equal Opportunity/Affirmative Action Employer.*

**POSITIONS OPEN**

**THE UNIVERSITY OF WISCONSIN-MADISON  
DRUG DELIVERY  
TWO FACULTY POSITIONS**

The Division of Pharmaceutical Sciences in the School of Pharmacy, University of Wisconsin-Madison, solicits applications for two tenure-track faculty positions in the general area of drug delivery. The specific area of interest is biomaterials and drug delivery; preferred research emphasis will be in polymeric drug delivery systems, self-assembling systems, nanostructures, macromolecular adsorption, supramolecular chemistry, or related studies. One position is at the FULL or ASSOCIATE PROFESSOR rank, the other at the ASSISTANT or ASSOCIATE PROFESSOR rank. Applicants should possess the Ph.D. in an appropriate field (pharmaceutics, physical chemistry, chemical engineering, etc.) and be capable of maintaining or building a strong independent research program while engaging in productive collaborative interdisciplinary research. A commitment to undergraduate and graduate education is essential.

Applications will be accepted until November 1, 1997. Inquiries and applications should be directed to:

**Joseph R. Robinson  
School of Pharmacy  
University of Wisconsin-Madison  
425 North Charter Street  
Madison, WI 53706-1515  
Telephone: 608-262-7968**

**FACULTY POSITION IN PHYSIOLOGY  
TULANE**

Applications are invited for non-tenure-track appointment at the rank of ASSOCIATE PROFESSOR. Candidates should hold the Ph.D. or M.D. degree and have a record of excellence in research. The candidate must be a productive cellular and molecular physiologist with a research interest on the molecular and cellular mechanisms underlying atrial natriuretic peptide and angiotensin II signaling. The successful applicant will be expected to have an established research program consistent with an academic appointment at the Associate Professor level and extramurally funded research program. Please submit curriculum vitae, a brief statement of research interest, copies of representative publications, and the name of three references to: **Dr. L. Gabriel Navar, Chair, Tulane University School of Medicine, Department of Physiology SL-39, 1430 Tulane Avenue, New Orleans, LA 70112.** We will accept applications until a qualified applicant is found. *Tulane University is an Affirmative Action/Equal Opportunity Employer, and qualified women and minorities are encouraged to apply.*

**ASSISTANT PROFESSORS (2) In Evolutionary Biology/Ecology.** The Department of Biological Science at Florida State University invites applications for two positions at the Assistant Professor level. We are particularly interested in candidates in evolutionary ecology and/or systematics, but would consider any excellent candidate who will complement our current faculty in ecology, conservation biology, and evolution. Teaching responsibilities will include an undergraduate course in evolution and participation in the graduate program. Applicants should send a curriculum vitae, a statement of teaching interests, a description of research interests and goals, and relevant reports. Applicants should also provide the names and telephone numbers of three references and arrange to have letters of recommendation sent to the search committee. All applications should be submitted to: **Ecology and Evolutionary Biology Search Committee, Department of Biological Science, Florida State University, Tallahassee, FL 32306-1100.** For more information E-mail: [search3@bio.fsu.edu](mailto:search3@bio.fsu.edu) or website: <http://www.fsu.edu/biology>. *Florida State University is an Affirmative Action, Equal Opportunity Employer.*

**BIOCHEMISTRY FACULTY POSITION  
CALIFORNIA STATE UNIVERSITY,  
SACRAMENTO**

The Department of Chemistry is seeking a tenure-track faculty at the ASSISTANT PROFESSOR level to teach at a primarily undergraduate institution with also a Master's program. Position begins the start of the fall 1998 academic semester; review of applications begins November 1, 1997. For complete position description and requirements, read the vacancy announcement at the site: <http://www.chem.csus.edu>. Or contact: **C. Hill, Chair, Chemistry Department, CSU, Sacramento, 6000 J Street, Sacramento, CA 95819. E-mail: hilljames@csus.edu.** *California State University is an Affirmative Action/Equal Opportunity Employer.*

## OUR FORMULA FOR SUCCESS:

Science  Compassion

 Fulfillment

### Diabetes Research

#### **Ph.D. and BSIMS - Cell Biologists/Biochemists**

We are seeking multiple scientists with proven expertise in cell biology, cellular biochemistry, receptor biology and signal transduction for expanding programs in the areas of insulin sensitivity (Indianapolis, Indiana location) and beta cell function (Hamburg, Germany location). Candidates should have broad expertise in areas of mammalian cell biology, and the use of cell biology techniques to explore signal transduction, regulation of gene expression, and regulation of insulin secretion. Successful candidates will be involved in multidisciplinary programs to identify and validate new drug targets.

#### **Ph.D. and BSIMS - Physiologists**

We are seeking multiple scientists with proven expertise in physiology for our programs in hormone action (BS/MS) and insulin sensitivity (Ph.D., BS/MS). Candidates should have broad expertise with techniques to assess carbohydrate and lipid metabolism in animal models of NIDDM and IDDM. These individuals will be part of multidisciplinary programs to identify and validate new targets, and to assess the impact of potential drug candidates on animal models of diabetes.

### Obesity Research

#### **Ph.D. and BSIMS**

#### **Molecular/Cell Biologists/Biochemists/Physiologists**

We are seeking multiple scientists with proven expertise in molecular biology, cell biology, cellular biochemistry, mitochondrial function, physiology, receptor biology and signal transduction for our programs in the area of obesity research. Candidates should have broad expertise in areas of mammalian cell biology, and the use of cell biology and pharmacology techniques to the regulation of energy homeostasis. Successful candidates will be involved in multidisciplinary programs to identify and validate new drug targets.

### Skeletal Research

#### **Ph.D. and BSIMS**

#### **Molecular/Cell Biologists/Pharmacologists**

We are seeking multiple scientists with proven expertise in molecular biology, cell biology, cellular biochemistry and pharmacology. Applicants should have experience in at least one of the following areas of research: growth factor signal transduction pathways; G protein coupled receptor structure and function; or in vivo and in vitro models in bone and cartilage biology. Experience in a drug discovery program would be beneficial, but not required. As part of a multidisciplinary effort, applicants would be involved in finding unique therapeutic solutions to osteoporosis.

### Genomics Research

We are seeking senior scientists to expand our effort to profile human gene expression associated with obesity and diabetes. Projects will be centered around investigating potential therapeutic targets and proteins, that in their own right may be therapeutic agents.

#### **Ph.D. - Molecular Biologists**

Successful candidates will have a background exemplified by the identification of novel genes using at least one of the following techniques: positional cloning, differential/subtractive cloning, expression cloning, PCR cloning, cDNA and genomic DNA library construction and/or use of DNA data base search analysis.

#### **Ph.D. - Molecular Biologists**

Successful candidates will have experience in at least one of the following areas: G protein-coupled receptors, proteases, cytokines, nuclear receptors, transcription factors, insulin signaling and resistance, adipocyte differentiation, mammalian gene expression and/or lipid metabolism.

### Postdoctoral Fellows

We are looking for creative scientists in a variety of areas to explore emerging aspects of endocrinology diseases. A Ph.D. in molecular biology, cell biology, biochemistry or physiology is required. Positions are available in Endocrine Research in the areas of genomics, diabetes, obesity, and skeletal research. Lilly Postdoctoral Fellows gain sound practical experience and focused training that will significantly expand their scientific knowledge and abilities in drug discovery.

Ph.D. applicants should have a minimum of two years postgraduate experience or its equivalent. We offer a competitive compensation and benefits package and a highly professional environment. For confidential consideration, please send your resume and cover letter indicating the position of interest to: **Eli Lilly and Company, Division of Endocrine Research, US Recruiting and Staffing, Lilly Corporate Center, Indianapolis, IN 46285.**

We are an equal opportunity employer dedicated to diversity and the strength it brings to the workplace. For other opportunities at Eli Lilly and Company, please access our Job Bank at: <http://www.lilly.com>

**M**ost people work to live. Others work so people live longer. At Lilly, our proven leadership in the worldwide battle against human disease has allowed us to define success on our own terms. And while it's true we market products in 156 countries, employ nearly 30,000 people internationally and are a \$7+ billion leader in the pharmaceutical industry, we ultimately measure our accomplishments by their effect on the health and happiness of the international community we serve.

Eli Lilly and Company's Division of Endocrine Research is committed to developing novel drug therapies to effectively treat diabetes, obesity and skeletal diseases. At Lilly, our delivery of revolutionary pharmaceutical-based health care solutions is inspired and guided by the people we touch, be it customers, employees, shareholders, or partners. Our commitment to excellence and professional integrity reinforces our passionate pursuit and discovery of mankind's most advanced treatments, cures and methods of disease prevention.



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## POSITIONS OPEN

### TWO FACULTY POSITIONS VIROLOGY AND MICROBIAL PATHOGENESIS

Department of Microbiology and Immunology  
University of Rochester  
School of Medicine and Dentistry

The Department of Microbiology and Immunology of the University of Rochester invites applications for two tenure-track positions at the ASSISTANT PROFESSOR level. Applicants should have a Ph.D. and at least three years of postdoctoral experience. We are seeking (1) individuals with expertise in microbial pathogenesis (applicants with an interest in host-pathogen interactions, opportunistic infections, or emerging infectious disease are encouraged) and (2) a virologist (applicants with interest in human tumor viruses, vaccine biology, and/or viral immunology are encouraged). Successful candidates are expected to develop an externally-funded research program as well as participate in graduate and medical student teaching. The University of Rochester has embarked on major new research initiatives in the areas of vaccine biology and immunology, cancer biology, and aging and development. This will entail the hiring of 50 new faculty and construction of a new research facility. Please send curriculum vitae, statement of research interest, and names of three references to: Virology and Microbial Pathogenesis Search Committee, Department of Microbiology and Immunology, University of Rochester School of Medicine and Dentistry, 601 Elmwood Avenue, Box 672, Rochester, NY 14642. The University of Rochester is an Equal Opportunity Affirmative Action Employer. For additional information concerning the Department visit our website: <http://www.urmc.rochester.edu/smd/mbi/>.

### FACULTY POSITIONS BIOCHEMISTRY AND MOLECULAR BIOLOGY

The Department of Biochemistry and Molecular Biology at the University of Texas-Houston Medical School invites applications for two tenure-track positions at the rank of ASSISTANT PROFESSOR. Applicants with excellent training and accomplishments in the broad area of biochemistry and molecular biology will be considered. We are seeking outstanding scientists who are addressing important biological questions at the level of basic mechanisms. Areas of emphasis include gene targeting in mice, structural biology, and eukaryotic molecular biology. A generous start-up package and competitive salary are provided with each position. The selected candidates will be expected to develop vigorous independent research programs and to teach in the curriculum for graduate and medical students.

The University of Texas-Houston Medical School is located within the Texas Medical Center and provides an exceptional research environment with a variety of core facilities, research centers, and graduate training programs.

Submit a curriculum vitae, the names and addresses of three individuals who can supply letters of reference, and a summary of future research plans to: Julia E. Lever, Ph.D., Chairman, Search Committee, Department of Biochemistry and Molecular Biology, University of Texas-Houston Medical School, P.O. Box 20708, Houston, TX 77225-0708. The deadline is November 1, 1997. Additional information about the department can be found at our website: <http://www-bmb.med.uth.tmc.edu>.

Equal Opportunity Employer. Women and minorities are encouraged to apply.

### ASSISTANT PROFESSOR DEPARTMENT OF PHARMACOLOGY

Applicants are sought for a full-time, tenure-track Assistant Professor faculty position to participate in the research, instructional, and service activities of the Department. Candidates must have a Ph.D. degree in pharmacology or a closely related discipline, postdoctoral experience, and a record of research productivity in molecular pharmacology. Areas of research interest include, but are not limited to, immunology, endocrinology, and neuropharmacology. For information, contact website: [www.olemiss.edu/depts/pharmacology/](http://www.olemiss.edu/depts/pharmacology/). Submit a letter outlining research interests and qualifications, curriculum vitae, and names of three references by November 1 to: Administrative Manager, School of Pharmacy, NCDNP Room 1026, University of Mississippi, University, MS 38677. The University of Mississippi is an Affirmative Action/ADA/Equal Opportunity Employer.

## POSITIONS OPEN

### PURDUE UNIVERSITY MOLECULAR PHARMACOLOGY

The Department of Medicinal Chemistry and Molecular Pharmacology at Purdue University seeks to expand significantly its research in molecular pharmacology. Applications are invited for two tenure-track positions at the ASSISTANT or ASSOCIATE PROFESSOR level. Candidates should hold a Ph.D. in pharmacology or a related area of molecular science and should have at least two years of postdoctoral training; *legal authority to work indefinitely in the United States is also required*. The department is particularly interested in candidates whose research interests bridge the biology/chemistry interface in the areas of neuropharmacology and cancer pharmacology. Successful candidates will be expected to establish a strong research program with extramural funding and have a commitment to excellence in teaching at the undergraduate and graduate levels. Minority and women scientists are especially encouraged to apply. Applicants should submit a curriculum vitae, a detailed description of research plans, and the names and addresses of three references to: Search Committee, Department of Medicinal Chemistry and Molecular Pharmacology, Purdue University, West Lafayette, IN 47907-1333 by November 1, 1997, or until positions are filled. *Purdue University is an Equal Opportunity/Equal Access University.*

### IMMUNOLOGY FACULTY POSITIONS AVAILABLE

The Department of Microbiology and Immunology invites applications for tenure-track positions at the level of ASSISTANT PROFESSOR. We are seeking investigators whose research interests are directed to molecular and/or cellular analyses of contemporary problems in immunology. Candidates will be expected to develop high quality, extramurally funded independent research programs with long-term growth potential. Teaching responsibilities, which emphasize quality rather than quantity, include medical, dental, and graduate students. The Department offers a highly interactive intellectual environment with strong extramural research support.

The review of applications will begin on September 15 and will continue until the positions are filled. Applications should consist of curriculum vitae, copies of several recent publications, a brief statement of future research goals, and three letters of reference to be sent to:

Dr. Terrance G. Cooper  
Department of Microbiology and Immunology  
The University of Tennessee, Memphis  
858 Madison Avenue, Room 801  
Memphis, TN 38163

Detailed information about the Department may be obtained on the World Wide Web at: <http://microbiology.utmen.edu>.

The University of Tennessee, Memphis is an Equal Employment Opportunity/Affirmative Action/Title VI/Title IX/Section 504/ADA/ADEA Employer.

### TENURE-TRACK POSITIONS DEPARTMENT OF PHYSIOLOGY AND BIOPHYSICS UNIVERSITY OF TENNESSEE, MEMPHIS

The University of Tennessee, Memphis, Department of Physiology and Biophysics is actively recruiting for two tenure-track faculty positions. Academic rank is dependent upon experience and qualifications. Candidates should have a Ph.D. or M.D. degree, a good track record in publications, and postdoctoral research experience with a background in cellular and/or molecular biology. The abilities to establish an independent research program in the areas of cardiovascular, gastrointestinal, developmental, endocrine, or epithelial physiology and to engage in teaching activities of the department are expected.

Applicants should send a curriculum vitae, copies of three representative publications, and the names of three references to: Dr. Leonard R. Johnson, The Thomas A. Gerwin Professor and Chair, Department of Physiology and Biophysics, UT Memphis, 894 Union Avenue, Memphis, TN 38163. The University of Tennessee is an Equal Employment Opportunity/Affirmative Action/Title VI/Title IX/Section 504/ADA/ADEA Employer. Minorities and females are encouraged to apply.

## POSITIONS OPEN

### ASSISTANT PROFESSOR SURGICAL RESEARCH LABORATORY

The Department of Surgery at the University of Tennessee Medical Center at Knoxville invites application for an Assistant Professor, limited term, non-tenure-track position for the vascular surgical research in the Surgical Research Laboratories. The position requires an individual who has operative skills in experimental surgery. Successful applicants will be expected to carry out a research program in vascular biology, and to teach and advise students, residents, and fellows in basic science methodology. Start-up funds are available, but the candidate will be expected to generate extramural funding. The applicant should possess a minimum of a Ph.D. degree in molecular and cellular biology. Experience in recombinant DNA technology and endothelial/smooth muscle cell biology is desired. An interest in animal models of human diseases is desirable.

The Surgical Research Laboratory is located in the University of Tennessee Memorial Research Center. There are busy clinical vascular, oncologic, and trauma surgery services for clinical collaboration with the Surgical Research Laboratory. Current research interests include: the study of platelet function and fibrinolysis endothelial antigen systems, genetic engineering of endothelial cells, laser and endovascular surgery, noninvasive vascular technology, coagulation, shock, and nutrition.

Contact: Mitchell H. Goldman, M.D., Professor and Director, Surgical Research Laboratory, Department of Surgery, The University of Tennessee Medical Center at Knoxville, 1924 Alcoa Highway, Knoxville, TN 37920. Telephone: 615-544-9234.

The University of Tennessee is an Equal Employment Opportunity/Affirmative Action Employer/Title VI/Title IX/Section 504/ADA/ADEA Employer.

### GENETIC EPIDEMIOLOGIST FACULTY POSITION UCSF CANCER CENTER CANCER RESEARCH INSTITUTE

The UCSF Cancer Center has an opening for a Genetic Epidemiologist at the ASSISTANT or ASSOCIATE PROFESSOR level. Applicants should have experience in studying the prevalence and penetrance of cancer susceptibility genes, interactions between genes and environmental factors, and/or genotype/phenotype interactions. The successful application will occupy laboratory space in the new UCSF Cancer Research building and will collaborate with a multidisciplinary cancer genetics program that is currently developing new methods for detecting mutations and gene rearrangements in tumor specimens, and is developing a state-of-the-art facility for molecular diagnostics. Minimum requirements include a M.D. or Ph.D. in genetics, epidemiology, or a related field, and evidence of independent research capability based on publications and extramural funding.

Interested applicants should send a curriculum vitae, a short statement of research plans, and the names of at least three references to:

Thea Tlsty, Ph.D., Chair  
Cancer Research Institute Search Committee  
c/o Tracey A. Lee  
UCSF Cancer Center  
1600 Divisadero Street, Room C126-A  
San Francisco, CA 94143-1297

UCSF is an Affirmative Action/Equal Opportunity Employer. The University undertakes Affirmative Action to assure Equal Employment Opportunity for underutilized minorities and women, for persons with disabilities, and for Vietnam-era veterans and special disabled veterans.

### TENURE-TRACK FACULTY POSITIONS TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER

The Department of Cell Biology and Biochemistry is seeking ASSOCIATE PROFESSORS who desire the opportunity to teach medical/allied health gross anatomy. Collaborative opportunities with investigators in cellular, molecular, and reproductive biology are available. Applications will be reviewed upon arrival and will be accepted until the positions are filled. Please send a curriculum vitae, including a statement of teaching/professional goals, and names and addresses of referees to: Dr. Beverly S. Chilton, Faculty Search Committee, Department of Cell Biology and Biochemistry, Texas Tech University Health Sciences Center, Lubbock, TX 79430. FAX: 806-743-2990. Texas Tech University Health Sciences Center is an Equal Employment Opportunity/Affirmative Action Employer.



# St. Jude Children's Research Hospital

ALSAC • Danny Thomas, Founder

## POSTDOCTORAL FELLOWSHIP FOR MINORITY CANDIDATES

St. Jude Children's Research Hospital, a premier research center for biomedical research, offers a Minority Postdoctoral Fellowship to American citizens or permanent residents as dictated by NIH. The Fellowship was established by the American Lebanese Syrian Associated Charities and St. Jude Children's Research Hospital's Board of Governors. Recent M.D., Ph.D., D.V.M., or Pharm.D. fellows are eligible to train with leading scientists and several basic biomedical research laboratories which include biochemistry, biostatistics, developmental neurobiology, diagnostic imaging, experimental oncology, experimental hematology, genetics, infectious diseases, immunology, pathology/molecular biology, pharmaceutical sciences, molecular pharmacology, radiation oncology, structural biology, surgery, tumor cell biology and virology/molecular biology. Please visit our web site at <http://www.stjude.org>.

Fellowship awards are given for up to three years and are based on merit, recommendation and promise of a productive career in biomedical research. Stipends are highly competitive.

Minority applicants should provide a curriculum vitae, a brief description of their research interests, and three letters of reference. Please send to:

Office of Academic Programs  
Minority Postdoctoral Fellowship  
St. Jude Children's Research Hospital  
332 N. Lauderdale Street  
Memphis, TN 38105-2794 • U.S.A.

Tel: (901) 495-2750  
Fax: (901) 525-2720

Deadline for receipt of application is September 30,  
1997.

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As a leading research and development company, Cell Genesys is genetically engineering the human immune system to create innovative therapies for serious diseases. We are currently seeking a Sr. Research Associate.

Collaborating with other members of the project team, you will design and conduct chimeric immune receptors for optimization of T cell function. The project may also include studies to determine the relationship between structure and function for these chimeric receptors.

A BS/MS degree in molecular biology, biochemistry, or related field, plus working experience in an industry or academic research environment are essential. The candidate must have 8-10 years' experience (with a BS degree) or 6+ years' experience (with an MS degree) in molecular biology, including PCR and Southern/Northern gene construction. Experience with tissue culture, Western blotting, immunoprecipitation, and flow cytometry would be helpful. Previous team work experience is highly desirable.

Cell Genesys is dedicated to developing important human healthcare products in gene therapy. We are equally committed to those who make up our team and provide our employees with excellent salaries and a full benefits package. To learn more, please forward your CV/resume/written inquiries to: CELL GENESYS, INC., Attention: Human Resources, 322 Lakeside Drive, Foster City, CA 94404. We are an equal opportunity employer.



CELL GENESYS

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Few biotechnology companies can offer you the promise and excitement of Gilead Sciences. We are a leader in the discovery and development of a new class of antiviral therapeutics that may provide powerful new treatments for CMV retinitis, HIV, influenza and other viruses. Here, you'll be a part of a company that takes pride in its achievements, knowing that patients may benefit from the products we create. Come join us in the following exciting opportunity.

### RESEARCH SCIENTIST DEPARTMENT OF CELL BIOLOGY

The successful candidate will participate in the discovery and development of novel antisense therapeutics. Specific responsibilities include developing *in vivo* and *in vitro* models to identify molecular targets in cancer and inflammation. Direct experience with animal models of human disease and a strong background in molecular and cellular biology are essential. Requirements include a Ph.D. plus 2-3 years of post-doctoral experience in the areas of tumor biology, immunology, and/or molecular biology.

At Gilead, we are committed to developing important treatments for a wide range of human diseases. As you will discover, we are as committed to opportunity as we are to scientific achievement. Interested candidates should send a resume to: Human Resources, Gilead Sciences, Inc. 333 Lakeside Drive, Foster City, CA 94404, fax (650) 573-4800, [www.gilead.com](http://www.gilead.com). We are proud to be an equal opportunity employer.

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Lilly's Oncology division has become increasingly important within

the corporate structure. As we blend science with technology, and an innovative spirit with the human spirit we commit ourselves to the discovery, development, and commercialization of innovative drugs to treat cancer. With research programs in signal transduction, drug resistance, cell cycle control, gene therapy, and prostate cancer, we offer a stimulating and productive environment for the discovery of innovative drugs that will advance the treatment of cancer patients worldwide. We are compelled by a sense of urgency, because we know that in the lives of waiting patients, every moment matters. **Join us today.**

THE SCIENCE OF

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innovation

**Ph.D. and BS/MS  
Biochemists**

We are seeking multiple candidates with proven experience in biochemistry. The applicants should have broad expertise in one or more of the following areas: protein purification, enzyme kinetics and characterization of enzyme activity, development of assays for high volume screening, signal transduction pathways, and development of drug candidates. Expectations also include proficiency in using software applications, maintaining an awareness of current scientific literature and technical writing ability for publications, reports, and presentations.

A successful Ph.D. candidate will have a minimum of 3 years postdoctoral experience. Knowledge of molecular biology techniques would be desirable.

**Ph.D. and BS/MS  
Molecular/Cellular Biologists**

We are seeking multiple individuals with proven experience in cell biology, cellular pharmacology, signal transduction, gene targeting, and tumor model technologies. The candidates should have a broad experience in various aspects of mammalian cell biology and the use of molecular and cellular biology techniques to explore and evaluate potential drug targets. Successful candidates will also perform research in multidisciplinary teams to develop cell-based and animal-based models for evaluating new drugs and drug targets. Experience in using software applications, DNA transcription, RNA splicing and DNA genomics is desirable.

Candidates for Ph.D. positions should have a degree in the Biological Sciences with a minimum of 3 years postdoctoral experience.

**Ph.D. and BS/MS  
Pharmacologists**

The candidates should have broad experience in various aspects of cell-based assay development and drug evaluation and/or animal-based tumor modeling and drug evaluation. Specific skills would include in vitro cytotoxicity, membrane transport, cell-based techniques, programming and operation of various automated assay equipment, proficiency in using software applications, radioactive enzyme assays, data collection and analysis, and preparation of reports, presentations and publications.

Our in vivo positions require expertise in the molecular characterization of human and murine tumors for the expression of key drug targets using immunohistochemistry, histology, and flow cytometry. Experience in the formulation of test compounds for administration to experimental animals is also necessary. Knowledge of the fundamentals of chemistry, molecular, and cellular biology is desirable.

Candidates for Ph.D. research scientist must have 2-5 years experience in cancer cell biology. Experience in signal transduction and development of cancer therapeutics is desired.

**Postdoctoral Fellows**

We are looking for creative individuals in a variety of areas to explore mechanistic aspects of new molecular targets associated with cancer. A Ph.D. in Molecular Biology, Cellular Biology, Biochemistry, Pharmacology or Medicinal Chemistry is required. Positions are available for projects in signal transduction, cell cycle control, drug resistance, angiogenesis, apoptosis, and evaluation of drug combinations in vitro and in vivo. Lilly Postdoctoral Fellows gain sound practical experience and focused training that significantly expands their scientific knowledge and abilities in drug discovery and development.

**We provide** the salary, compensation and advancement opportunities you would expect from an industry leader. For confidential consideration, please send your resume and cover letter indicating position of interest to:

- Eli Lilly and Company**
- Division of Oncology Research**
- US Recruiting and Staffing**
- Lilly Corporate Center**
- Indianapolis, IN 46285**

We are an equal opportunity employer dedicated to diversity and the strength it brings to the workplace. For other opportunities at Eli Lilly and Company, please access our Job Bank at: <http://www.lilly.com>

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Genentech employees form a human DNA chain.

Career Opportunities and Graduate Programs for

Honor the PhD: it truly is the academic pinnacle, public acknowledgment of excellence and potential. And that is as it should be. But the PhD confers no monopoly. Thousands of scientists with AA, BA, BS, MA, and MS degrees are demonstrating their own talents each day. They are the foundation on which most industrial science companies and all graduate science programs rest.

Here, we will speak of career opportunities for these scientists, not about what they don't have (the PhD) but rather what they have much of (skill and opportunity). Below, we hear from seven companies (Shaman Pharmaceuticals, Genentech, Hyland, Pfizer Inc, Hoffmann-La Roche Inc., SmithKline Beecham, and Zeneca Pharmaceuticals) and five graduate programs (the University of Rochester, the University of Colorado at Boulder, the University of California at Los Angeles [UCLA], Stanford, and the Biozentrum at the University of Basel in Switzerland). From all reports, BS and MS scientists are working at the very vanguard of contemporary science. They have a variety of ways to forge careers, and the science they do tells a tale of excellence expressed and potential realized.

# BS & MS Scientists

## Bringing Back the Wisdom: Shaman Pharmaceuticals

SOUTH SAN FRANCISCO, CALIFORNIA—Gina Morhun, vice president of human resources at Shaman Pharmaceuticals, says, "When you do things differently, you create new challenges for yourself." Shaman certainly does things differently, sending western-trained MDs and ethnobotanists to work with indigenous shamans in tropical regions, while biologists and chemists at home help turn shamanic wisdom (and medicinal plants) into pharmaceutical products.

Shaman currently is heavily recruiting BS and MS scientists in departments such as medicinal chemistry, plant discovery research, manufacturing, and QA/QC. "At every key level," Morhun says, "we have a number of research assistant and associate positions."

Natural products chemists, though rare, are indispensable at Shaman. "Once we have an extract from a natural product," Morhun

*John Timpane, PhD, writes frequently on the biotechnology and pharmaceutical industries.*

continued ►

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*Genentech's people share some pretty uncommon traits. Not surprising when you consider the scope of our mission - creating breakthrough medicines for conditions like cystic fibrosis, growth deficiency, cancer and heart disease. It demands a very special kind of person. Someone who will take risks, accept responsibility and constantly seek creative solutions.*

*Do you have the traits to contribute to making our vision of longer, healthier lives for thousands of people a reality? Consider what you expect from a career and yourself. Expect the extraordinary? Then share your traits with us.*

**www.gene.com**

## ***Associate Scientist/Scientist - Recovery Sciences***

You will design and develop commercial, large-scale recovery or purification processes using current protein purification technologies. This will involve participating in an interactive group collaborating with Scientists and Process Engineers. Your work may also encompass participation on project teams and in recovery process technology development and direct participation in plant implementation of process design. Requires a PhD or equivalent in Biochemistry, Bioanalytical Chemistry or Chemistry; at least 2 years of postdoctoral study is highly desirable. A conceptual understanding of chromatography and protein characterization and experience with protein purification at lab bench scale are essential. Good communication skills and the ability to conduct independent research are necessary. Job Code SCI784

## ***Research Assistant/Associate - Virus Testing and Development***

You will participate in the design and performance of studies on viral safety and validation of virus clearance by pharmaceutical protein recovery processes. You will also collaborate with several groups to work on the development of state-of-the-art nucleic acid-based methods to be used in the characterization of production cell lines and the optimization of cell culture and fermentation processes. Requires a BS or MS in Molecular Biology, Virology, Cell Biology, Biochemistry or a related field. You must also have strong skills in molecular biology (especially nucleic acid purification/characterization, quantitative PCR and nucleic acid sequencing) with 3-5+ years of applied experience. Job Code SCI547

## ***Research Associate/Associate Scientist - Analytical Chemistry***

You will act as a system manager of a 500 MHz spectrometer and pursue projects using NMR to study oligosaccharide structure/function/dynamics and protein-carbohydrate interactions. There will also be opportunities for interdisciplinary collaborations. Requires a BS or MS in Chemistry, Physics or a related field and direct experience in high resolution NMR spectroscopy. You must also have pulse sequence implementation, hardware maintenance and UNIX experience. Job Code SCI767

## ***Research Associate/Necropsy Specialist***

As part of the Pathology department, you will primarily support necropsy activities. Responsibilities will include performing necropsies on various species, assisting with blood collections, performing perfusion techniques, using anesthesia and euthanasia techniques according to company guidelines, utilizing gross photographic skills, trimming tissues and performing whole body cryotomy. A BS in a life science is preferred, but an AA with at least 2-5+ years' equivalent experience is acceptable. Job Code SCI722

## ***Research Associate - Protein Engineering***

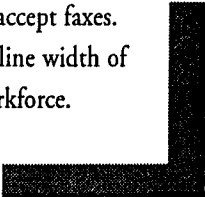
An energetic and flexible candidate is sought to participate in protein and peptide chemistry research projects in the department of Protein Engineering. You will work as part of a group of chemists focusing on problems in protein structure, function and recognition. Projects will require protein expression and purification, basic molecular biology, peptide synthesis and purification, and some biophysical and biochemical experimentation. Requires a BS in Chemistry or Biochemistry, previous research experience and skills in either organic synthesis or molecular biology, with a desire to learn the latter two disciplines. Strong organizational skills and a collaborative attitude are essential. Job Code SCI772

## ***Lab/Research Assistant***

Work in our Biopharmaceutics department determining pKa and solubility of new small drug candidates, develop formulation to support pharmacokinetic/toxicological studies, including stability studies, analytical method development (HPLC, MS, CZE, etc.). Requires a BS or MS in a pharmaceutical science, several years of experience in formulation of small drug candidates, strong analytical background and creativity in problem solving. Job Code SCI345

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Our progressive benefits package includes full medical/dental/vision, 3 weeks vacation, a sabbatical program, a stock purchase plan and health club membership. Send your resume, indicating Job Code, to: **Genentech, Inc., Human Resources, P.O. Box 1950, South San Francisco, CA 94083-1950**. Please use plain typefaces. We cannot accept faxes. **You may e-mail your resume indicating Job Code to [jobs@gene.com](mailto:jobs@gene.com)** (ASCII files only with a maximum line width of 76 characters). Genentech is an Equal Opportunity Employer. We value the contributions of our diverse workforce.





Biologists and chemists turn shamanic medicine into pharmaceuticals at Shaman.

says, "we go straight to analysis and structure elucidation." Organic chemistry skills and techniques, including chromatography and HPLC, are essential at this stage, where the search is on for the exact molecule that gives the plant its medicinal effects. Once the structure of the molecule is known, the project goes to medicinal chemists, who create analogues that may exhibit greater activity, less toxicity, and better receptor binding.

"We need people who are not only good scientists but also linguists, people with diplomatic skills, and people with some knowledge of FDA and foreign import and export regulations," Morhun says. The ethnobotany group at Shaman is extremely diverse, with degrees in biology, ethnobotany, biodiversity, and ecology, along with knowledge of indigenous languages and customs—and excellent long-term camping skills.

The company itself is "a very hard-driving, goal-oriented place," according to Morhun. Those who learn by doing, who like the candid exchange of opinion, who can grasp opportunity out of chaos in a multitask, time-crunched environment, do well here. Morhun says, "If I ask a candidate, 'What are you looking for?' and they answer, 'Stability,' I know this is not the place for them to be." In this real-world science environment, chemists and biologists work and think together—and both work with the ethnobiologists, who think in a very different manner from either one. And few things are more real-world than field expeditions, where, for three months, MDs, translators, and scientists bed down with snakes, insects, and other discomforts—not to mention dealing with people who have never set eyes on their kind before.

Shaman values applicants from highly recognized programs, those who have shown initiative and participated in internships, co-ops, or undergraduate research, and those who have acquired skills useful in industry. All job candidates give a seminar, which both introduces their work to their future colleagues and demonstrates their ability to communicate. "We ask questions about teamwork skills and conflict resolution skills," Morhun says. "We ask about mentors, and what role the mentor has played in this person's career development. We really want to know what kind of person we're hiring. We want them to be right for us, but more importantly, we want to be right for them."

#### **"Making a Legend": Espresso and Excellence at Genentech**

SOUTH SAN FRANCISCO, CALIFORNIA—Here, at the first biotech company in the world, you can hit the espresso coffeemakers in the lobby between experiments, or join the Ultimate Frisbee pick-up games on Wednesday night, or pump with the Bicycle Club, or attend the traditional company Ho-Ho's—or you could just be one of 3,161 people doing great science together. Genentech has a knack of finding good scientists who can help you understand what they do and why they are excited about it. Al Guiteras, senior manager for employment, says, "We combine a high level of science with an unconventionally egalitarian and free-flowing atmosphere."

Marnie Moody, college relations representative, says, "We're trying to create a legend." And Julie Oleynick, employment team leader for quality, regulatory, and medical affairs, locates BS and MS scientists in that effort: "They have great career opportunities because they have so many options, all of them science-based. Of course there's discovery research, but there's also clinical affairs, production, manufacturing, QA/QC, and regulatory affairs. Even in a department as seemingly far-removed as marketing, you see BS- and MS-level scientists using their science background daily."

Asked about the profile of a good candidate, the trio came up with adjectives such as "entrepreneurial," "creative," and "self-directed." Moody adds that community service is a

plus, both in a candidate's background and later in the scientist's career at Genentech: "People with a community consciousness find that the company thinks the same way."

Areas of need include manufacturing science, particularly entry-level biochemists for technical positions such as media preparation and QC analyst. Hot skills include recombinant work and protein sciences. "Our manufacturing, QA/QC, and production groups look for an understanding of protein analysis, fermentation science, and chromatography," Moody says. "In our research associate positions, molecular biology is a key area, with skills that include sequencing and library construction." Guiteras notes a steady need for biostatisticians ("they are hard-to-find people, much in demand"), molecular modelers, computational biochemists, and MS degrees in nursing or pharmacology. He also speaks of the clinical research associate as a particularly attractive job for BS/MS scientists: "Clinical affairs is an exciting career where you can enjoy a mixture of science, patient care, and research."

Oleynick urges job-seekers to get internships or other business experience that will serve as "both an eye-opener and a foot in the door." Moody advises them to "know as much as you can about the industry—who the major companies are and what they've done. Sometimes I'm surprised by the lack of knowledge I encounter at job fairs. The information is out there and more accessible than ever." As he guides us down an aisle, Guiteras adds, "We want people who have a romance about this business, who see it as a cause."

#### **"Finding and Growing Talent": Assuring Quality at Baxter Biotech's Hyland Division**

HAYWARD, CALIFORNIA—"In a word, anywhere": Teresa L. Patton, human resources manager for Baxter-Hyland Pharmaceuticals, is telling us where you are likely to find BS and MS scientists in her company. Hyland, a division of Baxter Healthcare, specializes in biotechnology, producing products from both human blood and recombinant technology. The Hayward facility is a provider of cGMP manufacturing services, specializing in pilot to small-scale cell culture and purifi-

continued ►

# STAR SCIENCE



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#### **Synthetic Organic Chemists/ Combinatorial Chemists**

#### **Animal Physiologists**

- Metabolic Diseases
- Oncology

#### **Protein Chemists**

- Neuroscience
- Applied Genomics
- Immunology
- Biologic Process

Ph.D. level candidates are also encouraged to contact us for opportunities within:

- Oncology
- Informatics
- Magnetic Resonance Imaging & Spectroscopy
- Macromolecular Structure (Enzymology & Protein Chemistry)
- Applied Genomics (Mass Spectrometry/Protein Chemistry)
- Metabolic Diseases & Age-Related Disorders
- Biologic Process

All positions are located in our Princeton, New Jersey facility, except for those in Neuroscience (CT only) and Synthetic Organic & Combinatorial Chemists (both sites). Please forward your resume to the relevant location, including your area of scientific interest:

**Bristol-Myers Squibb**  
Pharmaceutical Research Institute  
Human Resources, P.O. Box 11279  
Trenton, NJ 08620-0279  
FAX: 609-581-8841

**Bristol-Myers Squibb**  
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P.O. Box 5101, 5 Research Parkway  
Wallingford, CT 06492-7661  
FAX: 203-284-7762

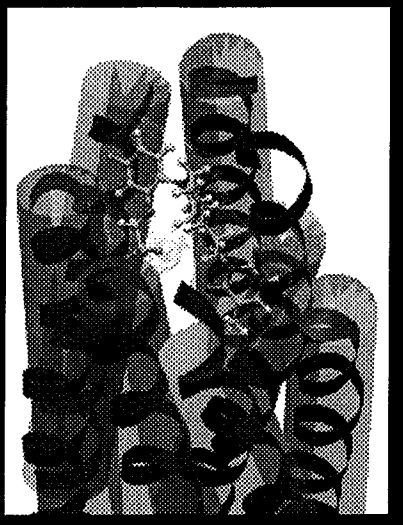


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## **research associates and research scientists**

### *Medicinal Chemistry*

Use your synthetic and analytical techniques to prepare, purify and characterize organic compounds for biological evaluation. This will include analyzing results, evaluating technology and proposing solutions. Your experience must include a good knowledge of literature resources.

### *Chemical Development*

Using your expertise in chemistry and/or organic chemistry, you'll conduct research to solve complex organic chemical problems related to process research, process development and scale-up. This may include participating in the production of drug substances needed for proof of concept, as well as devising and implementing procedures for lab and pilot plant operations, following GMPs.

### *Metabolism/PK/Bioanalysis*

Conduct *in vitro* and *in vivo* metabolism studies to support drug discovery programs, including new drug candidate selection, IND/CTX submissions, and related studies. Your chemistry/biochemistry/analytical chemistry background must include hands-on skills with a variety of experimental techniques and computer literacy.

**Roche Bioscience offers a highly attractive salary, bonus plans, a full benefits package, plus a unique environment that rewards new ideas and courageous decision-making. If you would like to explore our opportunities firsthand, apply today by sending your resume to: Roche Bioscience, Job Code: SCI0829KH, 3401 Hillview Avenue, Palo Alto, CA 94304. Fax 415/424-8159.**

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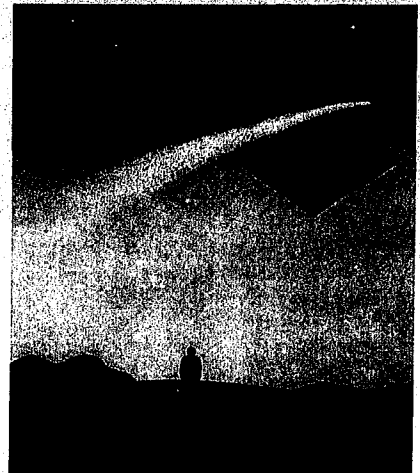
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Rapid growth. A strong research orientation. The drive ... and ability to set the direction for an industry. That's what you'll find at Genetics Institute.

As a result, Genetics Institute can help you find exactly what you've been looking for in your career:

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- The chance to discover the breakthrough products of tomorrow in protein-based therapeutics
- The unique sense of excitement, accomplishment, and satisfaction that comes from knowing that your efforts go directly towards improving health and life for generations to come

With its state-of-the-art technology and environment, Genetics Institute is also uniquely positioned to continue its success and growth well into the next millennium. You'll find it's a great organization for building and spending a career.



## ANDOVER, MA

### DRUG PRODUCT DEVELOPMENT

#### Development Staff - Parenterals Process Manufacturing Development

We currently have an exciting opening for an experienced, dedicated professional to participate in the development of our drug product manufacturing process for protein parenterals. Specific areas of involvement include process development, technology transfer, and validation. To qualify, you must have a BS in a scientific or engineering field, plus at least 3 years of experience in aseptic processing of parenterals. Process development or validation experience is desirable. Job Code: SCI829-PL-387

### BIOANALYTICAL SCIENCES

#### Scientific Staff

We seek a scientist with a strong work ethic, plus excellent communications, organizational, and interpersonal skills in dealing with all levels of scientists to serve as a research liaison between research immunology and the Antibody Technology Group on projects designed to generate monoclonals using traditional methods and phage display. Specific responsibilities include general antibody generation, purification, and characterization, plus the use of cell-based assays, flow cytometry, ELISA, and RIA. To qualify, you must have a Ph.D. plus 2 - 3 years of postdoctoral experience. Industrial experience and a knowledge of immunology, molecular biology, FACS, chromatography, Westerns, epitope mapping, FLITRX, MLRs, and functional assays are highly desirable. Job Code: SCI829-MB-352

#### Research Staff

We seek a scientist with the ability to interface with different researchers and manage multiple projects simultaneously to be involved with general antibody generation, purification, and characterization projects using traditional monoclonal antibody techniques as well as molecular approaches, such as phage display. You will also use cell-based assays for antibody purification, protein characterization, and assessment of antibody functionality. To qualify, you must have a BS/MS, plus 5 or more years of experience (or Ph.D. plus 1 - 2 years) in molecular biology and immunology. Molecular biology skills and familiarity with antibody generation a must, as is a knowledge of immunology, immune modulation, FACS, chromatography and general protein characterization, epitope mapping, and FLITRX. Job Code: SCI829-MB-454

## CAMBRIDGE, MA

### EMBRYONIC GROWTH AND REGULATORY PROTEINS GROUP

#### Scientist

We seek a highly motivated individual to join our team of scientists investigating the molecular basis of pancreas development and islet beta cell differentiation. To qualify, you must have a Ph.D. and 2 - 4 years of postdoctoral training in molecular biology, gene regulation or developmental biology. Familiarity with endoderm, gut or pancreas development, and hands-on experience in molecular biology, mRNA analysis, *in situ* hybridization, organ culture, and transgenic mice desirable. The successful candidate will contribute to ongoing efforts in large scale gene expression monitoring and functional analysis of candidate pancreas growth regulatory genes. Job Code: SCI829-HM-PS

#### Postdoctoral Fellowships

Two postdoctoral research positions are available to study pancreatic endocrine cell development and regeneration by applying molecular genetic and genomics technologies. Expertise in molecular biology and experimental embryology or developmental genetics required. Job Code: SCI829-HM-PD

To be considered for current or future job openings, please send resumes, suitable for scanning (see below), indicating Job Code, directly to: Human Resources Dept., Genetics Institute, Inc., 87 CambridgePark Drive, Cambridge, MA 02140. Fax: (617) 876-8847.

Scannable resumes should be forwarded on plain white bond paper, using standard types and fonts, and no bold or italic print. When faxing resumes, please also mail an original copy.

Genetics Institute offers competitive salaries and benefits, including comprehensive health care, dental and life insurance, three weeks' paid vacation, 401(k), pension plan, relocation assistance, tuition assistance, and an on-site exercise facility.

Genetics Institute is an equal opportunity, affirmative action employer, dedicated to building strength through diversity.

For additional opportunities, visit our web site at:



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*Harnessing the Body's Power to Heal™*



*Science is a closely collaborative effort at Hyland.*

cation of bulk pharmaceuticals (primarily monoclonal antibodies) for therapeutic applications. Quality control, known as QC throughout the biopharmaceutical world, is vital here, and AA, BS, and MS scientists are very much involved.

Quality control is the process of ensuring that the product, the materials that go into making it, and the environment in which it is made all meet company and federal specifications. BS scientists work as both analysts and supervisors in QC. "We look for attention to detail," says Jacquie Byatt, QC immunology supervisor. "What I like to see in a person is the ability to anticipate potential problems. We have constant contact with manufacturing, quality assurance, and regulatory affairs. It's dynamic and quite interactive."

K. Y. Chan, supervisor of QC microbiology, has a BS in biology and an MS in microbiology; all the scientists in his group have BS degrees. "They are all well trained in their various specialties—immunology, chemistry, microbiology," he says, "and they bring their skills together at this job." Like Byatt, he looks for detail-orientation in job-seeking candidates, a talent for hands-on work, as well as problem-solving and troubleshooting. "Often," he says, "when a problem arises in the facility, we won't know the cause, and we'll have to investigate. It takes a team of logical problem-solvers working closely together."

As Patton puts it, "We do a good job of finding good talent and growing them into the profession." With Stanford, Berkeley, and UC Davis all providing BS- and PhD-level talent of the highest caliber, competition for good scientists is fierce. Hyland also hires AA-level scientists; several local colleges offer excellent

hands-on associate's degrees in biotechnology. Valued skills at Hyland include ELISA, HPLC, IEF, SDS-PAGE and Western blot, environmental monitoring technique, familiarity with cGMP and good documentation practices, and a general background in immunology, chemistry, or microbiology.

Baxter also looks for what Patton calls a "good cultural hire," a person who enjoys the hands-on atmosphere, someone who will grow into the job and the company. In perusing CVs, Patton looks for signs of leadership and resourcefulness in or out of school: "It could be extracurricular activities, sports—we like evidence of team skills—or community service. I like a diverse person, one who, if possible, has worked as well as going to school, not necessarily a person who spent all his or her time studying."

Chan, Patton, and Byatt encourage job-seekers to do their homework about the company prior to interviewing. They should also come prepared with questions about the work they will be doing. "Talk to as many people as you can," Patton says. "Use the Internet, look at the job postings." Chan, like most of the professional scientists we have spoken to, says he is "happy to talk to people in informational interviews," as is Patton: "It's part of the community outreach process for us, and part of the education process for the job-seekers. Everybody benefits."

#### **"From Idea to Candidate": Discovery Research at Pfizer Inc**

GROTON, CONNECTICUT—In the words of John LaMattina, vice president of US discovery operations for Pfizer Inc, "Discovery research takes the drug development process from idea to candidate, from the nascent stage in which we have a problem and a possible way of attacking it, to identifying a compound ready for clinical testing."

BS and MS scientists are what LaMattina calls "a key component in what we do," making up fully 60 percent of the discovery research staff. Duties of these scientists depend on their level of expertise upon entry. BS chemists fresh out of school will start to work making compounds; they and other entry-level scientists will work under a

good deal of direction. But like other companies, Pfizer has established a scientific career ladder for BS and MS scientists. As they grow in experience and ability, their roles evolve, taking on more independence and responsibility. "At the high end of that ladder," LaMattina says, "the BS and MS scientist can enjoy levels of responsibility and economic benefit analogous to those accorded to PhD-level scientists."

Pfizer also encourages these scientists to enhance their degrees, offering Wednesday afternoon courses on-site toward an MS at nearby Brown University or the University of Rhode Island. And, just by dint of working at Pfizer, their science becomes more and more interdisciplinary. "We ask people here to broaden themselves," LaMattina says, "not be just a biologist, just a chemist, but to understand more of the process of drug development. The chemist who understands biological principles is a more versatile chemist, and the same is true of the biologist who learns more about chemistry."

LaMattina is nothing if not optimistic about the potential for pharmaceutical research. "As the human genome unravels," he says, "and as we learn more about the molecular bases of disease, one can imagine that we'll be able to go after all of the scourges of humankind. Some will be more difficult to attack and some easier. But at Pfizer you'll find great activity in all the major areas—cancer, heart disease, diabetes, osteoporosis, CNS disorders, diseases of the aged, urogenital disease, postmenopausal problems. We don't have a hottest area. They're all hot."

Prospective job candidates should have enthusiasm, lab experience ("Between two people with the exact same qualifications, we'll always pick the one with good laboratory experience," LaMattina says), good communications skills, and teamwork skills—and they should "want to grow."

LaMattina's enthusiasm is catching as he makes his case:

"Science is a wonderful field to be in right now. When your career is over, you want to be able to close the lab book and say you worked on something that made a difference to people. And that's what we do. I can almost guar-

continued ►

While you may perceive academia as the only place where you can practice good science and continuously develop your skills, you may be surprised to find that there's a Fortune 100 company with an environment that fosters all that and more - Pfizer.

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So if you want to continuously push the boundaries of science while you continue to push your own development further and further ahead, join us at Pfizer for an education in growth and success.

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Qualifications include a BS or MS in a relevant field. Research experience, particularly undergraduate and independent research projects, is desired.

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- Biological Sciences
- Cell Biology
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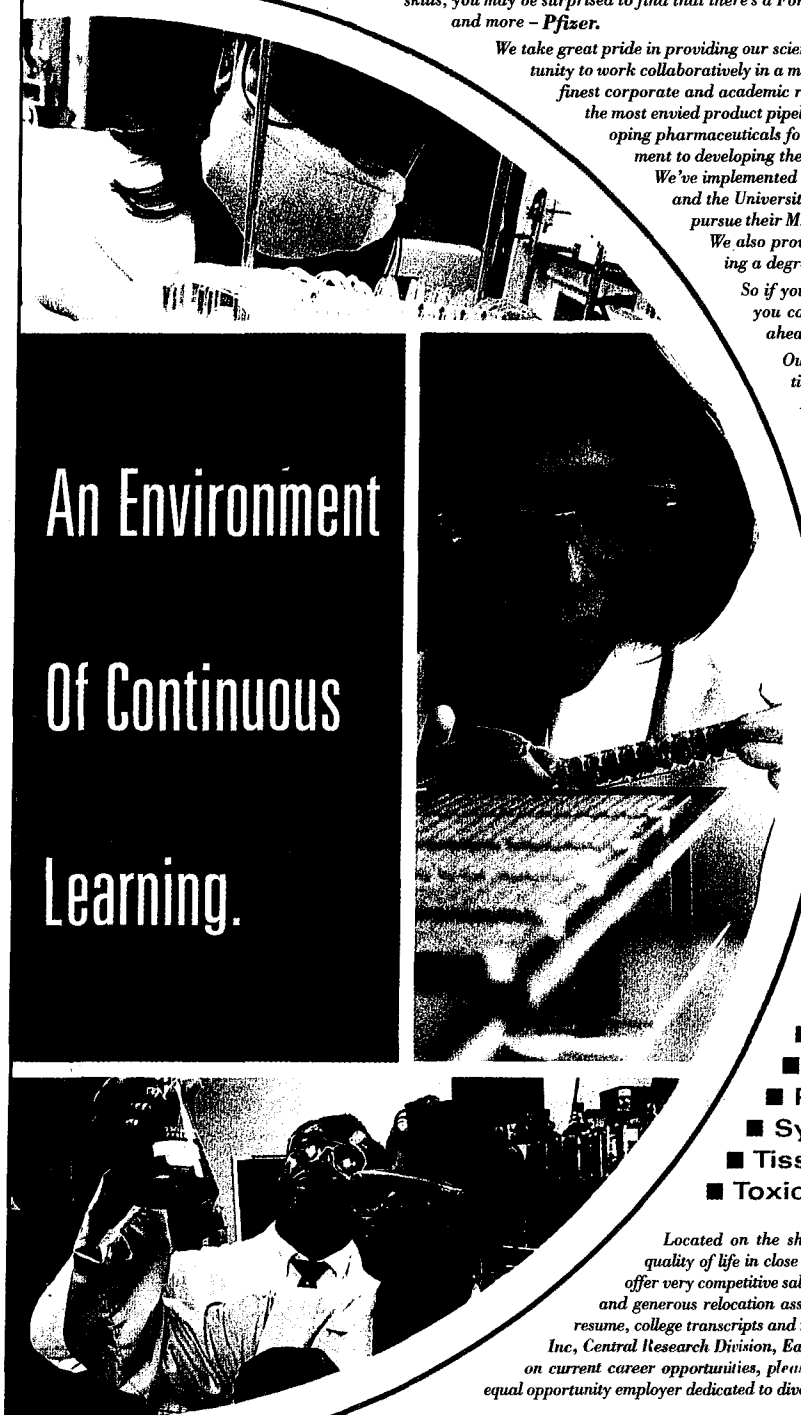


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Carry out all pathology projects in the Metabolic Disease and CNS program, including the localization of candidate genes/gene products and characterization of animal models of disease. To qualify, you must have a BS and 3+ years in a neuroscience or metabolic disease laboratory using histologic techniques. A strong understanding of rodent neuroanatomy and experience with *in situ* hybridization is a must.

Job Code: 0897-SHK

### **Monoclonal Antibodies**

Responsible for monoclonal antibody development and screening. Requires a BS and/or MS, plus experience with monoclonal antibody generation. Familiarity with automation a plus. Tissue culture, hybridoma generation, immunization of mice, flow cytometry, immunoassays, ELISA, radioligand binding assay experience desirable. Job Code: 0897-SMAK

### **Phage Display**

Aid in the development and practice of Phage Display technologies, including the cloning of immunoglobulin variable domains by PCR, construction of phage vectors and libraries expressing immunoglobulin receptors, selection of phage using affinity-based methods, and purification and characterization of the recombinant receptors. Requires a BS and 2 years of experience, specifically with the following techniques: mRNA isolation, cDNA production, PCR, plasmid cloning, phage handling, affinity purification, ELISA, flow cytometry and immunohistochemistry. Job Code: 0897-SPDK

### **Protein Purification**

Contribute to the key efforts of a group expressing and purifying secreted recombinant proteins in a technologically advanced purification and analysis environment. Specifically, you will carry out rapid protein purification and analysis on multiple protein projects. Strong experience in protein purification techniques (LC, FPLC, HPLC, etc.) and standard analytical techniques, such as SDS PAGE and western blotting, is essential. Familiarity with Biocad instruments or mass spec. analyses a plus. Job Code: 0897-SPPK

### **Finisher - DNA Sequencing**

Responsibilities include sequencing assembly, editing and polishing tasks on projects ranging from cDNA clones to large genomic clones. You will also meet regularly with gene discovery scientists to discuss clone assembly projects and take an active role in the design of new software and automation to support the assembly process. To qualify you must have a BS/MS in Molecular Biology, Biochemistry, Biology, Microbiology or Genetics. 3+ years of experience in DNA sequencing, sequence assembly, sequencing chemistry troubleshooting and familiarity with sequence analysis tools essential. ABI experience a plus. Job Code: 0897-SFH

### **Research/Production Associate (2nd Shift)**

2:30pm - 11:30pm Wed-Sun  
2:30pm - 11:30pm Sat-Wed

Join our high throughput second shift sequencing team in this entry-level position. You will utilize liquid handling robots for high throughput sequencing template preparation and sequencing reaction assembly. You will also be responsible for automated fluorescent sequencing, sequence data analysis, and production process optimization. Requires a BA/BS in Biochemistry, Biology, Microbiology, or Chemistry. Undergraduate research is a plus. Computer proficiency, Macintosh, PC, a plus. Job Code: 0897-SPH

## **BIOINFORMATICS**

### **Product Manager, Technology Transfer**

Work as a senior staff member in the TechTransfer group. Responsibilities include: planning, support, and transfer of Millennium's leading-edge bioinformatics software to our corporate pharmaceutical partners. Work closely with biologists, computer scientists, software engineers and program managers to ensure successful implementation and use of Millennium's proprietary technologies by our corporate partners. Requires 5+ years successful program management experience in software or technology-based environment and/or significant biology background; 20% travel required. MS in CS, Biology or related field required. Job Code: 0897-SITH

### **User Support Specialist**

Support users (both internal and pharmaceutical partners) of proprietary software; resolve technical problems with engineering, QA, and documentation. BS/MS and 5-10 years experience with UNIX, Mac, or Win95/NT and 20% travel required. Interest or experience in Biology required. JobCode 0897-SUSG

## **SCIENTISTS**

### **Metabolic Disease Physiologist**

Conduct *in vivo* studies exploring the effects of peripheral and central administration of compounds on food intake, metabolism and other parameters relevant to body weight regulation and diabetes. To qualify, you must have a Ph.D., MD, or DVM with a minimum of 3 years post-doctoral experience, preferably including *in vivo* and hypothalamic administration of compounds and work with *in vivo* metabolic disease models. Job Code: 0897-SMDPK

### **Therapeutic Proteins**

Play a key role in a group expressing, purifying and characterizing novel recombinant secreted proteins. Specific responsibilities involve identifying the cellular targets of these proteins using diverse protein biochemistry and cell biology paradigms, and developing *in vitro* bioassays to determine cellular function. Requires a Ph.D. and research carried out in two or more laboratories focused on the study of secreted signaling molecules. A strong background in the study of growth factors/cytokines/hormones and their receptors *in vitro* is highly desirable. Important skills include isotopic/fluorescent labeling of proteins, receptor binding studies, Scatchard analysis, protein crosslinking, receptor autoradiography, histology, tissue culture and cell-based assays. Job Code: 0897-STPK

### **Immunology**

We seek a highly motivated professional to oversee a critical project within the department focused on monoclonal antibody production and characterization. You will be expected to pursue an active research program centered on gene discovery efforts. To qualify, you must have a Ph.D., plus a knowledge of immunology, molecular biology, and cell biology. 2 - 4 years or more of post-doctoral experience preferred. Experience in tissue culture, monoclonal antibody production, immunoassays, ELISA, radioimmunoassays, T cell functional assays, molecular biology and protein chemistry required. Job Code: 0897-SIK

Make it possible. Send or fax your resume, indicating Job Code, to:

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antee anyone coming to Pfizer in 1998 that they'll experience working on a successful drug campaign at some point in their careers. If you like doing the work of science—and you should make sure you do—then I'd say strongly consider a career in drug discovery."

**"More than Just a Summer Job":  
Internships at Hoffmann-La Roche, Inc.**

NUTLEY, NEW JERSEY—"We see our internship program as more than just a summer job," says Dianne Ruffolo, human resources associate at Hoffmann-La Roche, Inc. (Roche): "Our goal is to offer students an opportunity to learn about us and the pharmaceutical industry while handling meaningful projects

**"No Longer Just a Pair of Hands":  
BS and MS Synthetic Chemists at  
SmithKline Beecham**

KING OF PRUSSIA, PENNSYLVANIA—*Joe Flisak is assistant director of synthetic chemistry at SmithKline Pharmaceuticals. Below, he meditates on how recent changes in the pharmaceuticals industry have renovated the role of the BS and MS chemist:*

BS and MS scientists are not just a pair of hands. With the field becoming so much more competitive, we need a team that can bring a drug to market more quickly than ever. So we're relying more and more on the BS and MS chemist to work, not under the PhD, but alongside the PhD, to be innovative in their chemistry, come up on their own with brand-new ideas and breakthroughs.

So when we look at a new BS or MS scientist, we're looking for signs of creativity. We talk to their supervisors or lab mentors. Do they just follow orders? Did they have creative input into their research work? How involved were they in their project? Good science is an absolute requirement, but beyond that, we need the assertive, intelligent person who can take care of a project.

It used to be said that to have a "real" career in chemistry, you needed a PhD. These days, that's no longer the case. We've had MS people that have been promoted to the PhD level and beyond, simply

in a challenging environment."

Out of hundreds of applicants, a total of 47 interns will be spending the summer at Roche in 1997, working in departments that range from marketing to engineering. Nineteen of those students are in discovery research, in departments that include immunology, oncology, and drug metabolism.

Shakel Lee, pursuing a BA in exercise science and psychology at Douglass College, Rutgers University, is spending her fourth straight summer as a Roche intern. Lee, who came in through the INROADS organization, is working in the department of inflammation and autoimmune diseases. "I like the experience of working in a large pharmaceu-

on the basis of their excellent work. The opportunity is there. Also, BS and MS chemists often move to other departments and move up the ranks—as with a good friend of mine, an MS in chemistry who went for a law degree and became a patent attorney.

This is definitely the time of the synthetic chemist. With the growing emphasis on computational chemistry, companies are screening more compounds more quickly than ever before, and they're facing the challenge of how to juggle so many new compounds coming at them at once. It's a time of great excitement in the field as well—for example, with all the new work in asymmetric synthesis. Competition for these people is fierce—we regularly compete with other companies for the best chemists—and I have seen some astounding starting salaries.

Good candidates should have a solid science background, good lab skills, excellent organizational and communications skills (SmithKline is an international company, and we have to learn to communicate across cultures, disciplines, and time zones), and the ability to shift gears quickly. We value people who can accept a chemistry challenge gladly and come up with a solution that's better than the original compound. That's why we're here.



Interns at Roche: Jeffrey Tam and Shakel Lee.

tical company," she says. "It gives you a good overview of the whole industry, and it gives you excellent opportunities for networking."

Fellow intern Jeffrey Tam is pursuing a BA in biochemistry at Wesleyan University. "For me, the program's main plus is that you get to put to work what you learn in school," he says. "You can read about science in a textbook—for example, x-ray diffraction, which I'm doing this summer—but reading about it is one thing and doing it is another. Until you get into the lab, you can't really see how it all works."

Both are seeing a great deal of work in the labs. Lee is part of a cell adhesion molecule project, requiring protein purification and tissue culture work, including immunoaffinity columns, HPLC, gel electrophoresis, and immunoblotting techniques. Tam is working with protein crystallography, employing x-ray diffraction to analyze a protein's three-dimensional structure.

As Ruffolo puts it, Roche considers its interns as "potential talents for the future." (What are the big hiring needs at the moment? Ruffolo names three: bioinformatics, genomics, and organic synthetic chemistry.) To enhance their marketability as job-seekers, the company offers a series of workshops, including a popular one on presentation techniques. At summer's end, each intern gives a presentation on his or her work to a group of Roche employees from various departments. Lee and Tam agree that the presentation is the culmination of their summer. "It's a fantastic experience," Tam says. "It's a good way of summing up the summer for yourself."

While Tam plans to pursue a PhD in biochemistry and eventually work in the biopharmaceuticals industry, Lee calls herself "unde-

continued ▶

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### **Scientist/Anti-Arthritis**

You will participate in the discovery of anti-arthritic therapies. This will involve *in vitro* examination of signal transduction pathways involved in inflammatory cytokine and growth factor signaling, as well as identification of targets for therapeutic intervention. You will also develop and run assays examining the activity of compounds on defined cellular targets. The successful candidate should have a BS or MS in biological sciences with 3 or more years of laboratory experience. Knowledge of signal transduction pathways and gene expression is also required. You must have strong skills in cell culture and in conducting biochemical assays, along with the demonstrated ability to work in an independent manner. Familiarity with radiotracer techniques, basic protein analysis (including gel electrophoresis, immunoprecipitation, Western blotting and metabolic labelling) is necessary. You must also have strong knowledge of recombinant DNA and RNA preparation, Northern blotting, PCR technology and methods involved in the expression of recombinant molecules within cells. Please refer to Position MG-4882 on resume AND envelope.

### **Research Scientist/Arthritis**

You will focus on assessing the effectiveness of potential new therapies for the treatment of inflammation and arthritis in animal model systems. These studies will use a variety of clinical outcome measures, as well as biochemical assessment of treatment effects on target molecules. In addition, you will work with other scientists to measure pharmacological properties of research compounds that influence *in vivo* activity. Qualifications include a bachelor's degree in Biology (or equivalent) and 3+ years of relevant laboratory experience. A strong background in animal pharmacology and expertise in small animal handling procedures is essential; familiarity with standard biochemical methods and computer software for data analysis is desirable. Please refer to Position MG-4815 on resume AND envelope.

### **Biochemist/Immunology/Arthritis**

The candidate selected for this position will be responsible for day-to-day operation of the lab. 3+ years of lab experience and technical expertise in at least two of the following areas is required: *in vitro* cell culture; immunoassay; protein analysis; western blotting; immunoprecipitation; protein purification and enzyme assays. A high level of independence and technical competence (to effectively carry out experimentation) is essential; knowledge of Excel, Word, Sigmaplot or similar PC experience is important. Excellent verbal and written communication skills are a must. Please refer to Position MG-4670 on resume AND envelope.

### **Scientist/Histology/Arthritis**

The ideal candidate will have 2+ years of experience in a laboratory histology environment, with proven expertise in collection, preparation, sectioning and staining of joint connective tissue specimens. Immunohistochemistry background and use of a cryostat required; experience with small and large animal experimentation a must. Please refer to Position MG-4775 on resume AND envelope.

### **Isotope Scientist**

The main responsibility is synthesizing drug substances labelled with radioactive isotopes ( $C^{14}$  or  $H^3$ ) or stable isotopes ( $C^{13}$  and/or  $H^2$ ). These labelled compounds are used in preclinical metabolic and biodistribution studies to support IND filings as well as in human ADME trials. This position offers some visibility within the department. To qualify, you must have a bachelor's degree in Chemistry with at least 3 years of experience in organic synthesis, or a masters degree in Organic Chemistry or a related field. Experience in organic synthesis, and familiarity with spectroscopic and chromatographic methods used in organic synthesis (IR, NMR, MS, HPLC, etc.) is also required. Excellent verbal and written communication skills are helpful. Experience handling radioisotopes is a plus. Please refer to Position MG-4734 on resume AND envelope.

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## ■ QUALITY CONTROL SPECIALIST

Performing quality assays for the Nucleic Acid Diagnostics group, you will analyze data, report results and modify assays to meet department objectives. You will also design and perform experimental assays. Requires a BS degree in Biology or Chemistry with 3-6 years' related experience. **Job Code: QW024**

## ■ MANUFACTURING PRODUCT SPECIALIST

You will oversee the technical aspects related to reagent manufacturing. BS degree in Biology, Microbiology, or Chemistry supported by 3-6 years of experience is required. Skills in statistics and experimental design plus knowledge of immunoassay theory desired. **Job Code: PW099**

## ■ PRODUCT ENHANCEMENT TECHNICIAN

You will implement assay improvements to optimize our immunodiagnostic product line. This will include data collection duties and assisting in the validation of enhanced products from feasibility to the release-for-sale stage. Requires a BS degree in Chemistry, Biochemistry, Biology or Medical Technology with 3-6 years' experience performing wet chemistry laboratory work in a GMP/GLP environment. PC skills are a must. **Job Code: GW017**

## ■ PRODUCT SUPPORT TECHNICIAN

You will elevate, purify and validate critical raw materials for use in manufacturing immunodiagnostic reagents. We require a BS degree in Biology, Chemistry or Biochemistry with 1-3 years' experience, including chromatography and protein purification techniques. **Job Code: GW016**

## ■ OPERATIONS SUPPORT TECHNICIAN

You will perform laboratory in-process testing and troubleshooting on assays. You will need a BS degree in Biology, Biochemistry, or Chemistry with 0-1 year's experience and general laboratory skills. **Job Code: PWO91**

## ■ POLYMER PROCESS ENGINEER

Requires a formal degree (advanced or multiple technical degrees a plus) in Polymer Science or Engineering, ideally from a recognized polymer institute or engineering school, and direct experience with PVC-based materials. Industrial experience within a manufacturing/process development setting plus an understanding of hydration behavior also required. **Job Code: GM116A**

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cided" but says a scientific career is "definitely" one of her options. They and Ruffolo recommend that BS and MS scientists thinking of a career in science find out about the industry in general and the company in particular. "Talk to a lot of different people about it," Lee says. "Talk to people actually working there." Ruffolo recommends that undergraduate scientists get lab experience. Perhaps the best advice comes from Lee: "If you're going to do an internship, find out what it has to offer besides a job."

#### **"A True Eye-Opener": BS and MS Scientists at Zeneca Pharmaceuticals**

WILMINGTON, DELAWARE—"Scientists at Zeneca Pharmaceuticals are involved in lots of interesting endeavors that don't look anything like traditional science, jobs that nobody even knows about. There are so many parts to this company I don't even know yet. It's fascinating."

Bill Zinkand, research portfolio and operations analyst, is talking about the many nontraditional jobs for scientists at a contemporary bioscience company. Zinkand, who holds a BS in biochemistry from Virginia Tech, had been a career bench scientist when he was offered the chance to jump to something completely different.

Indeed, very few readers of SCIENCE will know what a research portfolio and operations analyst does. Nor will they know what Laura Cronk, group leader of information science and library, does—yet both of these scientists use their science background every day to perform essential roles at Zeneca Pharmaceuticals.

Both Zinkand and Cronk supply information, albeit in different ways and for different people. Zinkand keeps tabs on the wide range of concurrent research projects at Zeneca Pharmaceuticals and keeps senior management informed of these projects' progress, problems, and needs. "The challenge is not only to learn all the necessary material but also to communicate it in an accessible manner," Zinkand says.

Cronk's group speeds information to various businesses within the company: which competitors have an angiotensin II inhibitor,

who is the market leader in antihypertensives, who has what drug at what phase. She also abstracts and indexes all literature written about company products (an FDA requirement). "A very common request is from a researcher, to find information on a given compound," Cronk says: "how to make it, who holds the patent, what animal model or cell line to use in setting up a screen. We use the Internet, as well as a broad range of database vendors. It's a great place to see a really high-altitude view of the business."

So while neither Cronk nor Zinkand is at the bench, both are scientists doing science. As Cronk puts it, "We can all talk both business and science, so to speak, and translate between the two." Zinkand agrees: "Zeneca's portfolio of research projects, from target collection to nomination or development, represents a particular molecular target opportunity, a particular scientific topic. I have to know where each project is at the moment. I have to know what a second messenger system is over here, and why we're examining a *ras* gene over there."

Cronk received her BS in chemistry from the University of Wyoming and later completed an MS in information science at Drexel. She discovered a knack for "being able to read the science knowing how a scientist thinks, being able to cull out the relevant information and relate it to business needs." Both Zinkand and Cronk are communicators, and they emphasize that today's scientist had also better be. "Sometimes the initial call from someone needing information is, shall we say, somewhat too broad? For example, 'I want to know everything about asthma,'" Cronk says. "So you need good interviewing skills to pinpoint what they really need."

Scientists who want to do what Cronk and Zinkand do should have a good science background, good team, computer, and communications skills, and an interest in growing. "Companies look at the BS- or MS-level scientist as more useful because they can follow a more varied career path," Zinkand says. "So you have to realize that change is the norm now in science. There's frequent redirecting, retargeting, retooling. Be ready to move with it, and you'll do fine."

Cronk suggests that all scientists learn how to use libraries and databases to access chemical and pharmaceutical information. "Become familiar with the Internet," she says. "Learn how to use Excel and related programs. And get some experience in the industry—nothing substitutes for that."

For both Cronk and Zinkand, there are real and immediate rewards for doing the kind of science they do. One reward is the appreciation they get from their clients. "It's great to realize how much time and money you can save someone by finding the information they're looking for," Cronk says. And learning all about a dynamic bioscience company like Zeneca Pharmaceuticals is its own reward, as Bill Zinkand points out: "When they lead you from the lab into new jobs, your focus suddenly broadens, and you say, 'Wow—there's this huge company doing all these amazing things.' It's a true eye-opener. I come in every morning really wanting to help."

#### **Promise, Intelligence, and "The Spark": The Access Program at UCLA**

LOS ANGELES, CALIFORNIA—David Meyers of UCLA sits with Will Silverman, a fourth-year graduate student in physiology, and Jennette Stevens, a second-year graduate student in molecular biology, speaking about the program that has brought them together. Meyers heads the ACCESS program in molecular and cellular life sciences, a consortium of 11 departments and 165 faculty in both the college of arts and letters and the school of medicine. "The program is designed to appeal both to students who have already focused on an area for thesis work, and those who haven't made up their minds yet," Meyers says. "What sets us apart is that students are literally inundated with choices here."

In its lineaments, the program is the contemporary PhD program in life sciences: three rotations in the first year, with the student selecting a thesis lab at the end of that time. A rigorous common curriculum exposes students to molecular biology, cell biology, molecular genetics, immunology, pathology, and neuroscience. About 70 percent of applicants express interest in the broad category of microbiology, virology, and immunology. "A

continued ►

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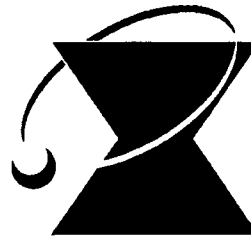
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### **Scientist, Histotechnology/Pathology**

The successful candidate will be responsible for image analysis, tissue staining, and pathological specimen interpretation. Responsibilities include developing and performing staining techniques, interpreting slides, and preparing summary reports. Qualifications include a D.V.M. or Ph.D. in biology, histology, pathology, or related field and 5+ years' research experience. Experience in flow cytometry is desirable. Job Code: HP/BLW

### **Scientist, Nucleic Acid Detection**

The successful candidate will develop, validate, and implement quantitative assays for the detection of specific DNA and RNA sequences in mammalian systems. Responsibilities include data analysis, assay troubleshooting, and managing junior investigators. Qualifications include a M.S. with 3–5 years' experience in a biotechnology environment or a Ph.D. with 0–2 years' experience. Expertise in quantitative PCR assays, solution hybridization techniques, quantitative Southern blot, Northern blot, and basic molecular biology skills required. Experience with \*real time\* quantitative PCR instrumentation preferred. Job Code: SNAD/JV

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The successful individual will possess a Ph.D. in pharmaceutical sciences, physical chemistry, chemical engineering, or biophysics and have 3+ years' experience in an industrial biotechnology setting. This individual will be responsible for the development of DNA formulations suited for pulmonary delivery. Their efforts will be directed toward non-viral lipid and non-lipid based formulations. A background in colloid and/or surface chemistry would be beneficial. The individual will also be expected to develop external collaborations and to work within a team framework. Job Code: DNAF/PD

### **Scientist, Pharmaceuticals**

The successful candidate will develop, formulate, and characterize non-viral DNA delivery systems, both lipid and non-lipid based. Familiarity with polymer chemistry, structural analysis, and colloid and/or surface chemistry would be beneficial. Qualifications include a M.S. with 3–5 years' experience in a biotechnology environment, or a Ph.D. in pharmaceutical sciences, physical chemistry, biophysics, or biochemistry with 0–2 years' experience in an industrial biotechnology setting. Job Code: NVDS/RN

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Biotechnology

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section 6 of 6





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**Discipline(s):** Biochemistry, Biology, Cell Biology, Genetics, Immunology, Microbiology, Molecular Biology, Developmental Biology

**Region(s):** United States

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**Keywords:** BS

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| Position Title                                                | Sub-Discipline                                            | Employer                                  |
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| Business Development, Sales & Sales, Marketing & Applications | Biochemistry, molecular biology, genomics, pharmaceutical | Packard Instrument Company<br>Meriden, CT |

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| Position Title     | Sub-Discipline                                                                    | Employer                                 |
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| Protein Biochemist | Biochemistry, protein purification, analytical instrumentation, mass spectrometry | The Monsanto Company<br>Chesterfield, MO |
| Posted: 02/05/98   |                                                                                   |                                          |

As seen in the 6 February issue of *Science*:

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**The Monsanto Company, 700 Chesterfield Pkwy, Job Code: PB-AC, Mail Code: BB5B,  
Chesterfield, MO 63198. EEO/AA Employer M/F/D/V.** Please visit our web site at  
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| Position Title      | Sub-Discipline                                                                  | Employer                          |
|---------------------|---------------------------------------------------------------------------------|-----------------------------------|
| Research technician | Computer science, chemistry, biology, synthetic chemistry, multi-step syntheses | Mayo Medical Center Rochester, MN |
| Posted: 02/05/98    |                                                                                 |                                   |

As seen in the 6 February issue of *Science*:

**Research at Mayo**

The computer-aided molecular design (CAMD) lab at the Mayo Cancer Center/Pharmacology Department at Mayo Clinic Rochester seeks: (1) A research technician with a **BS** in computer science, chemistry, or **biology** to conduct routine and established computer simulations of ligand-receptor interactions. **Please refer to job posting #98-216.sci**; and (2) A research technician with a **MS** in synthetic chemistry and at least two years of experience in multi-step syntheses to make rationally designed ligands. **Please refer to job posting #98-215.sci**.

The Mayo Clinic, with a research budget in excess of \$130 million per year, provides an outstanding environment for the conduct of basic science in molecular medicine. The CAMD lab has a record of developing biologically active ligands with real world impact (e.g., we developed the highly potent and selective, low-cost bis-THA, AchE inhibitor, which was reported by Chemical & Engineering News, News of the Week Section, September 30, 1996, and has been brought to commercial market by RBI/Sigma). Resources include: NMR, Mass Spectrometry, fluorescence, research computing, and other core facilities; the state of the art synthetic equipment; Origin 2000 (8xR10K, 2 Gb 896 Mb memory and 13.5 Gb disk), Octane (2xR10K, 128 Mb and 4 Gb disk) and three shared Power Challenge servers. Mayo offers a competitive salary and benefit package.

Interested candidates should send cover letter and resume with the corresponding job posting number to:

Mayo Medical Center  
Kaine A. Kerkhoff  
Human Resources Staffing Center, OE-1  
200 1st Street SW  
Rochester, MN 55905  
Fax: 507-284-1445  
email: kerkhoff.kaine@mayo.edu  
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| Position Title                                               | Sub-Discipline                                                                                                                               | Employer                                                    |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Senior/Principal Scientist, Assistant Scientists/Scientists, | Biochemistry, molecular biology, bacterial physiology, microbial genetics, fungal genetics, microbiology, immunology, pathogenesis, virology | Schering-Plough Research Institute<br><b>Kenilworth, NJ</b> |
| Posted: 02/05/98                                             |                                                                                                                                              |                                                             |

**As seen in the 6 February issue of *Science*:**

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### **ANTIBACTERIAL DRUG DISCOVERY**

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The successful candidate will have a PhD and 2-8 years of experience in bacterial physiology and genetics. A strong background in biochemistry or molecular biology is required to develop and implement secondary screens for the discovery of new antibiotics. Experience in high through-put screening is a plus. To be considered for this position, please reference Dept. DD98-29/KS-PC.

#### **SENIOR/PRINCIPAL SCIENTIST**

We are seeking a highly motivated, innovative professional with a PhD and 2-8 years of experience to determine the mechanism of action of novel antimicrobial agents. Excellent skills in biochemistry, bacterial physiology and molecular biology are essential. To be considered for this position, please reference Dept. DD98-50/KS-PC.

#### **ASSISTANT SCIENTISTS/SCIENTISTS**

We are seeking several scientists with a Bachelor's or Master's degree and 0-3 years of related experience. A strong background in Microbiology or experience as a medical technician is required for one position. Experience in biochemistry, microbial genetics or molecular biology is required for additional positions. To be considered for these positions, please reference Dept. DD98-27/KS-PC.

### **ANTIFUNGAL DRUG DISCOVERY**

#### **SENIOR/PRINCIPAL SCIENTIST**

As a member of our antifungal team, you will be responsible for the development and implementation of secondary screens for new antifungal agents. The successful candidate will have a PhD and 2-8 years of experience in fungal molecular biology/biochemistry. Experience with *Candida* or *Aspergillus* is a plus. To be considered for this position, please reference Dept. DD98-26/KS-PC.

#### **ASSISTANT SCIENTISTS/SCIENTISTS**

Positions are available to develop and implement secondary anti-fungal assays. To qualify, you will need a Bachelor's or Master's degree and 0-3 years of experience in microbial or fungal genetics/molecular biology/biochemistry. Experience in assay development and high through-put screening is a plus. To be considered for these positions, please reference Dept. DD98-24/KS-PC.

#### **ANTIBACTERIAL/ANTIFUNGAL DRUG EVALUATION**

The scientists we seek will utilize bacteria and fungi to evaluate antibacterial and antifungal agents using various *in vitro* and *in vivo* procedures.

#### **SENIOR/PRINCIPAL SCIENTIST**

To qualify, you will need a PhD and experience in microbiology/immunology/pathogenesis or a related field. To be considered for this positions, please reference Dept. DD98-22/DL-PC.

#### **ASSISTANT SCIENTISTS/SCIENTISTS**

We seek highly motivated, innovative professionals with an MS degree and 1-2 years of experience in microbiology/immunology/pathogenesis or a BS degree and 2-4 years of experience. Background must include experience in sterile technique, growing microorganisms, *in vitro* testing (e.g. MICs) and a range of *in vivo* experimental techniques. Knowledge of computer applications and molecular biology techniques is an asset. To be considered for these positions, please reference Dept. DD98-16/DL-PC.

#### **ANTIVIRAL DRUG DISCOVERY**

#### **SENIOR/PRINCIPAL SCIENTIST**

The successful candidate will have a PhD and 2-8 years of experience in virology/antiviral research. A strong background in biochemistry or molecular biology is required to develop and implement secondary screens for the discovery of new antivirals. Experience in hepatitis B or C viruses and/or high through-put screening is a plus. To be considered for this position, please reference Dept. DD71-36/IL-PC.

#### **ASSISTANT SCIENTISTS/SCIENTISTS**

We are seeking several scientists with a Bachelor's or Master's degree and 0-5 years of related experience. Positions require a strong background in virology or experience as a medical technologist. To be considered for these positions, please reference Dept. DD71-38/IL-PC.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send resume with cover letter stating your research interests, three references and the Dept. Code for your position of interest, to: Human Resources-PC, Schering-Plough Research Institute, 2015 Galloping Hill Road, K-15, Kenilworth, NJ 07033-0539. *We are an equal opportunity employer. We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*

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| Position Title                       | Sub-Discipline                                                                                                                                                                                | Employer                              |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Scientist,<br>Assistant<br>Scientist | Cell biology, molecular biology, biochemistry, FACs analysis, regulated gene expression in mammalian cells, mammalian cell culture, genetic manipulation, retrovirus or lentivirus-based gene | Mitotix, Inc.<br><b>Cambridge, MA</b> |

As seen in the 6 February issue of *Science*:

**Mitotix** is a biotechnology company developing cell-cycle based biotherapeutics for cancer, cardiovascular and infectious diseases.

#### SCIENTIST

We are seeking an individual with a Ph.D. in Cell Biology with 2-3 years' postdoc experience in molecular biology or biochemistry to design and create cell assays specific for target enzymes. The successful candidate will be responsible for current assays, determine future needs for developing programs, and create reagents to meet those needs. Expertise in FACs analysis, immunofluorescence, and regulated gene expression in mammalian cells is essential. **Job Code: SW98**

#### ASSISTANT SCIENTIST

This position requires a BS/MS with experience in mammalian cell culture and genetic manipulation, FACs analysis and immunologic techniques. 2-3 years' laboratory experience is essential. The successful candidate will implement cell-based assays for compounds targeted to specific molecular targets and have direct involvement in the creation of reagents required for the drug discovery programs at Mitotix. **Job Code: ASW98**

#### SCIENTIST

This position requires a Ph.D. in Molecular Biology and 2-3 years of postdoctoral training. The ideal candidate should have experience with the development or manipulation of retrovirus or lentivirus-based gene delivery systems. **Job Code: SG98**

**Mitotix** offers competitive salaries, benefits and a chance to work in an exciting scientific environment. Please send resume to: **Human Resources, Mitotix, Inc., One Kendall Sq., Bldg. 600, Cambridge, MA 02139; www.mitotix.com** EOE.

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| Position Title                                            | Sub-Discipline                                                                                                                  | Employer                              |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Principal Scientist, Research Associate/Microinjectionist | Molecular biology, transgenic and gene targeting research projects, biology, pronuclear microinjection and blastocyst injection | Chrysalis DNX<br><b>Princeton, NJ</b> |
| Posted: 02/05/98                                          |                                                                                                                                 |                                       |

**As seen in the 6 February issue of *Science*:**

**Chrysalis  
DNX  
Transgenic  
Sciences,**

a leader in providing Transgenic and Gene Targeting capabilities to the biomedical research community, has the following opportunities for research professionals at our Princeton, NJ facility.

**Principal Scientist-** To manage molecular biology, transgenic and gene targeting research projects. Qualified candidates should have a Ph.D. in molecular biology or related field plus 2-5 yrs post-doctoral exp. developing transgenic and gene targeted animal models. The position requires strong leadership and communications skills in a team environment. Industry exp. preferred.

**Research Associate/Microinjectionist-** Qualified candidates should have a BS in Biology or related scientific discipline with 3-5 yrs exp. in a core transgenic facility. Extensive experience and proficiency needed in pronuclear microinjection and blastocyst injection for the generation of transgenic and gene targeted animals. Excellent computer and communication skills are required.

Chrysalis emphasizes an atmosphere of collaboration, intellectual honesty and scientific integrity. We offer an excellent work environment with a competitive benefit and compensation package. Please send resume to:

**Human Resource Dept.  
Chrysalis DNX  
Transgenic Sciences  
301B College Road East, Princeton, NJ 08540  
FAX: (609) 520-9864  
www.chrysalisintl.com**

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| Position Title                  | Sub-Discipline                                          | Employer                   |
|---------------------------------|---------------------------------------------------------|----------------------------|
| ASSOCIATE SCIENTIST & SCIENTIST | CELLULAR/MOLECULAR BIOLOGY, NEUROBIOLOGY & BIOCHEMISTRY | Biogen<br>Cambridge,<br>MA |
| Posted: 02/12/98                |                                                         |                            |

As seen in the 13 February issue of *Science*:

*Biogen has established a unique record of success as one of the world's premier biotechnology companies. Pioneering research by our scientists has led to the introduction of several important new medical therapies, including AVONEX (Interferon beta-la), the most prescribed therapy in the U.S. for relapsing forms of multiple sclerosis. We are staking our future growth on the development of our next generation of pharmaceutical products, five of which are currently being tested in human clinical trials. Today, we are seeking the following committed professionals to join our expanding team in Cambridge.*

#### **DEFINING SUCCESS in BIOTECHNOLOGY**

#### **SCIENTIST**

You will assist in the evaluation of a number of molecules currently being studied in various neurobiological diseases as well as helping define new opportunities. Projects include the hedgehog and ret families and are part of a commitment to neurobiological diseases including stroke, ALS and Parkinson's disease. This position requires an individual with a Ph.D. and 3+ years of experience in molecular and cell biology with a focus on neurobiology. An Associate Scientist will report to this position.

#### **ASSOCIATE SCIENTIST**

The successful candidate will possess a BS/MS in Biochemistry with at least 2-5 years of experience in tissue culture as well as molecular and cellular biology techniques. Experience with neurobiological systems preferred.

**Biogen offers what few companies in our industry can - Professional Challenge, Stability, Growth, and one of the strongest financial profiles in the industry. In addition, our compensation and benefits package, including equity participation, is one of the best in the industry, and is designed to attract and retain the finest talent available. Positions are available in our Cambridge, MA, facility. Please forward your resume to: Biogen, Inc., Job Code: RC, 14 Cambridge Center, Cambridge, MA 02142; Fax: (617) 679-2546; E-mail: ron\_cornila@biogen.com Biogen is an Equal Opportunity Employer.**

**DELIVERING ON THE PROMISE OF BIOTECHNOLOGY**

<http://www.biogen.com>

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| Position Title   | Sub-Discipline                                                                  | Employer                                  |
|------------------|---------------------------------------------------------------------------------|-------------------------------------------|
| Scientists       | Biochemistry, Molecular Biology, Pharmacology, Cellular Biology, Bioinformatics | Eli Lilly and Company<br>Indianapolis, IN |
| Posted: 02/05/98 |                                                                                 |                                           |

As seen in the 6 February issue of *Science*:

## PEOPLE REASON PURPOSE

*When it comes to the search for innovative pharmaceuticals at Eli Lilly and Company, our people work together to produce unprecedented results in our mission to improve health care. We understand the human factor involved with our developments and we pass that ideal on to the women and men that make up our team of scientists. They know that every innovative treatment they create and every cure and method of prevention they discover affects the way people all over the world manage disease and illness. We currently have multiple openings across several different therapeutic areas including Cardiovascular Research, Neuroscience, Endocrine Research, Cancer Research and Infectious Diseases Research, as well as our Research Technologies and Proteins and Bioprocess Development area for Ph.D., BS/MS, and Post Doctoral scientists. If you want to be part of our team working for people, we hope you join us at Lilly today.*

### **Biochemists**

Useful experience includes isolation, purification, manipulation and characterization of proteins and developing functional assays for proteins. Familiarity with enzyme kinetics and mechanisms of inhibition of enzymes is desirable. Other positions are available for those with experience in developing high volume screens and development of drug candidates.

### **Molecular Biologists**

Candidates should possess a solid knowledge of current molecular biology and biochemical techniques including PCR, expression cloning, library construction, gene expression, protein expression, anti-sense technology, gene delivery systems, mutant construction and analysis. Working knowledge in bioinformatics is an added asset.

## Pharmacologists

These positions require the ability to carry out both in vitro and in vivo assays of drug efficacy. Candidates should have broad experience in various aspects of cell-based assay development and drug development and/or animal-based modeling and drug evaluation.

## Cellular Biologists

Successful candidates should possess a thorough knowledge of mammalian cell biology and the use of molecular and cellular biology techniques to explore and evaluate potential drug targets. Experience with techniques including tissue culture, transfection, reporter gene assays is required. Experience with any of the following would be desirable: membrane receptors, signal transduction pathways, regulation of gene expression, or regulation of secreted proteins.

*To attract the best and the brightest, we offer competitive salaries and excellent benefits. Qualified candidates are encouraged to apply by sending resumes and cover letters, referencing number ADSCMB103 to: Eli Lilly and Company, Lilly Corporate Center, US Recruiting and Staffing, Indianapolis, IN 46285. We are an equal opportunity employer dedicated to the strength diversity brings to the workplace.*

*For more information about Lilly, please access our website at: [www.lilly.com](http://www.lilly.com). To learn more about Indianapolis visit: [www.welcometoindy.com](http://www.welcometoindy.com).*

## KNOWLEDGE IS POWERFUL MEDICINE

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| Position Title                                                   | Sub-Discipline                                                                                                                                                      | Employer                                           |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Biochemistry Research Technicians, Chemistry Research Technician | Protein chemistry, expression, characterization, organic or polymer chemistry, molecular modeling, cellular and molecular biology, cell culture, tissue engineering | United States Surgical Corporation North Haven, CT |
| Posted: 02/05/98                                                 |                                                                                                                                                                     |                                                    |

As seen in the 6 February issue of *Science*:

**What You Help Develop Today, Medicine Will Take For Granted Tomorrow.**

United States Surgical Corporation is a global developer and manufacturer of surgical devices and products for wound management. We are expanding our research efforts in biotechnology. Join our dynamic team of scientists working to advance products with applications in wound healing, tissue augmentation, and tissue engineering. Our research facility is located in North Haven, CT, in proximity to major academic and biotechnology institutions.

### Biochemistry Research Technicians

Seeking ~~two~~ **two** BS/MS scientists to join our interdisciplinary team working on biomaterials for wound healing and tissue engineering. One position requires experience in protein chemistry, expression, and **characterization**. Familiarity with organic or polymer chemistry or molecular modeling a plus. The second position requires experience in cellular and molecular biology with emphasis in cell culture. Familiarity with tissue engineering and protein chemistry a plus. Dept. AD/BRT.

### Chemistry Research Technician

Seeking a BS/MS chemist to join our team working on novel polymer-based materials for tissue engineering and augmentation applications. Polymer chemistry and synthesis experience required. Familiarity with analytical techniques and instrumentation is desirable. Dept. AD/CRT

We offer a competitive salary and comprehensive benefits plan, including a matching 401(k), non-contributing health care, short and long-term disability, and dental and vision. For immediate confidential consideration, send your resume to: Andrea Delvecchio, Human Resources, United States Surgical Corporation, Dept. Code, 195 McDermott Road, North Haven, CT 06473. We are an equal opportunity employer.

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| Position Title                                         | Sub-Discipline                                                                                                                                                                                                                                                 | Employer                                                      |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Scientists,<br>Engineers and<br>Research<br>Associates | Molecular Biology,<br>Molecular Microbiology,<br>Molecular Genetics,<br>Biochemistry, Analytical<br>Chemistry, Biophysical<br>Chemistry,<br>Biotechnology,<br>Biomedical Engineering,<br>Material Sciences,<br>Chemical Engineering,<br>Mechanical Engineering | Becton Dickinson<br><b>Research<br/>Triangle Park,<br/>NC</b> |
| Posted: 02/05/98                                       |                                                                                                                                                                                                                                                                |                                                               |

**As seen in the 6 February issue of *Science*:**

**Outstanding**

## Research Is Our Primary Objective.

Becton Dickinson, the preeminent leader in clinical microbiology diagnostics, is embarking on its next generation of molecular diagnostics. Opportunities for Scientists, Engineers and Research Associates are available at its central research laboratory in Research Triangle Park, North Carolina.

### Scientists

We are seeking highly qualified and driven PhD Scientists with 2-10 years of experience. Scientists should have degrees in areas such as Molecular Biology, Molecular Microbiology, Molecular Genetics, Biochemistry, Analytical Chemistry, Biophysical Chemistry or Biotechnology with first-hand experience in antibiotic resistance, molecular diagnostics, high-throughput polymorphism detection, and/or gene expression analysis.

### Engineers

Engineers should have degrees (BS, MS or PhD) in areas such as Biomedical Engineering, Material Sciences, Chemical Engineering or Mechanical Engineering with 2-10 years of experience in instrument design, material/polymer sciences, nanotechnologies, medical devices or analytical chemistry.

### Research Associates

Research Associates should have BS or MS degrees with 3-5 years of experience in Molecular Biology, Molecular Microbiology, Molecular Genetics, Biochemistry, Analytical Chemistry, Biophysical Chemistry or Biotechnology. Working experience in antibiotic resistance, molecular diagnostics, high-throughput polymorphism detection, and/or gene expression analysis is desired.

We provide competitive salaries and comprehensive benefits including a 401(k) plan. Please forward your resume to: **Human Resources, Becton Dickinson, Research Center, 21 Davis Drive, Research Triangle Park, NC 27709.** AA/EOE Employer.

### The Rewards of Discovery.

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### Next 8 results



C



## Search Result

**Discipline(s):** Biochemistry, Biology, Botany/Plant Science, Cell Biology, Genetics, Immunology, Microbiology, Molecular Biology, Oncology, Developmental Biology

**Region(s):** United States

**Position(s):** Research Assistant, Researcher/Scientist, Other Positions

**Organization(s):** Academic, Government, Industry, Research Org./Foundation, Other Organizations

**Keywords:** BS

**Ads Posted Since:** 02/12/98

2/12/98 - 2/19/98

**Shown:** Results 1- 4 of 4

| Position Title        | Sub-Discipline                           | Employer          |
|-----------------------|------------------------------------------|-------------------|
| ASSOCIATE SCIENTIST & | CELLULAR/MOLECULAR BIOLOGY, NEUROBIOLOGY | Biogen Cambridge. |

### As seen in the 13 February issue of *Science*:

*Biogen has established a unique record of success as one of the world's premier biotechnology companies. Pioneering research by our scientists has led to the introduction of several important new medical therapies, including AVONEX (Interferon beta-1a), the most prescribed therapy in the U.S. for relapsing forms of multiple sclerosis. We are staking our future growth on the development of our next generation of pharmaceutical products, five of which are currently being tested in human clinical trials. Today, we are seeking the following committed professionals to join our expanding team in Cambridge.*

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position.

## ASSOCIATE SCIENTIST

The successful candidate will possess a BS/MS in Biochemistry with at least 2-5 years of experience in tissue culture as well as molecular and cellular biology techniques. Experience with neurobiological systems preferred.

**Biogen offers what few companies in our industry can - Professional Challenge, Stability, Growth, and one of the strongest financial profiles in the industry. In addition, our compensation and benefits package, including equity participation, is one of the best in the industry, and is designed to attract and retain the finest talent available. Positions are available in our Cambridge, MA, facility. Please forward your resume to: Biogen, Inc., Job Code: RC, 14 Cambridge Center, Cambridge, MA 02142; Fax: (617) 679-2546; E-mail: ron\_cornila@biogen.com Biogen is an Equal Opportunity Employer.**

### DELIVERING ON THE PROMISE OF BIOTECHNOLOGY

<http://www.biogen.com>

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| Position Title                                                             | Sub-Discipline                                              | Employer                                                        |
|----------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------|
| Staff Scientist,<br>Senior Research<br>Associate,<br>Research<br>Associate | Biochemistry,<br>Pharmacology,<br>Molecular<br>Pharmacology | Synaptic<br>Pharmaceutical<br>Corporation<br><b>Paramus, NJ</b> |
| Posted: 02/12/98                                                           |                                                             |                                                                 |

**As seen in the 13 February issue of *Science*:**

### ***Leaders in the Search***

*Synaptic Pharmaceutical Corporation is a research-based company engaged in the exploration of new biological targets and therapeutic agents for the treatment of central and peripheral nervous system disorders. Our approach has yielded important advances at the forefront of drug discovery.*

### ***Research Scientists***

Currently, we are seeking several Scientists to join the interdisciplinary team in this stimulating setting:

***Staff Scientist - Biochemistry***

Be responsible for the isolation and characterization of endogenous ligands for orphan receptors. Requires a Ph.D., two years post-doctoral training, and proven expertise in the purification of trace level bioactive substances from native sources. Successful applicant will be conversant in a broad spectrum of purification and analytical methods appropriate for the study of peptidergic or small molecule transmitters. **(Dept-246)**

***Senior Research Associate - Pharmacology***

Play a key role in the implementation of computer automated data analysis for our drug discovery program. Involves data analysis, database management and performance of pharmacological/biochemical assays. Requires BS or MS in Computer and/or Biological Science; at least 3 years of experience with receptor binding and similar biochemical techniques; and programming experience with Visual Basic and MS Access. Oracle database skills would be a plus. **(Dept-247)**

***Research Associate - Molecular Pharmacology***

Develop binding and signal transduction assays for cloned G-protein coupled receptors in heterologous expression systems. Requires a team player with strong communication skills; a BS or MS degree; and at least 2 years of experience in receptor characterization, binding and/or second messenger assays. **(Dept-248)**

Your rewards will include a competitive salary and an attractive benefits package, including a 401(k) and stock option plan. For immediate consideration, please forward your resume indicating appropriate Dept Code listed above, to: **Synaptic Pharmaceutical Corporation, Dept \_\_, 215 College Road, Paramus, NJ 07652.** An EOE M/F/D/V

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| <b>Position Title</b> | <b>Sub-Discipline</b>                                                                     | <b>Employer</b>                             |
|-----------------------|-------------------------------------------------------------------------------------------|---------------------------------------------|
| Staff Scientist       | Protein Expression and Engineering, Molecular Immunology, Molecular Biology, Cell Biology | Alexion Pharmaceuticals, Inc. New Haven, CT |
| Posted: 02/12/98      |                                                                                           |                                             |

**As seen in the 13 February issue of *Science*:**

**Alexion Pharmaceuticals, Inc. is an innovative and dynamic biopharmaceutical company engaged in the discovery, development, and commercialization of novel immunotherapeutics targeting**



**inflammation, autoimmune disorders, and transplantation.****We currently have the following positions open:****Protein Expression and Engineering**

**Staff Scientist:** The ideal individual will have extensive experience in the optimized production of biopharmaceuticals. Experience with both prokaryotic and eukaryotic expression systems including protein engineering, expression vector systems, and protein recovery is required. Some experience with the purification of research quantities of novel proteins will be helpful. Excellent communication, organizational, and interpersonal skills are needed to effectively work in a team environment with other discovery, development, and manufacturing personnel. Industrial experience and familiarity with FDA guidelines for recombinant protein production will be advantageous. **Response Code: SSPE**

**Molecular Immunology**

**Staff Scientist:** Alexion Pharmaceuticals, Inc. seeks a Scientist with extensive training in both Molecular Biology and Immunology. The successful candidate should possess a Ph.D. and/or MD., be team oriented, and have an interest in the discovery and development of novel immunotherapeutics. Preference will be given to candidates who have demonstrated an expertise in either inflammation, autoimmune disease, and/or transplantation immunology. **Response Code: SSMI**

**Research Associates (BS/MS)**

**Molecular Biology:** Alexion is looking for individuals with experience in molecular biological techniques to assist our Scientists in the discovery of novel drug candidates in the therapeutic areas of inflammation, autoimmune disease and transplantation. Experience in gene cloning, gene expression analysis, cDNA and genomic library construction and screening, yeast two hybrid cloning, phage display technology and cell culture is desired. A B.S. or M.S. degree and some work experience is required. **Response Code: MB**

**Cell Biology, Immunology:** Must have experience in cell biology or immunology research. Experience in immunological assay development, ELISA, Western blotting antibody purification, protein characterization, receptor binding and cell binding assays is desired. Additional experience with cell culture and molecular biology would be helpful. **Response Code: CB**

*We offer a competitive salary and benefits package, relocation assistance and a stock option plan. Please send your resume, the names of references and indicate the position of interest by response code to:*

**Human Resources  
Alexion Pharmaceuticals, Inc.  
25 Science Park, New Haven, CT 06511**

Equal Opportunity Employer

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| Position Title                                        | Sub-Discipline                                                        | Employer                                  |
|-------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------|
| Industrial Postdoctoral Research Associate; Scientist | Protein Chemistry, Biochemistry, Molecular Biology, Organic Chemistry | Altus Biologics Inc. <b>Cambridge, MA</b> |
| Posted: 02/12/98                                      |                                                                       |                                           |

As seen in the 13 February issue of *Science*:

**Altus Biologics Inc.**, located in Cambridge, MA develops, manufactures and markets a unique class of products based on a proprietary technology for stabilizing proteins. Cross-linked enzyme crystals (CLEC®) or more broadly cross-linked protein crystals (CLPC), have a variety of pharmaceutical, fine chemical, environmental and agricultural applications. If you would like to join an exciting, growing team which is changing the future of chemistry from research to manufacturing, we invite you to send your resume.

- **Protein Chemist/Biochemist**

We are seeking individuals at the BS/MS level to join an existing research team, dedicated to the purification, crystallization, biochemical characterization and chemical modification of proteins. Successful candidates will have a minimum of three years experience with a diverse array of modern methods of protein isolation and characterization, and molecular biology techniques. Familiarity with protein crystallization procedures would be a distinct advantage. **Job Code: PCB**

- **Industrial Postdoctoral Research Associate**

We are seeking several recent Ph.D. graduates with hand-on experience in Protein Chemistry, Biochemistry or Organic Chemistry who are interested in a 1-2 year postdoctoral position in the design and development of novel products based on CLPC technology. A strong background in protein chemistry and a desire in applying these skills to therapeutic proteins is required. Strong written and oral communication skills and interpersonal skills are a must. Publication and presentation of the results of your research will be strongly encouraged. **Job Code: PRA**

Please submit your resume and three names from whom references may be solicited, referencing Job Code, to: **Altus Biologics Incorporated, c/o: Recruiting Manager, 40 Allston Street, Cambridge, MA 02139; Fax: (617) 499-2480. Please visit our Web site at: [www.altus.com](http://www.altus.com).** Altus is an Equal Opportunity Employer.

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2/19/98  
2/25/98



## Search Result

**Discipline(s):** Anatomy/Physiology, Biochemistry, Biology, Botany/Plant Science, Cell Biology, Genetics, Immunology, Medicine, Microbiology, Molecular Biology, Agriculture

**Region(s):** Canada, Europe, US/Northeast, US/Southeast, US/Midwest, US/Southwest, US/West

**Position(s):** Research Assistant, Researcher/Scientist

**Organization(s):** Academic, Government, Industry, Medical, Research Org./Foundation, Other Organizations

Shown: Results 1- 3 of 3

| Position Title   | Sub-Discipline                                                                                         | Employer                                  |
|------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Scientist        | Pharmacology, pathology, immunohistochemistry, cell biology, molecular biology, biochemistry, oncology | Hoechst Marion Roussel<br>Bridgewater, NJ |
| Posted: 02/19/98 |                                                                                                        |                                           |

As seen in the 20 February issue of *Science*:

### *Enhancing lives through oncology innovations*

Hoechst Marion Roussel, a world leader in pharmaceutical-based healthcare, is dedicated to extending and enhancing human life through discovery, development and manufacture of innovative products.

Additional dedicated resources have created the following opportunities within our expanding Oncology Disease Group at our U.S. Strategic Research Center in Bridgewater, NJ:

#### **Ph.D. - Sr. Tumor Research Biologist**

We are seeking a group leader for our Tumor Biology Group. This individual will be responsible for, in collaboration with the Head of Disease Group Oncology, determining the strategy for efficient drug testing and assessment of drug effects in tumor models.

#### **Requirements:**

- Ph.D. or DVM/Ph.D. in Pharmacology, Pathology or recognized equivalent field
- Minimum of 8 years experience (industry experience preferred) in tumor model use for drug testing, including experience with human tumor xenografts in nude and scid mice, working knowledge of and hand-on experience in tumor pathology, immunohistochemistry, and in situ hybridization
- Experience with in vivo models of angiogenesis, tumor model development, and tumor cell culture is highly desirable
- Published record of accomplishment in drug testing and development
- Excellent verbal and written communication skills

### **Ph.D. - Cell Cycle Researcher**

Responsible for identifying new therapeutically relevant, cell cycle related molecular targets and developing assays for high throughput chemical library screening.

#### **Requirements:**

- Ph.D. in Cell Biology, Molecular Biology or Biochemistry
- 1 to 3 years postdoctoral experience in cell cycle research including the ability to identify innovative targets and approaches and apply to oncology therapeutic projects
- Expertise in molecular biology including experience in molecular cloning and functional gene expression
- Thorough knowledge of mammalian and yeast cell cycle
- Record of peer-reviewed publications
- Excellent verbal and written communication skills including the ability to effectively interact with teams of diverse disciplines

### **BS/MS - Cell and Molecular Biologists**

Responsible for providing molecular biology support for oncology projects in the areas of angiogenesis, cell cycle, and signal transduction. Selected candidates will also compile results and present to project teams and to Sr. Oncology Associates.

#### **Requirements:**

- MS (or BS with a minimum of four years experience) in molecular biology or recognized relevant disciplines.
- Experience in several of the following areas:
  - molecular biology (Northern and Southern blotting, cloning, recombinant DNA techniques, functional expression, baculovirus expression technology, PCR)
  - biochemical techniques (Western blotting, enzyme assays, protein electrophoresis)
  - cell biology
- Experience in the areas of angiogenesis, cell cycle, or signal transduction preferred.
- Experience with assay development desirable.

**We are also actively recruiting other professionals with Oncology Research and Pharmaceutical based backgrounds for a variety of positions.**

Visit us at the **1998 American Association for Cancer Research Conference (booth 152)** being held at the Ernest Morial Convention Center in New Orleans, LA on March 29th - April 1st.

Attracting and retaining top talent is a high priority at Hoechst Marion Roussel. That is why we offer one of the most outstanding and comprehensive compensation and benefits packages in the pharmaceutical industry. In addition, our relocation package is second to none in addressing the transitional needs of our associates. For consideration, please mail your resume (suitable for scanning) including salary history/requirements, indicating position of interest, to: **Staffing Manager, D103-H, Ref# 1998BW0006, Hoechst Marion Roussel, Routes 202-206, P.O. Box 6800, Bridgewater, New Jersey 08807-0800, U.S.A.,** or e-mail: [jobs@hmri.com](mailto:jobs@hmri.com). For additional company information, we invite you to visit our website: [www.hrmi.com](http://www.hrmi.com). An affirmative action employer M/F/D/V.

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| Position Title                                                                                                          | Sub-Discipline                                                                                                                                                                                                 | Employer                                                               |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Research Scientists, Scientists, Postdoctoral Fellows, Senior Scientist, Senior Associate Scientist, Research Associate | Genomics, bioinformatics, Biology, Biochemistry, Chemistry, Computer Sciences, Biostatistics, Crystallography, Protein Chemistry, Enzymology, Computational Biology, Molecular Biology, Pharmacology, Pharmacy | Parke-Davis Pharmaceutical Research Division<br><b>Los Angeles, CA</b> |
| Posted: 02/19/98                                                                                                        |                                                                                                                                                                                                                |                                                                        |

As seen in the 20 February issue of *Science*:

## INNOVATIONS IN PHARMACEUTICALS, TECHNOLOGIES AND CAREERS

At **Parke-Davis Pharmaceutical Research Division of Warner-Lambert Company**, located in **Ann Arbor, Michigan**, inspired science and a strategy of innovation have made us leader in pharmaceuticals. As part of a major expansion, our Preclinical Research departments are seeking **Computer Scientists, Information Technologists, Chemists, and Biologists** to join our multidisciplinary bioinformatics team. We have an optimum environment for both working and living.

### GENOMICS

## **Research Scientists**

### ***Bioinformatics***

In collaboration with therapeutic groups, the successful candidate will mine genomic databases to support drug discovery. A Ph.D. in Biology, Biochemistry, or equivalent education and experience in research and information technology is required. Experience in genomics and bioinformatics is highly desirable. Job Code: CJM-98032

## **Scientists**

### ***Bioinformatics***

Responsibilities will include development and user support of Laboratory Information Management Systems (LIMS). Candidates should be familiar with laboratory functions associated with clinical data, sample intake, and genotyping. Desirable experience includes MS Office tools, web browsers, basic SQL, and knowledge of UNIX and Windows NT operating environments. Job Code: CJM-98031

## **Postdoctoral Fellows**

### ***Bioinformatics***

We are looking for highly motivated individuals who wish to expand their scientific careers into the area of bioinformatics research. A Ph.D. in Biology, Biochemistry, or other life sciences is required. Familiarity with relational databases and web server technology, and genomic data are desirable. Job Code: CJM-BM

## **BIOMOLECULAR STRUCTURE AND DRUG DESIGN**

## **Senior Scientist**

### ***Chemical Informatics and SAR***

We are seeking a highly talented individual to participate in the development and application of methods to analyze large structure-activity databases. Chemometrics, pattern recognition, fingerprinting techniques, and statistical methods will be used. The position will bridge multidisciplinary initiatives and will evolve scientific methodologies relating to combinatorial chemistry libraries, high-throughput screening data, and genomic results. Candidates should have a Ph.D. in Chemistry, Computer Sciences, and/or Biostatistics. Excellent analytical, mathematical, and statistical skills are essential. Previous experience with structure-activity data is highly desirable. Job Code: RJB/CCH

## **Senior Scientist**

### ***Protein Structures and Folding***

This is a unique opportunity to apply methods in protein structure prediction, folding, and modeling to structure-based design related to our genomic effort. Candidates should have a Ph.D. in Chemistry, Biophysics, and/or Crystallography and have three years of experience with three-dimensional structures, sequences and function, and ligand recognition. Excellent interpersonal skills are essential. Job Code: RJB/CH

**Senior Associate Scientist/  
Research Associate*****Protein Crystallography***

Protein Crystallographers experienced in protein expression, purification and crystallization, structure solution and refinement; here's your chance to enjoy access to a synchrotron source at the IMCA beamlines of Argonne. Experience with synchrotron data collection or data processing and MAD are desirable. A Ph.D. in Protein Crystallography and modern computational/graphic techniques, as applied to macromolecular modeling and ligand design, is highly desirable. Three to five years' industrial experience exemplifying the applications of crystallography preferred. Job Code: RJB-97463

**Associate Scientist*****Protein Crystallography***

This position involves all aspects of protein crystallization experiments, including implementation and management of cutting-edge crystallization robotics and a variety of spectroscopic instruments. A BS/MS in Biochemistry, Enzymology, Protein Chemistry, or Protein Biophysics and 3-5 years' experience in protein purification, crystallization, and analysis are required. An industrial background is preferred. Job Code: RJB/RB

**Associate Research Fellow*****Computer-Assisted Drug Design***

You will participate in structure-based design and pharmacophore modeling approaches to support ongoing drug discovery projects. Positions involve analyses of structure-activity relationships, protein/ligand interactions, protein homology, model building, and de novo drug design. In-depth working knowledge of computational analysis techniques a must, along with a proven track record in successful Chemistry or related sciences, and 3-5 years' industrial experience required. Job Code: LJB-97447

**Senior Associate Scientist/  
Research Associate*****Protein and Motif Fingerprinting***

Experience the challenges of cutting-edge scientific initiatives in protein and ligand informatics. You'll participate in the development and application of methodologies involving proteometrics, pattern recognition, fingerprinting techniques, and/or statistical analyses to study protein and ligand structures and their interactions, thereby bridging bioinformatics and cheminformatics. A Ph.D. in Chemistry, Chemical Information, Computer Sciences, or Biostatistics, along with knowledge of 2 and 3-dimensional structural information handling, and previous experience with structure activity or structure-function relationships required. Job Code: RJB/98

**SCIENTIFIC INFORMATION  
RESOURCES****Senior Analysts/Programmers**



Responsibilities will include coordination of computing support, web-based software development, personnel supervision, and project leadership. Candidates should have a M.S. or Ph.D. degree in Computational Biology, Molecular Biology, Computer Science, or a related discipline and experience in information systems development. Programming experience in a UNIX/Windows NT environment is essential. Job Code: DSB-97456

### **Database Administrators**

The successful candidates will provide database support for bioinformatics. Responsibilities will include maintenance of relational databases on a variety of platforms and collaboration with programming staff to develop normalized data models and program specifications for future bioinformatics systems. Candidates should have a M.S. or Ph.D. in either Computational Biology, Molecular Biology, Computer Science, or a

WORLDWIDE WEB. JOB CODE: DSB-97456

## **PHARMACOKINETICS DYNAMICS METABOLISM**

### **Associate Scientist/ Senior Associate Scientist**

As a member of our dedicated drug discovery team, you'll be responsible for the development and implementation of analytical methods (HPLC, LC/MS/MS) for drug and metabolites in biological fluids, and conduct pharmacokinetic/bio-availability studies in drug discovery phase, pharmacokinetic data analysis, and summarize results. Qualifications include a BS/MS in Pharmacy, Pharmacology, Chemistry, Biochemistry, or a related discipline, with a minimum of 5 years' (BS), or 3 years' (MS), pharmaceutical R & D experience. HPLC and/or LC/MS/MS method development and assay of biological samples experience required. Knowledge of pharmacokinetic principle, along with solid computer/communication skills preferred. Job Code: RJB-98006

Qualified candidates please mail, fax or e-mail a resume (on laser-quality white paper, with legible 10 point or larger type, and avoid boldface, italics, borders, etc.), indicating the Job Code of interest, to:  
**Parke-Davis Resume Processing Center, P.O. Box 92242, Los Angeles, CA 90009-2242. Fax: (310) 337-3367. E-mail: [parkedavis@isearch.com](mailto:parkedavis@isearch.com)**

Equal opportunity in action.  
Smoke-free work environment.

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| Position Title                            | Sub-Discipline                                                                                          | Employer                             |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------|
| Patent attorney,<br>Research<br>Scientist | Molecular biology,<br>biochemistry, bioorganic<br>chemistry, protein<br>biochemistry,<br>chromatography | Phylos, Inc.<br><b>Cambridge, MA</b> |
| Posted: 02/19/98                          |                                                                                                         |                                      |

As seen in the 20 February issue of *Science*:

## EXCELLERATING EVOLUTION

*Phylos, Inc., is a well-funded, privately held biotechnology company dedicated to developing and applying novel technologies in the field of Directed Protein Evolution. We are seeking highly talented individuals with proven backgrounds in technology development and innovation. Phylos offers a high quality scientific environment and tremendous opportunities for motivated individuals.*

### PATENT ATTORNEY

Responsible for obtaining the appropriate IP protection for Phylos technology, you will prepare and prosecute worldwide patent applications and provide intellectual property review. You will play a significant role in defining and effecting corporate strategy, including drafting, reviewing and negotiating agreements with significant IP content, working closely with the senior management team.

Applicants should possess a JD, and a BS in biological science, with a minimum of five years experience in drafting patent applications, and amendments, in the biotechnology/pharmaceutical industry; experience in drafting technology agreements (in- and out-licensing) and, have excellent verbal and written communication skills.

### RESEARCH SCIENTIST: Ph.D. MOLECULAR BIOLOGY & BIOCHEMISTRY

You will develop novel methods for directed evolution of proteins. Experience with *in vitro* recombination highly preferred, along with experience in *in vitro* selection, phage display, antibody affinity maturation, and affinity column preparation.

### RESEARCH SCIENTIST: Ph.D. BIOORGANIC CHEMISTRY

You will synthesize chemical tools to explore interactions between proteins and nucleic acids in translation systems. The position requires a Ph.D. in Organic Chemistry and good knowledge of Molecular Biology. Candidates with 1-3 years research experience in peptide and nucleic acid chemistry are preferred.

### RESEARCH SCIENTIST: Ph.D. PROTEIN BIOCHEMISTRY

You will purify proteins from expression systems and participate in selection to isolate proteins with

unique binding properties. Experience in molecular biology, chromatography, and correlation of macromolecular structure and function is required. Familiarity with cDNA libraries, eukaryotic protein expression, protein folding, or protein modeling is an advantage.

**RESEARCH SCIENTIST: Ph.D.  
MOLECULAR BIOLOGY & BIOCHEMISTRY**

You will develop novel, *in vitro* methods for detecting protein-protein interactions. Experience in protein biochemistry, cDNA library preparation, and signal transduction preferred.

**PLEASE, NO PHONE CALLS.**

*Phylos offers a competitive compensations package including; health benefits, 401K, and stock options. Phylos is an equal opportunity employer. Send CV's to Phylos, Inc., 300 Putnam Avenue, Cambridge, MA 02139, or fax to (617) 491-9494.*

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SEARCH RESULTS FOR: **BS**

**Search Result**

**Discipline(s):** Biochemistry, Biology, Botany/Plant Science, Cell Biology, Genetics, Immunology, Medicine, Microbiology, Molecular Biology, Neuroscience, Oncology, Chemistry, Agriculture, Developmental Biology  
**Region(s):** Canada, United States  
**Position(s):** Research Assistant, Researcher/Scientist, Other Positions  
**Organization(s):** Academic, Industry, Medical, Research Org./Foundation

2/24  
3/26



## Search Result

**Discipline(s):** Biochemistry, Biology, Botany/Plant Science, Cell Biology, Genetics, Immunology, Medicine, Microbiology, Molecular Biology, Neuroscience, Oncology, Chemistry, Agriculture, Developmental Biology

**Region(s):** Canada, United States

**Position(s):** Research Assistant, Researcher/Scientist, Other Positions

**Organization(s):** Academic, Industry, Medical, Research Org./Foundation

**Keywords:** BS

Shown: Results 1- 10 of 12

| Position Title                       | Sub-Discipline                                                                        | Employer                                            |
|--------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------|
| Senior Associate Scientist/Scientist | Neurochemistry, Neuropharmacology, Neuroscience, Electron Spin Resonance Spectroscopy | Parke-Davis Pharmaceutical Research Los Angeles, CA |
| Posted: 03/19/98                     |                                                                                       |                                                     |

As seen in the 20 March issue of *Science*:

### Influence the World of

*Parke-Davis Pharmaceutical Research, a division of Warner-Lambert, offers you an outstanding opportunity to influence important research for world health. We are currently seeking this individual to join our team in Ann Arbor, MI.*

#### SENIOR ASSOCIATE

You will conduct ex vivo biochemical analyses on brain tissues and microdialysis harvested from rodent models of acute traumatic brain injury at various post-traumatic timepoints. A BA, BS, MA or MS in

Neurochemistry, Neuropharmacology or other neuroscientific discipline is required. Two to six years' experience with routine tissue extractions, HPLC and biochemical analyses is required. Experience with electron spin resonance spectroscopy is desirable.

Qualified candidates mail, fax or e-mail a resume (Please submit resume on laser-quality white paper, with legible 10 point or larger type, and avoid boldface, italics, borders, etc.) indicating Job Code RJB-980044, to: **Parke-Davis Resume Processing Center, P.O. Box 92242, Los Angeles, CA 90009-2242. Fax: (310) 337-3367. E-mail: parkedavis@isearch.com**

Equal opportunity in action. Smoke-free work environment.

Warner-Lambert "**Pharmaceutical Company of the Year**"  
- Med Ad News September 1997

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| Position Title                                 | Sub-Discipline                                                                                | Employer                                                  |
|------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| SCIENTISTS; RESEARCH<br>TECHNICIANS/ASSISTANTS | Chemistry,<br>Biochemistry,<br>Immunology,<br>Molecular/Cellular<br>Biology and<br>Immunology | PowderJect<br>Vaccines,<br>Inc.<br><b>Madison,<br/>WI</b> |
| Posted: 03/19/98                               |                                                                                               |                                                           |

**As seen in the 20 March issue of *Science*:**

**PowderJect Vaccines, Inc.**, a wholly owned subsidiary of PowderJect Pharmaceuticals, PLC, is seeking highly motivated individuals to join an outstanding research team in the development of DNA and conventional vaccines. PowderJect Vaccines has developed a distinctive technological expertise focused on the use of particle delivery to generate immune responses which have broad potential prophylactic and therapeutic utility in infectious diseases and cancer.

## SCIENTISTS

**Scientist - Immunology/Molecular Biology** - Position available to lead the DNA vaccine project. Candidates must hold a Ph.D. with at least 10 years post-doctoral experience, and preferably experience in industry. Investigators should have expertise in immunology/molecular biology with an emphasis in infectious diseases. This position reports to the V.P. of Research.

**Scientist - Immunology/Vaccines** - Position available to lead the conventional vaccine department. Candidates must hold a Ph.D. with at least 10 years post-doctoral experience, and preferably vaccine experience in industry. Investigators should have expertise in cell biology, immunology or related field

with an emphasis in vaccine development. This position reports to the V.P. of Research.

**Scientist - Cellular Immunology** - Position available to lead the cellular immunology department. Candidates must hold a Ph.D. with at least 10 years post-doctoral experience, and preferably experience in industry. Investigators should have expertise in cell biology, immunology or related field with an emphasis in cell-mediated immunity. This position reports to the V.P. of Research.

## RESEARCH TECHNICIANS/ASSISTANTS

(FIVE POSITIONS)

Candidates should hold a BS or MS degree in Chemistry or Biological sciences. Research experience and demonstrated capabilities in biochemistry, immunology or molecular biology are highly desirable.

PowderJect Vaccines offers a competitive salary and comprehensive benefits package. Our R&D facility, located in Madison, Wisconsin near the University of Wisconsin, provides an ideal setting for both career and lifestyle enhancement.

Please send your resume to: **Human Resources**  
**585 Science Drive,**  
**Madison, WI 53711 or Fax: (608) 231-6990.**

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| Position Title     | Sub-Discipline                              | Employer                                                |
|--------------------|---------------------------------------------|---------------------------------------------------------|
| SCIENTIST/ENGINEER | Biochemical<br>Engineering,<br>Biochemistry | Schering-Plough<br>Research Institute<br>Kenilworth, NJ |
| Posted: 03/19/98   |                                             |                                                         |

As seen in the 20 March issue of *Science*:

*The transition from theory  
to practical application transforms  
molecules to medicines*

## BIOTECHNOLOGY DEVELOPMENT

AT SCHERING-PLOUGH

At Schering-Plough's Biotechnology Process Development Facilities in Union, NJ, scientists and engineers skillfully perfect innovative and cost-effective methods to bring quality pharmaceutical products to market. In this technologically advanced environment, you will provide the vital link between research and manufacturing.

## SCIENTIST/CHEMICAL ENGINEER

As a member of our Biotechnology Development Group, you will play a key role in the timely advancement of clinical candidates toward approval. You will be involved in the development of fermentation and purification of recombinant proteins and viruses. Responsibilities will include the transfer of processes to our facility in Switzerland, requiring overseas travel.

To qualify, you will need an MS in Biochemical Engineering, Biochemistry or a related field and 0-4 years of experience or a BS and 2-6 years of experience. Preference will be given to individuals with demonstrated skills in mammalian cell culture, microbial fermentation and protein purification. Strong problem-solving skills and computer experience are necessary. Knowledge of cGMP guidelines is desirable.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send a scannable resume and cover letter, original copy only, referencing Dept. BD97-25-BHS, to: Schering-Plough Research Institute, MS #1250, 2015 Galloping Hill Road, Kenilworth, NJ 07033-0539. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*

### Using Science for Human Advantage

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| Position Title       | Sub-Discipline                                               | Employer                                                    |
|----------------------|--------------------------------------------------------------|-------------------------------------------------------------|
| Researcher/Scientist | CNS Molecular Pharmacology, Molecular Biology & Biochemistry | Schering-Plough Research Institute<br><b>Kenilworth, NJ</b> |
| Posted: 03/19/98     |                                                              |                                                             |

**As seen in the 20 March issue of *Science*:**

## **CNS Discovery Research at Schering-Plough**

It's an exciting time at Schering-Plough Research Institute. Every day, some of the world's brightest minds are discovering breakthrough therapeutic agents and treatments that will improve the health and extend the lives of millions of people around the world. As we continue to experience unprecedented growth, we are moving confidently into the 21st century and seek exceptional Scientists who want to be on the cutting edge of pharmaceutical discovery. The following outstanding opportunities are available in our expanding CNS Drug Discovery Facility in Kenilworth, NJ.

***CNS Molecular Pharmacology, Molecular Biology & Biochemistry***

We seek BS, MS and PhD level scientists with strong backgrounds in molecular pharmacology, molecular biology and biochemistry to join research teams studying the molecular mechanisms of CNS disorders such as Alzheimer's disease, stroke, schizophrenia and metabolic diseases. In addition to general cell and molecular biology techniques, candidates should have experience in at least one of the following areas: primary neuronal cell culture, assessment of neuronal cell survival and neuronal cell death, receptor binding assays and signal transduction assays. Good communication skills and attention to detail are essential. For consideration, respond to Dept. CNS-MB.

### ***Receptors***

Several openings exist for BS or MS level scientists to join a group focused on the identification and characterization of receptors and related proteins as potential therapeutic targets. Previous experience in cDNA library construction and cloning, cell culture, protein purification and mammalian gene expression analysis is required. For consideration, respond to Dept. CNS-RR.

## **Using Science for Human Advantage**

### ***C. elegans Genomics***

We seek a PhD level scientist with experience in functional genomics studies in *C. elegans*. The successful candidate will have a PhD in Neurobiology or Molecular Biology/Biochemistry and at least 2 years of postdoctoral experience using *C. elegans* as a model organism for human gene function. Expertise in gene knockouts, GFP fusions and bioinformatics is required. For consideration, respond to Dept. CNS-CE.

### ***CNS Pharmacology/Electrophysiology***

Openings for scientists with BS, MS and PhD degrees exist in our CNS Pharmacology department. Successful candidates will have strong backgrounds using *in vivo* techniques and biochemical assays to study models of blood/brain barrier and/or gastrointestinal-renal function, or behavioral pharmacology. Positions are also available in our newly formed electrophysiology laboratory to study the effects of novel compounds on nervous system function. For consideration, respond to Dept. CNS-PE

### ***Bioinformatics***

Several positions are available in our Bioinformatics group for scientists with strong bioinformatics experience. The successful candidates will have either a PhD and at least 2 years of bioinformatics experience in a research setting, or an MS in Computer Science with a background in Biology. Strong interpersonal and communication skills are essential. For consideration, respond to Dept. CNS-BI.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send a scannable resume and cover letter, original copy only, referencing the Dept. Code for your position of interest, to: Schering-Plough Research Institute, MS #1250, 2015 Galloping Hill Road, Kenilworth, NJ 07033-0539. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*



## Using Science for Human Advantage

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                  |                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <p><b>Postdoctoral Fellowships</b></p> <p>The successful candidate will investigate novel screening formats and assay development for new antibacterial targets. To qualify, candidates should have expertise in Protein Biochemistry and experience with enzymes and/or receptors. Experience in fluorescence polarization, time resolved fluorescence, resonance energy transfer or scintillation proximity assays is preferred. Refer to Job Code 98RLDM2S.</p> <p>In this position, the successful candidate will work with gram-positive genetic systems and their development for use in anti-microbial target discovery and characterization. Expertise in microbial and</p> | <p><b>Sub Discipline</b></p> <p>biochemistry, genetics and molecular biology</p> | <p><b>Employer</b></p> <p>SMITHKLINE BEECHAM<br/>Pharmaceuticals Bala<br/>Cynwyd, PA</p> |
| <p><b>Postdoctoral Fellowships; Research Scientists &amp; Scientists</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                  |                                                                                          |
| <p>Posted: 03/19/98</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                  |                                                                                          |

As seen in the 20 March issue of *Science*:

## Genomics to antibiotics - ensuring a healthy future

### Microbiology Research

SmithKline Beecham Pharmaceuticals is at the forefront of anti-infectives research and a leader in using genomic technologies in the discovery of drugs that will shape and influence the future of worldwide health programs. Our Microbiology Research department is committed to intensive research into new antimicrobial targets and their utility in identifying novel antimicrobial agents. Opportunities exist at the PhD, Postdoctoral Fellow, MS and BS levels of expertise.

### Investigators

PhD level positions exist in microbial biochemistry and molecular biology. We are seeking candidates with expertise in bacterial gram-positive genetics, bacterial translation and/or transcription systems, molecular biology, gene expression and regulation, gene replacement and knock-out techniques, development and use of animal models of infection for examining pathogenesis. **Refer to Job Code 98RLDM1S.**

### Postdoctoral Fellowships

The successful candidate will investigate novel screening formats and assay development for new antibacterial targets. To qualify, candidates should have expertise in Protein Biochemistry and experience with enzymes and/or receptors. Experience in fluorescence polarization, time resolved fluorescence, resonance energy transfer or scintillation proximity assays is preferred. **Refer to Job Code 98RLDM2S.**

In this position, the successful candidate will work with gram-positive genetic systems and their development for use in anti-microbial target discovery and characterization. Expertise in microbial and

molecular biology is essential, as is experience with microbial genetic systems, gene replacement and knock-out techniques. Experience in the pharmaceutical industry is preferred. **Refer to Job Code 98RLDM3S.**

The successful candidate will study gene expression of pathogenic bacteria in various disease models using microarray technology. Experience in microbiology, molecular biology and/or nucleic acid chemistry is desired. **Refer to Job Code 98RLDM4S.**

#### **Research Scientists**

**For these positions, Refer to Job Code 98RLDM5S.**

The successful candidate will assist in the genetic characterization of novel antibacterial agents. Expertise in gram-positive bacterial gene cloning, vectorology and gene knockout technology is desirable. A BS is required with experience in DNA molecular biological techniques, bacterial genetic techniques and DNA sequence homology analysis.

The successful candidate will conduct studies to investigate the disposition and pharmacodynamics of novel antibacterial agents in experimental models of infection. An MS or PhD with expertise in the development and use of animal models of infection for the evaluation of antibacterial distribution and efficacy is essential. A working knowledge of pharmacokinetics/pharmacodynamics and expertise in microbiology/pharmacology is preferred.

The successful candidate will assist in the characterization of novel bacterial DNA replication targets and inhibitors, run routine screens for inhibitor evaluation, identify assayable functions of essential bacterial proteins and develop assays amenable to high throughput screening. A minimum of a BS is required, as is experience with in-vitro assay development.

#### **Molecular Virology and Host Defense**

We are also seeking Scientists for our Molecular Virology and Host Defense department. This department works on projects which encompass basic and applied research in many aspects of virology including viral replication, pathogenesis, host-virus interaction, and the discovery of novel anti-viral compounds as well as the immunology of infectious diseases including immunomodulators, hematoregulatory cytokines, and stromal cell biology.

#### **Scientist**

The selected individuals will assist in research aimed at discovery, evaluation and development of novel therapeutic anti-viral agents for human herpes viruses and respiratory viruses; and will apply virological, molecular, and biochemical skills as a member of a multi-disciplinary team.

The successful candidates will possess a BS/MS in Biological Sciences, and a minimum of 5-7 years of post-graduate experience in a wide variety of advanced molecular biological skills including DNA, RNA, protein analysis, PCR, and tissue culture. Experience with analysis of differential gene expression and cDNA expression arrays is preferred. Candidates with a demonstrated ability to trouble shoot molecular procedures, identify new techniques and adapt them to relevant research, and plan individual experiments in relation to a broad set of research objectives are preferred. Excellent organizational, communication, and computer skills, as well as the ability to work both independently and effectively with individuals of

varied backgrounds and disciplines are required. **Refer to Job Code 98RTSRLS.**

Located in a state-of-the-art research facility in suburban Philadelphia, SmithKline Beecham offers a competitive compensation/benefits/relocation package and a stimulating work environment in which to grow and excel. For confidential consideration, please forward a resume and salary requirements to: SmithKline Beecham Pharmaceuticals, Job Code (select one), P.O. Box 2646, Bala Cynwyd, PA 19004. **Indicating Job Code is essential.** For more information on SmithKline Beecham, visit our Web site at [www.sb.com/careers](http://www.sb.com/careers). We are an Equal Opportunity Employer, M/F/D/V.

**Challenging the natural limits.**

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| Position Title   | Sub-Discipline                                  | Employer              |
|------------------|-------------------------------------------------|-----------------------|
| TAFF             | Molecular/Cellular<br>Biology,<br>Biochemistry, | GENETICS<br>INSTITUTE |
|                  | Chemical<br>Engineering                         |                       |
| Posted: 03/19/98 |                                                 |                       |

As seen in the 20 March issue of *Science*:

## AS BIG AS **LIFE** ITSELF

**GENETICS INSTITUTE'S MISSION IS TO DO WHAT HAS NEVER BEEN DONE BEFORE ... TO DISCOVER NEW PROTEIN-BASED THERAPEUTICS FOR THE TREATMENT OF A WIDE VARIETY OF HUMAN CONDITIONS. AS A RESULT, THE CHALLENGES WE FACE ARE EXTRAORDINARY. YET BECAUSE OUR WORK GOES DIRECTLY TOWARD IMPROVING HEALTH AND LIFE FOR PEOPLE AROUND THE WORLD, THE REWARDS OF OUR WORK ARE JUST AS IMPRESSIVE ... AS BIG AS LIFE ITSELF.**

**WITH TWO MILESTONE PRODUCTS - BENEFIX™ AND NEUMEGA® RECEIVING FDA APPROVAL IN 1997 - GENETICS INSTITUTE IS WELL POSITIONED TO CONTINUE ITS SUCCESS AND GROWTH INTO THE NEXT MILLENIUM. WE ARE COMMITTED TO PROVIDING TO OUR DEDICATED PROFESSIONALS, WHO CONTRIBUTE SO MUCH TO OUR SUCCESS, THE RIGHT TOOLS AND TECHNOLOGY NEEDED TO MEET THE CHALLENGES THAT MAKE OUR ENVIRONMENT UNIQUE. YOU'LL FIND IT'S A GREAT ORGANIZATION FOR BUILDING A REWARDING CAREER.**

## **MAMMALIAN AND MICROBIAL CELL SCIENCES/PILOT LAB**

The Mammalian and Microbial Cell Sciences/Pilot Lab is responsible for the design, development and ongoing support of GMP cell culture and fermentation processes. This multidisciplinary department employs molecular and cell biology, biochemistry, microbiology, cell physiology and chemical engineering to create the capacity to manufacture recombinant human proteins of exceptional quality in a consistent and economical manner. Several openings exist for individuals with hands-on experience in the above areas, who are committed to applying state-of-the-art science and technology to address the challenges of biopharmaceutical manufacturing.

### **STAFF SCIENTIST/PRINCIPAL SCIENTIST (SC4-LL-SH)**

Seeking candidates with at least three years of experience in the design and characterization of mammalian cell culture expression systems, with an emphasis on high yield expression of recombinant glycoproteins. A Ph.D. in Cell Biology, Biochemistry or Biochemical Engineering with training in basic molecular biology is highly desirable. Ability to work well in a team environment is critical, and excellent written and verbal communication skills are required.

### **STAFF SCIENTIST/PRINCIPAL SCIENTIST (SC4-LL-SH2)**

Seeking candidates with at least three years of experience in the characterization of microbial or mammalian expression systems. This position requires expertise in a broad range of analytical methods and hands-on experience in applying those methods to study the expression, secretion and post-translational modifications of recombinant proteins. A Ph.D. in Cell Biology, Biochemistry or Biochemical Engineering with training in basic molecular biology is highly desirable. Ability to work well in a team environment is critical, and excellent written and verbal communication skills are required.

### **POSTDOCTORAL FELLOW (SC4-LL-MS)**

The primary goal of this fellowship is to extend our understanding of protein tyrosine sulfation in Chinese hamster ovary cells. This project will involve cloning of relevant CHO sulfo transferase enzyme(s) and subsequent studies of cellular regulation of transferase expression and catalytic activity. We are seeking candidates with training in cell biology and biochemistry and in molecular biology. Suitable candidates should also have a demonstrated interest in cellular pathways responsible for posttranslational modifications of secreted proteins.

## **BIOPHARMACEUTICAL CHARACTERIZATION & ANALYSIS**

This department is focused on the development and application of analytical technologies for the characterization and analysis of recombinant glycoproteins.

### **MASS SPECTROMETRY LABORATORY HEAD (SC4-LL-HS)**

Seeking a Ph.D.-level scientist with extensive knowledge in biochemical mass spectrometry to lead the mass spectrometry group within the department. The candidate should have relevant experience and expertise in biochemical structural analysis as applied to glycoproteins. The mass spectrometry group focuses on the development and application of mass spectrometry for the structural analysis of proteins, glycoproteins and carbohydrates. The candidate will help to define and implement MS-based strategies for the analysis of recombinant therapeutics. Candidates should be comfortable working at the interface of analytical chemistry, biochemistry and cell biology. Additional experience in chromatographic separation methods (electrophoretic and chromatographic) micro-sample handling techniques or other methods for protein and carbohydrate structural analysis is beneficial. Prior experience in the biopharmaceutical

industry is desirable. The candidate should have excellent communication skills and the ability and desire to work in a multidisciplinary, team-oriented environment.

### **THE DRUG PRODUCT DEVELOPMENT GROUP**

This team consists of protein chemists, process engineers and manufacturing personnel focused on the development of stable, manufacturable, user-friendly dosage forms for all of Genetics Institute's products.

#### **SCIENTIFIC STAFF (SC4-LL-GA)**

An exciting opportunity exists for an analytical protein chemist to develop and understand the dosage forms of a modified form of recombinant Factor VIII (rVIII SQ). This individual will coordinate a team effort in understanding the stability of the protein, develop appropriate analytical methods, and function as a member of an interdisciplinary team focused on the development and manufacture of safe, effective dosage forms of rVIII SQ. Qualified candidates should possess a Ph.D. in Biochemistry, Analytical Chemistry or related field with 3-5 years of demonstrated work experience or an MS with 10+ years of experience. A strong background in HPLC and electrophoretic methods development is required. Strong interpersonal and communications skills are essential. Experience in dosage form development, lyophilization or coagulation factors is helpful but not essential.

#### **STAFF SCIENTIST, DELIVERY MATRIX DEVELOPMENT (SC4-LL-191)**

Seeking an individual to lead a group responsible for development and characterization of Bone Morphogenetic Protein (BMP) delivery matrices. This includes matrices based on collagen and hydroxyapatite, as well as other materials. Responsibilities include: determining critical features of the matrices with regard to biological efficacy; understanding the nature of the interaction of BMP with the matrices; and helping to develop manufacturing processes for the matrices that reproducibly yield material with the desired properties. Requires a Ph.D. degree in Pharmaceutics, Biochemistry or a related field, with relevant postdoctoral experience (industrial or academic). Experience with collagen characterization as well as with characterization of drug delivery matrices is highly desirable. We also have openings in this area for individuals with BS/MS degrees and relevant experience.

#### **STAFF SCIENTIST, LYOPHILIZATION DEVELOPMENT (SC4-LL-DPD)**

Exciting opportunity within our Drug Product Development group for an individual to participate in lyophilization cycle development for protein parenterals. Work with our formulation scientists to develop robust formulations and lyophilization cycles for new product candidates and to understand and optimize existing cycles. Requires a minimum of a Ph.D. in a scientific or engineering field, and three or more years of experience in lyophilization technology are required; knowledge of physical biochemistry of proteins and relevant analytical techniques (DSC, X-ray diffraction, freeze-drying microscopy) is desirable.

For additional opportunities, visit our web site at:

**[www.genetics.com](http://www.genetics.com)**

To be considered for current or future job openings, please mail or fax your resume, indicating job code, to: Genetics Institute, Inc., Resume Processing center, Job Code: \_\_\_\_, P.O. Box 385, Burlington, MA 01803. Fax: (978) 623-2607

Scannable copies should be forwarded on plain white bond paper, using standard types and fonts, and no bold or italic print. When faxing, please also mail the original copy to the above address.

Genetics Institute is a wholly owned subsidiary of American Home Products Corporation and offers competitive salaries and benefits, including comprehensive health care, dental and life insurance, three weeks' paid vacation, 401(k), pension plan, relocation assistance, tuition assistance, dependent care subsidy, and an on-site exercise facility. Genetics Institute is proud to be an equal opportunity, affirmative action employer, dedicated to building strength through diversity.

### Harnessing the Body's Power to Heal™

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| Position Title                                   | Sub-Discipline                                                                                                                         | Employer                             |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Manager,<br>Scientist,<br>Associate<br>Scientist | Pathology; toxicology,<br>pharmacology,<br>pharmacokinetics, protein<br>engineering, biochemistry,<br>protein chemistry,<br>immunology | Biogen, Inc.<br><b>Cambridge, MA</b> |
| Posted: 03/26/98                                 |                                                                                                                                        |                                      |

As seen in the 27 March issue of *Science*:

*Biogen has established a unique record of success as one of the world's premier biotechnology companies. Pioneering research by our scientists has led to the introduction of several important new medical therapies, including AVONEX (Interferon beta-1a), the most prescribed therapy in the U.S. for relapsing forms of multiple sclerosis. We are staking our future growth on the development of our next generation of pharmaceutical products, five of which are currently being tested in human clinical trials. Today, we are seeking the following committed professionals to join our expanding team in Cambridge.*

### DEFINING SUCCESS in BIOTECHNOLOGY

#### MANAGER - DEVELOPMENT

This is a senior scientific position responsible for the design, conduct, reporting and management of IND, BLA and NDA enabling programs. Position is responsible for all scientific issues related to preclinical and clinical ADME, toxicology, pathology, biopharmaceutics and associated product development strategies. Position requires a minimum of 7-10 years of relevant experience in the biopharmaceutical industry with direct involvement and responsibilities in the development of small molecules and biotechnology-derived products. A Ph.D., D.V.M. or equivalent, specific expertise in pathology; toxicology, pharmacology, or pharmacokinetics, and a strong publication record is required. Initial preference is for a pathologist trained in veterinary pathology or toxicologic pathology; however, candidates with credentials in the scientific

disciplines noted above are urged to apply. The ability to perform independently and collaboratively in a matrix environment is essential for a successful candidate. Prior experience working with interdisciplinary project teams and with CROs is essential. **Job Code: JT/MD**

### **SCIENTIST - TOXICOLOGY**

An entry level scientific position that is responsible for assisting in the design, conduct and reporting of toxicology studies conducted to support IND, BLA and NDA programs. A Ph.D. in toxicology, specific expertise in immunotoxicology and a publication record indicative of strong scientific potential is required. An exceptional post-doctoral candidate or person who has completed a recent post-doctoral appointment in a relevant area of toxicology and is interested in an industrial career would be considered ideal. **Job Code: JT/ST**

### **SCIENTIST - PHARMACOKINETICS AND METABOLISM**

An entry level scientific position that is responsible for assisting in the design, conduct and reporting of pre-clinical pharmacokinetic and metabolism studies conducted to support IND, BLA and NDA programs. A Ph.D. or equivalent, specific expertise in pharmacokinetics and metabolism issues and a publication record indicative scientific potential is required. An exceptional post-doctoral candidate or person who has completed a recent post-doctoral appointment in a relevant scientific area and is interested in an industrial career would be considered. **Job Code: JT/SPM**

### **ASSOCIATE SCIENTIST**

In this Scientific position you will be responsible for assisting in the design, conduct and reporting of preclinical and clinical pharmacokinetic and metabolism studies conducted to support IND, BLA and NDA programs. A MS in a basic science, specific experience in pharmacokinetics and metabolism issues and a publication record indicative of scientific ability is required. **Job Code: JT/AS**

These positions will work collaboratively with other senior scientists and scientific managers in a matrix environment, participate in inter-disciplinary project teams and work with contract research organizations. Each presents a unique opportunity for the right individual to be trained for a successful career in the pharmaceutical development in a leading biopharmaceutical company.

### **ASSOCIATE SCIENTIST - PROTEIN ENGINEERING**

Assist in the isolation, purification, and characterization of non-recombinant and recombinantly expressed proteins in support of ongoing research programs. Requires a BS/MS in Biochemistry with 2 years' post undergraduate protein purification and protein chemistry experience. Low pressure and high performance column chromatography of proteins and peptides, gel electrophoresis, and Western blotting skills are necessary. Must have strong communication skills and the ability to perform carefully controlled experiments and review data critically. The ability to operate and upgrade computerized chromatographic instrumentation is preferred, as is experience in cell (bacterial, insect, mammalian) culture. **Job Code: RC-ASPE**

### **ASSOCIATE SCIENTIST - IMMUNOLOGY**

Examine stimulatory pathways of non-hematopoietic cell types and how these pathways relate to disease. Requires a BS or MS in Biology, Immunology or related field, with 5 years' laboratory experience. Required skills include tissue culture, preparation of primary cultures from tissue, molecular biology techniques and cell surface staining with mAbs for FACS analysis. Computer skills and animal handling experience also necessary. **Job Code: RC-ASI**

**Biogen offers what few companies in our industry can - Professional Challenge, Stability, Growth, and one of the strongest financial profiles in the industry. In addition, our compensation and benefits package, including equity participation, is one of the best in the industry, and is designed to attract and retain the finest talent available. Please forward your resume including job code, to: Biogen, Inc., 14 Cambridge Center, Cambridge, MA 02142; Fax: (617) 679-2546. Biogen is an Equal Opportunity Employer.**

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**<http://www.biogen.com>**

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| <b>Position Title</b> | <b>Sub-Discipline</b>                                                            | <b>Employer</b>                                     |
|-----------------------|----------------------------------------------------------------------------------|-----------------------------------------------------|
| Scientists            | Bioinformatics,<br>Pharmacology,<br>Molecular/Cellular Biology<br>and Physiology | Eli Lilly and<br>Company<br><b>Indianapolis, IN</b> |
| Posted: 03/23/98      |                                                                                  |                                                     |

**As seen in the 27 March issue of *Science*:**

**Lilly Cardiovascular  
Discovery**

**Come talk to us at the  
FASEB Meeting April 18-22  
In San Francisco**

**If you would be interested in interviewing for any of the following positions during the FASEB meeting, please fax your resume to FASEB Recruiting Coordinator at 317-276-4716 by April 10, 1998.**

**As part of the Cardiovascular Discovery team, you will be involved in finding ways to help patients live healthier, happier lives through innovative cardiovascular pharmaceutical products and services. You will become a member of a multi-disciplinary team focused on one of the following**



**areas: Atherosclerosis, Congestive Heart Failure, Stroke or Thrombosis.**

**Ph.D. - Thrombosis Research  
(Pharmacology or Physiology)**

*A multidisciplinary team of scientists are seeking a highly motivated senior in vivo cardiovascular investigator to join in their search for novel antithrombotic agents. Primary responsibilities include direction of a laboratory program toward development of small animal models of thrombotic disease to study etiologic mechanisms and novel pharmacologic interventions focused upon coagulation. A Ph.D in Pharmacology or Physiology with 5 years of independent research is preferred. The individual must be sufficiently creative and flexible to effectively address issues ranging from pharmacodynamics to animal modeling of problems that arise during clinical evaluation of drug candidates.*

**Ph.D. - Bioinformatics**

*Bioinformatics Scientists and Software Engineers work closely with discovery teams and Genome Scientists to ensure effective use and management of information on biological databases throughout Lilly. An outstanding individual is sought for a number of functions including utilization and integration of gene expression data as well as exploration of novel software technologies in computational functional analysis. Candidates should have a degree and substantial experience in Bioinformatics and/or Molecular Biology.*

**Ph.D. - Atherosclerosis Research (Biochemistry)**

*A position is available at the senior scientist level for a Biochemist with extensive background in the biochemistry of metabolic pathways involved in the development of Atherosclerosis and/or insulin resistance. Demonstrated expertise in molecular pathways involved in lipoprotein metabolism and expertise in lipid biochemistry and/or enzymology are required together with an experience in the development of whole animal metabolic studies. Experience with insulin signaling would be preferred.*

**Ph.D. - Congestive Heart Failure (Biochemistry)**

*A position is available at the senior scientist level (Ph.D. or equivalent) for a Biochemist with extensive background in experimental protein biochemistry or cardiac cells associated with the development of heart failure. The scientist should have significant experience with the in vitro models (cardiac myocytes, fibroblasts) and the molecular and signaling pathways associated with cardiac contractility changes and fibroplasia. The scientist should have proven experience in the routine use of protein biochemistry, DNA protein interaction, viral transfection, and tissue culture techniques. The capacity to develop functional assays and to interpret functional assays in cardiac cells would be preferred.*

**Ph.D. - Thrombosis Research  
(In Vitro Biochemist)**

*We are seeking a Biochemist with experience in blood coagulation, specifically with the biology and chemistry of coagulation factors and anticoagulants. We expect the scientist to conduct research toward the elucidation of antithrombotic mechanisms and the discovery of novel antithrombotic agents. A qualified candidate would have the ability to integrate basic scientific knowledge and experience into problem solving relevant to drug discovery, interest or experience in the discovery of novel anticoagulant mechanisms and pharmaceutical candidates, interest or experience in the study of mechanisms of thrombosis/antithrombotics/anticoagulants; interest or experience in the development of biochemical*

*assays for use in study of antithrombotic agents and for screening and testing compounds as candidates for anticoagulant drug discovery.*

#### **Ph.D. - Thrombosis (Biochemistry)**

*We are looking for a senior scientist to join an exciting and novel approach in our thrombosis research group. A qualified applicant will need a strong background in enzymology and kinetics with additional experience in hemostasis/thrombosis and/or molecular biology being highly desirable. Skill sets should include enzymology, kinetic analysis with allosteric modulators with enzymes, cell culture, coagulation assays, platelet biology, expressing point mutation of recombinant proteins in mammalian cells, and protein purification.*

#### **Ph.D. - Stroke Research (Pharmacology)**

*A position is available in our Stroke Research Group for a Ph.D. level scientist with expertise in animal models of cerebral ischemia. Demonstrated experience in use of behavioral and/or neurological assessment during prolonged recovery would be an advantage. Experience with testing neuroprotectant strategies is preferred.*

#### **Ph.D. - Stroke Research (Enzymology/Biochemistry)**

*We are looking for a senior scientist to join a multi-disciplinary team developing novel therapeutics for the treatment of acute ischemic stroke. Candidate will be expected to have a strong background in enzymology - kinetic analysis, structure-function and inhibitor characterization. The ability to integrate enzymology expertise with an understanding of cell biology and the pathophysiology of cerebral ischemia is expected.*

***The Cardiovascular Research division at Eli Lilly and Company has openings for BS/MS level candidates to support our efforts in thrombosis, congestive heart failure, stroke and atherosclerosis.***

#### **Biochemists:**

*Useful experience includes isolation, purification, manipulation and characterization of proteins and developing functional assays for proteins. Familiarity with enzyme kinetics and mechanisms of inhibition of enzymes is desirable. Additional experience in G-coupled receptor and/or kinases in cardiac cells would be an advantage. Other positions are available for those with experience in developing high volume screens and development of drug candidates. For our thrombosis positions, experience in coagulation enzyme assays, clotting assays or platelet aggregation a plus.*

#### **Molecular Biologists:**

*Candidates should possess a solid knowledge of current molecular biology and biochemical techniques including PCR, expression cloning, library construction, gene expression, protein expression, anti-sense technology, gene delivery systems, mutant construction and analysis. Working knowledge in bioinformatics is an added asset. Experience in signaling pathways/kinases or phosphatases would be an advantage.*

#### **Pharmacologists:**

*These positions require the ability to carry out both in vitro and in vivo assays of drug efficacy. Candidates should have broad experience in various aspects of cell-based assay development and drug development and/or animal-based modeling and drug evaluation. Specific training in both large and small animal thrombosis models or in vivo stroke models a plus.*

### **Cellular Biologists:**

*Successful candidates should possess a thorough knowledge of mammalian platelet or cell biology and the use of molecular and cellular biology techniques to explore and evaluate potential drug targets. Experience with techniques including tissue culture, transfection, reporter gene assays is required. Experience with any of the following would be desirable: integrins and membrane receptors, signal transduction pathways, regulation of gene expression or regulation of secreted proteins.*

To attract the best and the brightest, we offer competitive salaries and excellent benefits. Qualified candidates are encouraged to apply by sending resumes and cover letters to: **Eli Lilly and Company, Lilly Corporate Center, US Recruiting and Staffing, Indianapolis, IN 46285. Please reference ad code: ADSCM-B104.** We are an equal opportunity employer dedicated to the strength diversity brings to the workplace.

**For more information about Lilly,  
please access our website at  
[www.lilly.com](http://www.lilly.com).**

**To learn more about Indianapolis, visit:  
[www.welcometoindy.com](http://www.welcometoindy.com).**

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**Be sure to mention that you saw this ad on *Science Online***

| <b>Position Title</b> | <b>Sub-Discipline</b>                                                  | <b>Employer</b>                  |
|-----------------------|------------------------------------------------------------------------|----------------------------------|
| QA Systems Analyst    | Science, scientific data systems, GLP and GMP requirements, statistics | Bayer Corporation<br>Clayton, NC |
| Posted: 03/26/98      |                                                                        |                                  |

**As seen in the 27 March issue of *Science*:**

**THE  
BAYER  
FACTS:**

**Bayer:**

**A premier  
healthcare  
company for  
the 21st century.**

Our business is  
to significantly  
improve health  
worldwide.

People are the heart  
of our company.

Our corporate  
culture inspires and  
commits all  
to do their best.

**QA SYSTEMS  
ANALYST**

- Bayer Corporation is a \$32 billion international diversified organization and is one of the most broadly-based healthcare companies in the U.S. Our Clayton facility is the largest of its kind in the world and is primarily involved in the manufacture of **Biological Products**.
- You will conceive, design, develop and implement applications for QA related data collection, transfer, storage, retrieval, analysis and reporting. Responsibilities include development and administration on the PENelson LIMS system. You will be capable of independently ensuring the LIMS application, Oracle database and operating systems are available 24 hours/day. Activities will include the implementation, use and user training of advanced information management tools for QA data trending and analysis, as well as formulation, presentation and preparation of system documentation.
- To qualify, you must be a team player with a BS degree with scientific emphasis or equivalent and 10 years related experience, with at least 6 years in application development for scientific data systems. Familiarity with GLP and GMP requirements is required, along with experience in data mining techniques and statistical evaluation. Proven experience with PENelson LIMS, VMS/Unix, Oracle and SAS is required. PowerBuilder environment and development experience desired, as is Developer; Designer and Discover 2000 experience.
- For immediate consideration, please forward your resume (indicating response code 98-33) including salary history to: **KC/Human Resources Administrator, Bayer Corporation, Pharmaceutical Division, P.O. Box 507, Clayton, NC 27520**. No agencies or phone calls please. For more information on Bayer, search: <http://www.careermosaic.com/cm/bayer/>
- An Equal Opportunity Employer M/F/D/V. Bayer Corp. is committed to enhancing and maintaining cultural diversity within our work environment.

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| Position Title         | Sub-Discipline                                                 | Employer                                                       |
|------------------------|----------------------------------------------------------------|----------------------------------------------------------------|
| ASSOCIATE<br>SCIENTIST | Biology,<br>Biochemistry,<br>Molecular and<br>Cellular Biology | Schering-Plough<br>Research Institute<br><b>Kenilworth, NJ</b> |
| Posted: 03/26/98       |                                                                |                                                                |

**As seen in the 27 March issue of *Science*:**

*Working on the molecular level  
to conquer, treat, or prevent  
debilitating diseases.*

## **CNS DISCOVERY RESEARCH AT SCHERING-PLOUGH**

At Schering-Plough Research Institute in Kenilworth, NJ, scientists are discovering innovative therapeutic agents that challenge humankind's most debilitating diseases. If you are seeking an opportunity to be on the cutting edge of pharmaceutical discovery, become part of an advanced multidisciplinary research group focused on CNS disorders.

### **ASSOCIATE SCIENTIST Receptor Research**

We seek a talented scientist to join a team focused on the discovery and characterization of drugs to treat obesity. To qualify, you will need a BS degree in Biology or a related field and at least 4 years of experience, or an MS degree and at least 2 years of experience. The successful candidate will have a background in radioligand binding assays, signal transduction and mammalian cell culture. Experience in molecular biology is also desirable. Excellent communication and organizational skills are a must.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send a scannable resume and cover letter, original copy only, referencing Dept. DD98-02-CNS/PC, to: Schering-Plough Research Institute, MS # 1250, 2015 Galloping Hill Road, Kenilworth, NJ 07033-0539. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*

**Using Science for Human Advantage**

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**Next 2 results**



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## Search Result

**Discipline(s):** Biochemistry, Biology, Botany/Plant Science, Cell Biology, Genetics, Immunology, Medicine, Microbiology, Molecular Biology, Neuroscience, Oncology, Chemistry, Agriculture, Developmental Biology

**Region(s):** Canada, United States

**Position(s):** Research Assistant, Researcher/Scientist, Other Positions

**Organization(s):** Academic, Industry, Medical, Research Org./Foundation

**Keywords:** BS

### Previous 10 results

Shown: Results 11- 12 of 12

| Position Title   | Sub-Discipline                   | Employer                             |
|------------------|----------------------------------|--------------------------------------|
| Scientist        | Cell Biology, and microinjection | AXYS Pharmaceuticals<br>La Jolla, CA |
| Posted: 03/26/98 |                                  |                                      |

As seen in the 27 March issue of *Science*:

## TRANSGENICS

*AXYS Pharmaceuticals is a leader in the integration of drug discovery technologies from gene identification through clinical development and is focused on the discovery of small molecule therapeutics. We have research collaborations with world-class pharmaceutical companies. Join us in this exciting opportunity:*

### MICROINJECTIONIST

recipient mice, and tracking of offspring. Requires a <sup>BS/MS</sup>BS/MS and several years experience producing transgenic or knockout mice. Must be able to communicate well and interact effectively. Creative problem solving skills and critical attention to detail are highly desirable. Demonstrated experience in ES cell

culture, production of ES cell aggregation chimeras, and/or mouse embryology is a plus.

As a publicly held corporation, AXYS is proud to offer a stimulating scientific setting along with a highly competitive salary and benefits package. Please mail or fax your resume to: AXYS Pharmaceuticals, Inc., Attn: HR/SCI98-106, 11099 N. Torrey Pines Rd. #160, La Jolla, CA 92037. Fax: (619) 452-6653. Visit our website @www.axyspharm.com EOE.

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**Be sure to mention that you saw this ad on *Science Online***

| Position Title       | Sub-Discipline                        | Employer                                             |
|----------------------|---------------------------------------|------------------------------------------------------|
| Researcher/Scientist | Insect and Plant<br>Molecular Biology | Rohm and Haas<br>Company <b>Spring<br/>House, PA</b> |
| Posted: 03/26/98     |                                       |                                                      |

**As seen in the 27 March issue of *Science*:**

### **Insect and Plant Molecular Biology Positions**

Agricultural Chemicals Discovery Research at Rohm and Haas Company has openings for highly motivated researchers at doctoral and MS/BS levels. These positions are located at our Corporate Research Center in Spring House, PA - ten miles north of Philadelphia. The scientists will work in the Insecticide or Herbicide Research groups, discovering novel and eco-toxicologically safe pesticides.

Candidates for each technical area should have a strong background and research experience in applying molecular biology techniques to study insect or plant biochemical and physiological processes. The work will involve utilizing molecular biology (cloning and expression of genes) and biochemical techniques for assay development, identification of novel biochemical targets, and mode of action research.

The PhD biological scientists should have at least two years of postdoctoral experience in insect or plant molecular science. They will have responsibility for independent research, as well as collaborative work in interdisciplinary project teams. Candidates for the MS/BS positions must have a degree (preferably MS) in molecular biology and at least two years of laboratory experience in the use of molecular biology techniques to study insect or plant biochemistry and physiology. For those applying for either insect molecular biology position, knowledge and experience in insect toxicology is a distinct advantage.

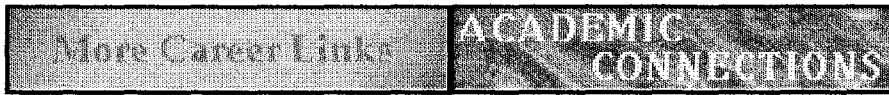
Rohm and Haas Company offers a highly competitive salary and benefits program, including relocation assistance and profit sharing. We are also committed to the professional development of our Research staff. We are an Equal Opportunity Employer. Candidates must be legally authorized to hold regular employment in the U.S. Please specify which opening you wish to be considered for and send your c.v. or resume before **May 15, 1998**, to: **Technical Recruiting #298, Rohm and Haas Laboratories B-70, 727 Norristown Road, Spring House, PA 19477-0904**, or by e-mail to [techstaff@rohmmaas.com](mailto:techstaff@rohmmaas.com)



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## Search Result

**Discipline(s):** Anatomy/Physiology, Biochemistry, Biology, Botany/Plant Science, Cell Biology, Environmental Science, Genetics, Immunology, Medicine, Microbiology, Molecular Biology, Neuroscience, Nutrition/Health Care, Oncology, Pharmacology, Virology, Agriculture, Developmental

**Organization(s):** Academic, Government, Industry, Medical, Research Org./Foundation, Other Organizations

**Keywords:** BS

**Ads Posted Since:** 03/26/98

**Note:** You entered a date which is earlier than the oldest ad available. The earliest ad currently available was posted on 04/13/98. Ads are normally posted for two weeks only.

**Shown:** Results 1- 4 of 4

| Position Title                        | Sub-Discipline                                                                                                         | Employer                                                    |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| SCIENTIST (PHD & POSTDOCTORAL LEVELS) | PROTEIN ENGINEERING, PROTEIN BIOCHEMISTRY, CHEMISTRY, MOLECULAR/CELLULAR/STRUCTURAL BIOLOGY, PHARMACLOGY AND CHEMISTRY | Monsanto Company<br><b>CHESTERFIELD &amp; ST. LOUIS, MO</b> |
| Posted: 04/16/98                      |                                                                                                                        |                                                             |

As seen in the 17 April issue of *Science*:

**We're redefining the way the world looks  
at life sciences.**

**We're the new life sciences company  
at Monsanto.**

And we're even more focused on the future. That's why our entire organization, from agricultural biotechnology to pharmaceuticals to food ingredients, is dedicated to life sciences. Now, we can answer the questions, needs and demands of our ever-changing planet. After all, the world's resources are finite,

but our vision for the future is limitless. Currently, we have the following opportunities for individuals to join our organization:

### **PROTEIN CRYSTALLIZATION SCIENTIST (BS/MS LEVEL)**

Working as part of an interdisciplinary discovery team, you will be responsible for the crystallization of proteins that are molecular targets in pharmaceutical discovery. As a team member of our Structure and Computational Chemistry Group, you will work in a project based environment with crystallographers, structural biologists, computational and medicinal chemists, molecular biologists, protein biochemists, biologists, and pharmacologists.

The successful candidate will have experience in protein crystallization, as well as excellent communication, documentation and interpersonal skills. Experience with protein purification and/or molecular biology techniques would be a plus. **(Job Code: PCS)**

### **PROTEIN NMR SPECTROSCOPIST (PH.D LEVEL)**

You will work closely with multidisciplinary teams of scientists, including protein crystallographers, molecular modelers, molecular biologists, protein biochemists, and medicinal chemists on Discovery Projects in Pharmaceutical Research.

A Ph.D. in a relevant field with a minimum of 3 years postdoctoral experience in protein structure determination by NMR is required. Successful candidates will have skills in all aspects of protein NMR including pulse sequence programming, data analysis, and structure calculation. Familiarity with protein engineering, molecular modeling, or protein purification is also beneficial. **(Job Code: NMR)**

For immediate consideration for these positions, please send your CV and three letters of reference, to: **G. Reynolds, Monsanto Company, Job Code: \_\_\_\_ (select from above), 700 Chesterfield Pkwy., Mail Zone: BB5B, Chesterfield, MO 63167.**

### **SCIENTIST (POSTDOCTORAL LEVEL)**

Ph.D. scientist trained in arachidonic acid metabolism and biochemistry wanted to dissect mechanistic role of this pathway in immune cell physiology and in vivo models of inflammation. Training in lipid metabolism and methodology, as well as in cellular biology and tissue culture required.

For immediate consideration for this position, please send your CV, three letters of reference, and a cover letter detailing your experience and scientific interest to: **Dr. Philip Needleman, Senior Vice President and Chief Scientist, Monsanto Company, 800 North Lindbergh Blvd., Mail Zone: A3SC, St. Louis, MO 63167.**

Monsanto offers a competitive salary and excellent benefits package. EEO/AA Employer M/F/D/V. Please visit our website at [www.monsanto.com](http://www.monsanto.com).

**Food - Health - Hope™**

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| Position Title                                                                                         | Sub-Discipline                           | Employer                                                       |
|--------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------|
| ASSISTANT<br>SCIENTIST/SCIENTIST;<br>SCIENTIST AND<br>ASSOCIATE SCIENTIST<br>OR POSTDOCTORAL<br>FELLOW | Biology,<br>Biochemistry or<br>Chemistry | Schering-Plough<br>Research Institute<br><b>Kenilworth, NJ</b> |
| Posted: 04/16/98                                                                                       |                                          |                                                                |

As seen in the 17 April issue of *Science*:

*Working on the molecular level  
to conquer, treat, or prevent  
debilitating diseases.*

## **DRUG METABOLISM & INFECTIOUS DISEASES DISCOVERY RESEARCH AT SCHERING-PLOUGH**

At Schering-Plough Research Institute in Kenilworth, NJ, scientists are discovering innovative therapeutic agents that challenge humankind's most debilitating diseases. If you are seeking an opportunity to be on the cutting edge of exploratory pharmaceutical discovery, become part of advanced multidisciplinary research groups focused on drug metabolism and infectious diseases.

### **SCIENTIST AND ASSOCIATE SCIENTIST Drug Metabolism**

Due to the dynamic nature of the drug discovery process and the expanding role of drug metabolism in drug discovery support, we require highly capable scientists with the ability to use state-of-the-art instrumentation such as LC/MS and automated liquid handling equipment. The individuals we seek will develop techniques to assess metabolic stability of new drug candidates utilizing microsomes, hepatocytes or liver slices, and process data using spreadsheets. Studies may involve the use of radiolabeled compounds.

To qualify for our Scientist position, you will need an MS degree in Biology, Biochemistry or Chemistry and 5-8 years of experience or a BS/BA degree and 7-10 years of experience. To qualify for our Associate Scientist position, you will need an MS degree in Biology, Chemistry or Biochemistry and 2-4 years of experience or a BS/BA degree and 4-7 years of experience supporting drug discovery projects. Demonstrated ability to work both independently and as part of a team is critical. To be considered for these positions, please reference Dept. DD98-NY-PC.

### **ASSISTANT SCIENTIST/SCIENTIST**

## OR POSTDOCTORAL FELLOW

### Infectious Diseases - Virology

We have excellent opportunities for scientists to focus on studies in antiviral chemotherapy. To qualify, you will need a BS/MS degree or PhD (Postdoctoral Fellow) and expertise in molecular biology or biochemistry. Experience in virology/antiviral research is essential; expertise in hepatitis B or C viruses (or flaviviruses) is a definite plus. Strong organization, interpersonal and communication skills are essential. To be considered for these positions, please reference Dept. DMS-MS.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to apply on-line at <http://www.sp-research.com> or send a scannable resume and cover letter, original copy only, referencing the Dept. Code for your position of interest, to: Schering-Plough Research Institute, Human Resources, 2015 Galloping Hill Road, K-15, Kenilworth, NJ 07033-0539. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*

#### Using Science for Human Advantage

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| Position Title         | Sub-Discipline                                                                                                                          | Employer                                         |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Scientists & Post Docs | Molecular/Cellular Biology, Protein Biochemistry, Microbial Physiology, Neuroscience, Pathology, Pharmacology, Virology, and Immunology | Eli Lilly and Company<br><b>Indianapolis, IN</b> |
| Posted: 04/20/98       |                                                                                                                                         |                                                  |

**As seen in the 24 April issue of *Science*:**

**LILLY RESEARCH LABORATORIES  
COME TALK WITH US AT THE  
AMERICAN SOCIETY  
FOR BIOCHEMISTRY AND  
MOLECULAR BIOLOGY MEETING  
IN WASHINGTON, D.C.  
MAY 16-20, 1998.**

**We will be interviewing for the following positions at the ASBMB meeting in May. If you are interested in any of the following positions, please fax your resume to: ASBMB Recruiting**

**Coordinator at 317-276-4716 by May 8, 1998. Please reference the ad code for the position(s) for which you would like to be considered.**

**At Eli Lilly and Company, we've been driven by a commitment to excellence and the pursuit of innovation ever since we began researching and developing novel pharmaceuticals more than a century ago. We work hard to balance the needs of our employees by providing challenges that can make a difference along with a lifestyle that can inspire professional growth.**

## **OUR FORMULA FOR SUCCESS:**

# **Science + Compassion = Fulfillment**

### **Infectious Diseases Research:**

#### **Ph.D. and BS/MS Biochemists**

We are seeking scientists with proven expertise in biochemistry. Individuals with experience with microorganisms are preferred. These individuals will become colleagues on multidisciplinary teams committed to identifying, characterizing, purifying and exploiting novel antimicrobial/antifungal targets. Experience purifying and characterizing proteins, developing functional assays for proteins and studying the kinetics and mechanisms of inhibition of enzymes and proteins is critical. Knowledge of microbiology, microbial physiology and protein biochemistry is highly desirable. **Ad Code: ADSCMBI51**

#### **Post Doctoral Fellows**

We are looking for creative individuals in a variety of scientific areas to explore emerging aspects of human infectious diseases. A Ph.D. in Biochemistry or related field is required. Focus areas in Infectious Diseases Research include hepatitis viruses, important human fungal pathogens, and antibiotic-resistant Gram-positive bacteria. Lilly postdoctoral fellows gain sound practical experience and focused training that will significantly expand their scientific knowledge and abilities in drug discovery. **Ad Code: ADSCMBI52**

### **Neuroscience Research:**

#### **BS/MS Biochemical Pharmacologists**

These positions require the ability to carry out both in vitro and in vivo measures of drug receptor interaction and effects on brain neurochemistry. Experience in radioligand binding, second messenger assays, neurotransmitter release/turnover and/or in vivo microdialysis is desired. **Ad Code: ADSCMBI53**

#### **BS/MS Molecular Neurobiologists**

These positions require some experience in the following areas: neuronal signal transduction, receptor-mediated biology, neuropeptides, neurosteroid biology, knock-out mouse technology, proficiency in neuronal tissue culture, and immunohistochemistry. Candidates must have a strong molecular biology background; protein expression, expression cloning, gene delivery systems, anti-sense technology and

protease biology. BS/MS applicants should have 3-5 years experience. **Ad Code: ADSCMBI54**

## **Research Technologies and Proteins:**

### **Associate Molecular Biologist:**

We are seeking an enthusiastic and self motivated B.S./M.S. scientist with extensive experience in molecular biology, biochemistry, cell biology or a related field to join an ongoing efforts to optimize and develop novel therapeutic proteins. Excellent communication and presentation skills are required as well as interest in expanding skills leading to successful drug discovery. Candidates should have demonstrated expertise in protein expression, preferably in a variety of heterologous expression systems, and strong proficiency in molecular biology (DNA cloning, PCR, mutagenesis). In addition, experience in protein purification and characterization is desirable. **Ad Code: ADSCMBI55**

### **BS/MS Protein Biochemist**

biochemical methods to purify and characterize proteins. Basic knowledge of protein analytical methods is needed. Good data organization and communication skills are also required. Experience in molecular biology techniques would be beneficial. **Ad Code: ADSCMBI56**

## **Biochemical Development:**

### **Ph.D. Cell Culture Development**

We are seeking a highly qualified individual to develop novel processes to express therapeutic proteins using mammalian cell culture technology. The qualified candidate will have experience with large scale mammalian cell culture and harvest techniques and will have a working knowledge of CBER regulatory requirements. Experience in the drafting of regulatory documents and transfer of processes from development to commercial manufacturing facilities is desirable. Successful applicants will have a PhD in Biochemical Engineering, Cell Biology or Microbiology and 5 - 7 years post graduate experience. **Ad Code: ADSCMBI57**

### **BS/MS Mammalian Cell Molecular Biologists**

The successful candidates will have demonstrated success constructing cell lines to express recombinant proteins. General molecular biological training with a BS or MS degree in Biochemistry, Molecular Biology, Microbiology or equivalent discipline is essential. The applicant should be able to construct recombinant DNA molecules, analyze the DNA with a variety of techniques such as restriction mapping, southern and northern blots, and quantitative measurements. The successful candidate will know how to grow cultures and analyze expression using techniques such as PAGE, western blots and ELISAs. **Ad Code: ADSCMBI58**

### **BS/MS Cell Culture Development**

We are seeking individuals with experience in mammalian cell culture technologies at both laboratory (cloning and cell line evaluation) and pilot plant scales to assist in the development and optimization of novel mammalian cell culture processes for the expression of recombinant therapeutic proteins.

Particularly desirable is knowledge of, and experience in, the culture of mammalian cells in stirred tank bioreactors from 2 to 2000 liters. Working knowledge of scale-up issues and cGMPs are desirable as well as an understanding of mammalian cell physiology. Applicants should have a BS or MS in a relevant field and 2 - 4 years experience. **Ad Code: ADSCMBI59**

## **Bioprocess Purification Development**

### **BS/MS Biochemists:**

We are seeking several individuals who possess strong expertise in the isolation, purification and manipulation of protein products derived from various recombinant DNA expression systems. Proven experience in the fields of preparative chromatography, protein folding, enzymology and analytical characterization are considered ideal. The preferred candidate will possess a BS or MS degree in biochemistry or equivalent discipline and have a minimum of 2 years of relevant experience. In addition to possessing strong scientific skills, candidates should be capable of effectively planning and managing their time and activities and communicating their results. **Ad Code: ADSCMBI60**

### **BS/MS Bioanalytical Chemists:**

We are seeking multiple candidates with proven experience in analytical biochemistry. The preferred candidates will possess a BS or MS degree in Biochemistry, Chemistry or equivalent discipline and ideally have 2 or more years of relevant experience. Candidates will have proven experience in analytical method development via HPLC, ELISA, Western blots and restriction enzyme digest methods. Written and verbal communication skills and a demonstrated ability to work in an independent manner are essential. **Ad Code: ADSCMBI61**

### **BS/MS Biochemists, Chemical Engineers - Technical Services:**

Qualified candidates will participate in supporting the scale-up and manufacturing of recombinant proteins and natural products. Preferred candidates will have 3 or more years of experience in bulk manufacturing or development. Experience in the isolation, purification and manipulation of proteins and/or natural products is ideal. Strong candidates will have excellent problem solving, organizational and planning skills and demonstrated leadership abilities. Innovation and creativity are highly valued and the ability to work effectively in teams is critical. **Ad Code: ADSCMBI62**

**To attract the best and the brightest, we offer competitive salaries and excellent benefits. If you will not be attending the meeting but would like to be considered for the positions listed above please send a resume and cover letter to: Eli Lilly and Company, Lilly Corporate Center, US Recruiting and Staffing, Indianapolis, IN 46285. We are an equal opportunity employer dedicated to the strength diversity brings to the workplace.**

**For more information about Lilly, please access our website at [www.lilly.com](http://www.lilly.com). To learn more about Indianapolis, visit: [www.welcometoindy.com](http://www.welcometoindy.com).**

## **WORLDWIDE HEALTH CARE SOLUTIONS**

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| Position Title                        | Sub-Discipline                             | Employer                  |
|---------------------------------------|--------------------------------------------|---------------------------|
| Molecular Breeding Research Assistant | Life sciences, agronomy, molecular biology | Monsanto Company Ames, IA |
| Posted: 04/23/98                      |                                            |                           |

As seen in the 24 April issue of *Science*:

## EVER BEEN ASKED TO SAVE THE WORLD?

THAT'S EXACTLY WHAT YOU'LL DO AT MONSANTO LIFE SCIENCES COMPANY.

As a global leader in life sciences, we're dedicated to addressing the food and health needs of a rapidly expanding world. Our breakthrough products and innovative technologies in the areas of agriculture, nutrition and health are helping people live longer, healthier lives. Currently, we're seeking a Molecular Breeding Research Assistant to join our Asgrow Seed Company located in Ames, IA:

### MOLECULAR BREEDING RESEARCH ASSISTANT

The selected individual will play a key role in the function and support of the Molecular Breeding laboratory, performing multiple tasks in the process of completing molecular breeding. Responsibilities will include: DNA extraction, PCR, gel electrophoresis, and data capture, scoring and interpretation. Additionally, you will supervise, train, and provide input for staffing of the Molecular Breeding project and forecast, plan, and schedule use of labor and resources to meet research goals.

We require a BS/MS degree in Life Sciences or Agronomy or related field with molecular biology experience. Skills in the area of DNA isolation and manipulation, data analysis and management, and protocol execution is essential. Candidates must be highly motivated, have excellent interpersonal skills, and have the ability to work in a high-performance team-based environment. An understanding of quantitative trait loci and statistics is desired. A demonstrated knowledge of scientific principles is required, as well as an understanding and working knowledge of basic genetics, biotechnology, and molecular markets. Other skills required are experimental design and implementation and experience with Microsoft Software applications with excellent overall PC knowledge and skills.

We offer a competitive compensation and benefits package. For consideration, please send your cover letter, resume and three references to: **The Monsanto Company, Attn: PSR/MBRA, 800 N. Lindbergh Blvd., Mail Zone: C35H, St. Louis, MO 63167. Phone: (314) 694-3999. Fax: (314) 694-3038 or email to: psrogo@monsanto.com.** Visit our website at [www.monsanto.com](http://www.monsanto.com). EEO/AA Employer M/F/D/V.

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## Search Result

**Discipline(s):** Anatomy/Physiology, Biochemistry, Biology, Botany/Plant Science, Cell Biology, Environmental Science, Genetics, Immunology, Marine Science, Medicine, Microbiology, Molecular Biology, Neuroscience, Nutrition/Health Care, Oncology, Pharmacology, Toxicology, Virology,

**Organization(s):** Academic, Government, Industry, Medical, Research Org./Foundation, Other Organizations

**Keywords:** BS

**Ads Posted Since:** 04/13/98

**Shown:** Results 1- 3 of 3

| Position Title         | Sub-Discipline                                                                                                                          | Employer                                  |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Scientists & Post Docs | Molecular/Cellular Biology, Protein Biochemistry, Microbial Physiology, Neuroscience, Pathology, Pharmacology, Virology, and Immunology | Eli Lilly and Company<br>Indianapolis, IN |
| Posted: 04/20/98       |                                                                                                                                         |                                           |

As seen in the 24 April issue of *Science*:

**LILLY RESEARCH LABORATORIES  
COME TALK WITH US AT THE  
AMERICAN SOCIETY  
FOR BIOCHEMISTRY AND  
MOLECULAR BIOLOGY MEETING  
IN WASHINGTON, D.C.  
MAY 16-20, 1998.**

We will be interviewing for the following positions at the ASBMB meeting in May. If you are

interested in any of the following positions, please fax your resume to: **ASBMB Recruiting Coordinator at 317-276-4716 by May 8, 1998. Please reference the ad code for the position(s) for which you would like to be considered.**

**At Eli Lilly and Company, we've been driven by a commitment to excellence and the pursuit of innovation ever since we began researching and developing novel pharmaceuticals more than a century ago. We work hard to balance the needs of our employees by providing challenges that can make a difference along with a lifestyle that can inspire professional growth.**

## **OUR FORMULA FOR SUCCESS:**

### **Science + Compassion = Fulfillment**

#### **Infectious Diseases Research:**

##### **Ph.D. and BS/MS Biochemists**

We are seeking scientists with proven expertise in biochemistry. Individuals with experience with microorganisms are preferred. These individuals will become colleagues on multidisciplinary teams committed to identifying, characterizing, purifying and exploiting novel antimicrobial/antifungal targets. Experience purifying and characterizing proteins, developing functional assays for proteins and studying the kinetics and mechanisms of inhibition of enzymes and proteins is critical. Knowledge of microbiology, microbial physiology and protein biochemistry is highly desirable. **Ad Code: ADSCMBI51**

##### **Post Doctoral Fellows**

We are looking for creative individuals in a variety of scientific areas to explore emerging aspects of human infectious diseases. A Ph.D. in Biochemistry or related field is required. Focus areas in Infectious Diseases Research include hepatitis viruses, important human fungal pathogens, and antibiotic-resistant Gram-positive bacteria. Lilly postdoctoral fellows gain sound practical experience and focused training that will significantly expand their scientific knowledge and abilities in drug discovery. **Ad Code: ADSCMBI52**

#### **Neuroscience Research:**

##### **BS/MS Biochemical Pharmacologists**

These positions require the ability to carry out both in vitro and in vivo measures of drug receptor interaction and effects on brain neurochemistry. Experience in radioligand binding, second messenger assays, neurotransmitter release/turnover and/or in vivo microdialysis is desired. **Ad Code: ADSCMBI53**

##### **BS/MS Molecular Neurobiologists**

These positions require some experience in the following areas: neuronal signal transduction, receptor-mediated biology, neuropeptides, neurosteroid biology, knock-out mouse technology, proficiency in neuronal tissue culture, and immunohistochemistry. Candidates must have a strong molecular biology

background; protein expression, expression cloning, gene delivery systems, anti-sense technology and protease biology. BS/MS applicants should have 3-5 years experience. **Ad Code: ADSCMBI54**

## **Research Technologies and Proteins:**

### **Associate Molecular Biologist:**

We are seeking an enthusiastic and self motivated B.S./M.S. scientist with extensive experience in molecular biology, biochemistry, cell biology or a related field to join an ongoing efforts to optimize and develop novel therapeutic proteins. Excellent communication and presentation skills are required as well as interest in expanding skills leading to successful drug discovery. Candidates should have demonstrated expertise in protein expression, preferably in a variety of heterologous expression systems, and strong proficiency in molecular biology (DNA cloning, PCR, mutagenesis). In addition, experience in protein purification and characterization is desirable. **Ad Code: ADSCMBI55**

### **BS/MS Protein Biochemist**

We are seeking an enthusiastic and self-motivated individual with experience in protein biochemistry who will join a multifunctional team focused on protein optimization. The selected candidate will use biochemical methods to purify and characterize proteins. Basic knowledge of protein analytical methods is needed. Good data organization and communication skills are also required. Experience in molecular biology techniques would be beneficial. **Ad Code: ADSCMBI56**

## **Biochemical Development:**

### **Ph.D. Cell Culture Development**

We are seeking a highly qualified individual to develop novel processes to express therapeutic proteins using mammalian cell culture technology. The qualified candidate will have experience with large scale mammalian cell culture and harvest techniques and will have a working knowledge of CBER regulatory requirements. Experience in the drafting of regulatory documents and transfer of processes from development to commercial manufacturing facilities is desirable. Successful applicants will have a PhD in Biochemical Engineering, Cell Biology or Microbiology and 5 - 7 years post graduate experience. **Ad Code: ADSCMBI57**

### **BS/MS Mammalian Cell Molecular Biologists**

The successful candidates will have demonstrated success constructing cell lines to express recombinant proteins. General molecular biological training with a BS or MS degree in Biochemistry, Molecular Biology, Microbiology or equivalent discipline is essential. The applicant should be able to construct recombinant DNA molecules, analyze the DNA with a variety of techniques such as restriction mapping, southern and northern blots, and quantitative measurements. The successful candidate will know how to grow cultures and analyze expression using techniques such as PAGE, western blots and ELISAs. **Ad Code: ADSCMBI58**

### **BS/MS Cell Culture Development**

We are seeking individuals with experience in mammalian cell culture technologies at both laboratory (cloning and cell line evaluation) and pilot plant scales to assist in the development and optimization of

novel mammalian cell culture processes for the expression of recombinant therapeutic proteins. Particularly desirable is knowledge of, and experience in, the culture of mammalian cells in stirred tank bioreactors from 2 to 2000 liters. Working knowledge of scale-up issues and cGMPs are desirable as well as an understanding of mammalian cell physiology. Applicants should have a BS or MS in a relevant field and 2 - 4 years experience. **Ad Code: ADSCMBI59**

## **Bioprocess Purification Development**

### **BS/MS Biochemists:**

We are seeking several individuals who possess strong expertise in the isolation, purification and manipulation of protein products derived from various recombinant DNA expression systems. Proven experience in the fields of preparative chromatography, protein folding, enzymology and analytical characterization are considered ideal. The preferred candidate will possess a BS or MS degree in biochemistry or equivalent discipline and have a minimum of 2 years of relevant experience. In addition to possessing strong scientific skills, candidates should be capable of effectively planning and managing their time and activities and communicating their results. **Ad Code: ADSCMBI60**

### **BS/MS Bioanalytical Chemists:**

We are seeking multiple candidates with proven experience in analytical biochemistry. The preferred candidates will possess a BS or MS degree in Biochemistry, Chemistry or equivalent discipline and ideally have 2 or more years of relevant experience. Candidates will have proven experience in analytical method development via HPLC, ELISA, Western blots and restriction enzyme digest methods. Written and verbal communication skills and a demonstrated ability to work in an independent manner are essential. **Ad Code: ADSCMBI61**

### **BS/MS Biochemists, Chemical Engineers - Technical Services:**

Qualified candidates will participate in supporting the scale-up and manufacturing of recombinant proteins and natural products. Preferred candidates will have 3 or more years of experience in bulk manufacturing or development. Experience in the isolation, purification and manipulation of proteins and/or natural products is ideal. Strong candidates will have excellent problem solving, organizational and planning skills and demonstrated leadership abilities. Innovation and creativity are highly valued and the ability to work effectively in teams is critical. **Ad Code: ADSCMBI62**

**To attract the best and the brightest, we offer competitive salaries and excellent benefits. If you will not be attending the meeting but would like to be considered for the positions listed above please send a resume and cover letter to: Eli Lilly and Company, Lilly Corporate Center, US Recruiting and Staffing, Indianapolis, IN 46285. We are an equal opportunity employer dedicated to the strength diversity brings to the workplace.**

**For more information about Lilly, please access our website at [www.lilly.com](http://www.lilly.com). To learn more about Indianapolis, visit: [www.welcometindy.com](http://www.welcometindy.com).**

## **WORLDWIDE HEALTH CARE SOLUTIONS**

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| Position Title                        | Sub-Discipline                             | Employer                  |
|---------------------------------------|--------------------------------------------|---------------------------|
| Molecular Breeding Research Assistant | Life sciences, agronomy, molecular biology | Monsanto Company Ames, IA |
| Posted: 04/23/98                      |                                            |                           |

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| Position Title                | Sub-Discipline                                                                           | Employer                      |
|-------------------------------|------------------------------------------------------------------------------------------|-------------------------------|
| Senior Scientists, Scientists | Physiology, Pharmacology, Biochemistry, Immunology, Molecular Biology, Assay Development | Merck & Co.<br>West Point, PA |
| Posted: 04/30/98              |                                                                                          |                               |

As seen in the 1 May issue of *Science*:

## we're about great science

Merck Research Laboratories in West Point, Pennsylvania, a world leader in biological and pharmaceutical research, has immediate opportunities for highly-qualified scientists in the **Departments of Pharmacology, Virus and Cell Biology, and Automated Biotechnology.**

### Senior Research Pharmacologist

modulation of blood vessel proliferation in ophthalmic disorders such as diabetic retinopathy and macular degeneration. Responsibilities include experimental design, conducting/supervising studies, data analysis, interpreting and presenting results, as well as external publication. A MD/Ph.D. degree or equivalent in Physiology, Pharmacology, or related area with a minimum of 2 years' postdoctoral experience is required. Extensive knowledge of relevant anatomy and physiology, and hands-on expertise in experimental animal models of ocular neovascularization is preferred. **Job # B-152**

### Biochemist

The qualified candidate will be responsible for conducting basic and developmental research on the identification, isolation, and characterization of proteins expressed in recombinant prokaryotic and eukaryotic systems as well as products from wild type organisms. Also involved is the analytical characterization of purified products and process intermediates. A MS degree in Biochemistry, or equivalent, with a good academic record and a high degree of motivation is necessary. The candidate should have a strong background in current isolation techniques for proteins encompassing methodologies such as low and high pressure liquid chromatography, filtration techniques, equilibrium centrifugation, and electrophoretic methods. Additional experience in carbohydrate or nucleic acid biochemistry is preferred. Familiarity of optical methods, electrophoresis, immunological techniques, cGMP/GLP, and sterile technique is required. **Job # B-153**

### Biologists/Immunologists

Several openings exist for dynamic individuals for research studies leading to the discovery and development of novel human vaccines. The successful candidates will conduct laboratory evaluations of animal and human cellular immune responses to a series of new vaccine candidates. Experience in the performance of cellular immune assays, familiarity with common laboratory immunological techniques

and culturing human peripheral blood cells is preferred. Willingness to work with human clinical samples as well as with infectious agents is essential. A BS/MS degree in Biology, Immunology or equivalent with a minimum of several years of research laboratory experience is required. **Job # B-151**

### **Biochemist/Staff Biochemist**

The successful candidate will assist in the development and optimization of biochemical assays in preparation for automation; perform follow-through assays and mechanistic studies on hits; propose newscreening strategies and novel assay formats; and maintain lab supplies and equipment in the biochemistry laboratory. A BS/MS degree in Biochemistry, or related biomedical science, with 2-5 years of hands-on laboratory experience, or equivalent, is required. Experience with common laboratory instruments, such as HPLC, FPLC, UV-vis, and fluorescence is necessary. Good quantitative skills and familiarity with enzyme kinetics is preferred. Computer literacy and hands-on experience with one or more software programs used in kinetic analysis is needed. **Job # B-156**

### **Assay Development Molecular Biologist**

As a team member of the Automated Biotechnology Department, you will be responsible for developing high throughput reporter assays for the function of GPC-receptors and nuclear receptors. Identification, design and execution of complex cloning and cell engineering strategies are required. Ability to work with mammalian cells in culture, troubleshoot technical problems, and creatively overcome throughput limiting issues are required. A Ph.D. degree or equivalent with 3-5 years of research experience in mammalian cell biology and gene expression is required. Industrial experience is desirable. Good interpersonal skills are necessary to function as part of this highly interactive team. **Job # B-154.**

Excellent salary and benefit programs accompany these positions at our modern research facilities located 25 miles northwest of Philadelphia. Please send *curriculum vitae* with cover letter and the names of three references to: **Indicate Job # \_\_\_\_\_, Merck & Co., Inc., WP42-2, Merck Research Laboratories, P.O. Box 4, West Point, PA 19486.** Only candidates considered for interviews will receive responses. We are an Equal Opportunity Employer, Principals Only, M/F/D/V.

<http://www.merck.com>

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