

The University of Maryland at College Park Molecular and Cell Biology Program Handbook

The Molecular and Cell Biology Program (MOCB) offers study leading to the Doctor of Philosophy degree. The training emphasizes research in the broad areas of cell biology, developmental biology, molecular biology, and related disciplines. More than sixty faculty members are affiliated with MOCB. The program is multidisciplinary and interdepartmental, supported by faculty from six departments in the Colleges of Life Sciences and Agriculture & Natural Resources at the University of Maryland; from two units in the University of Maryland Biotechnology Institute; and from several institutes at the National Institutes of Health.

THE PROGRAM

The Program's faculty members have a broad spectrum of expertise and represent some of the most outstanding investigators on campus. MOCB provides training opportunities in a wide variety of areas. These include molecular genetics, cell biology, regulation of gene expression, developmental biology, evolutionary-developmental biology, oncology, molecular virology, immunology, biochemistry, plant biology, signal transduction, host-parasite interactions, membrane transport & channels, protein/enzyme structure and function, and neurobiology.

Admission to the program requires a baccalaureate degree from a regionally accredited institution (or the international equivalent). Course work in calculus, physics, organic chemistry, biochemistry, cell biology, and genetics is required. In addition, the program requires the results of the Graduate Record Examination in assessing applicants for admission. Promising students who lack preparation in certain areas may be admitted into the program provisionally but will be required

to correct course work deficiencies within one year from the entrance date.

COURSE REQUIREMENTS

Incoming students are advised for their initial course work by the First Year Advisory Committee. In most cases, the core requirements serve as the primary course load during the first year of study. The core requirements of the program consist of four lecture courses in molecular and cell biology, genetics, and biochemistry, two one-semester student seminars, and two one-semester rotations in laboratories of participating faculty. After completion of the core requirements, usually in the first year, each student must take advanced second-level courses in relevant specialty areas for a total of 4 additional credits, distributed as either: one 3 credit course plus one topic seminar; or two 2 credit courses, which may be modules or topic seminars. The student selects these additional classes, but must obtain approval from his/her advisor and advisory committee to ensure that the requirement is fulfilled. All students are required to attend weekly seminars, sponsored by the program, in which outstanding molecular/cell biologists from other institutions and this campus give presentations about their ongoing research.

The core courses are:

- *MOCB 630* *Molecular Genetics* (3 credits), offered in the Fall Semester
- BCHM 674 *Nucleic Acid Biochemistry* (3 credits), offered in the Fall Semester
- *MOCB 639/ *Advanced Cell Biology* (3 credits), offered in the Spring Semester
or BIOL 708A *Eukaryotic Cell Biology* (3 credits), offered in the Spring Semester
- MOCB 640 *Protein Structure and Function* (3 credits), offered in the Spring Semester
- MOCB 608 *Seminar* (1 credit)
 - Fall Semester: Topics in Cell & Developmental Biology
 - Spring Semester: Bioethics
- MOCB 699 *Laboratory Rotation* (2 credits), offered in the Fall and Spring Semester

MOCB 699 will be graded either as "Satisfactory" or "Unsatisfactory." The student must attain a grade of "B" or better in each of the four core lecture courses. A satisfactory performance in the core requirements is mandatory for continued matriculation in the MOCB Program. Under exceptional circumstances, one or more core courses may be waived by the Director upon the recommendation of the

* In future years, MOCB 630 and MOCB 639 will likely be replaced with two sets of 2-credit modules in Gene Expression & Genetics and in Cell Biology, respectively.

Chair of the First Year Advisory Committee; this will depend on the previous training and background of the student.

A doctoral candidate must complete at least 30 hours of graduate academic credits with a minimum of 12 semester hours of MOCB 899 to be eligible for a Ph.D. At least 24 of the credit hours must be at the 600-level or above. No transfer credits from another institution are acceptable.

SELECTION OF A RESEARCH ADVISOR

By the end of the first year (12 months) in the program, the student must choose a research advisor from the program's faculty. Under unusual circumstances, a student may change advisors; this change must be made in conjunction with the Advisory Committee and the Program Director. Past the first year from the date of admission, every student must have a research advisor to remain in the program.

APPOINTMENT OF AN ADVISORY COMMITTEE

Shortly after the selection of an advisor, the mentor and student should submit to the Director the names of at least five faculty members who will serve as the student's Advisory Committee. The student's research advisor serves as the chair of this committee. At least four members of the Advisory Committee should be faculty from MOCB, and no more than two members of the committee may be from the same department, the University of Maryland Biotechnology Institute, or NIH. Once the composition of the Advisory Committee is approved by the Director, it becomes the responsibility of the committee to guide the student through the remainder of the graduate program. Students must convene a meeting of their Advisory Committee at least once a year to report on their progress in the program. After each meeting of the committee, the advisor must provide a written report to the program office summarizing the committee's views and recommendations. The report becomes part of the student's permanent file. PLEASE OBTAIN A COPY OF THE FORM REQUIRED FOR YOUR ANNUAL MEETING (Report of the Research Advisory Committee) FROM DONNA BROWN (4112 PLANT SCIENCES; dbrown14@umd.edu) AND RETURN THIS FORM TO HER AFTER THE MEETING. This becomes part of the student's permanent file and is necessary for the yearly review of progress.

REVIEW OF STUDENT PROGRESS

At the end of each spring semester, every student and advisor in the program is required to submit an Annual Progress Report/Evaluation to the program office. Copies of the form can be obtained from the MOCB Program office. The reports are reviewed initially by the Director and then by the program's Executive Committee.

At least once a year, usually between the spring and fall semesters, the Executive Committee conducts a thorough analysis of each student's progress toward completion of the degree. The criteria for measuring progress toward the degree include the student's cumulative grade point average in courses receiving graduate credit, completion of deficiencies as required for admission to the program, completion of any special requirements stipulated by the advisor or by the advisory committee, compliance with program's time-line requirements, the outcome of the preliminary examination, and the development of a dissertation research plan and the degree of success in its execution. After the review, the committee may recommend retention for students who are making reasonable progress, probation for students who are not making reasonable progress, or dismissal from the program for students who are not making reasonable progress and have not fulfilled the program's conditions for retention. The committee's recommendations are made to the Director for approval, and the students are then notified in writing of their status by the Director.

A COPY OF THE FORM REQUIRED FOR YOUR ANNUAL PROGRESS REPORT WILL BE SENT TO YOU FROM THE MOCB PROGRAM OFFICE EACH SPRING. PLEASE RETURN THIS TO DONNA BROWN (4112 PLANT SCIENCES; dbrown14@umd.edu) BEFORE THE INDICATED DEADLINE.

ADMISSION TO CANDIDACY IN THE PROGRAM

A qualifying examination must be completed satisfactorily before a student is admitted to candidacy. The examination must be attempted by the end of the student's fifth semester in the program. This time frame can only be extended under extenuating circumstances and only with written permission of the Program Director. The examining committee corresponds to the student's Advisory committee (see above), which includes at least five faculty members including the advisor. Part of the examination consists of a written research proposal that describes the student's intended dissertation research project. The dissertation project must be approved by a majority of the student's Advisory Committee in a meeting prior to the formal qualifying examination. The completed proposal must be given to the committee at least two weeks before the scheduled date for the oral

examination.

The qualifying examination focuses principally on the written proposal. However, more general questions may be asked to ensure mastery by the student of critical areas in molecular and cell biology. At the end of the examination, all members of the committee vote on the student's performance using secret ballots. Two negative votes constitute failure. The committee could recommend to the Director that a student be admitted to candidacy based on a satisfactory performance during the examination.

In a case where a student fails the examination, it would be up to the committee to decide on conditions for re-examination and to advise the student and the MOCB Program Director of the recommendations in writing through the committee's chair. The committee may recommend that the research proposal be revised, that the student be re-examined, or both. A student who fails the qualifying examination must be re-examined within six months of the first examination date and may be re-examined only once more. This time frame can only be extended under truly extenuating circumstances and only with written permission of the Program Director. Failure to pass the qualifying examination a second time leads to the cancellation of the student's matriculation. Although the committee could require additional course work from the student, the final decision on the qualifying examination must be based on the written and oral presentations and not on completion of additional course work.

PLEASE OBTAIN A COPY OF TWO FORMS REQUIRED FOR THIS EXAM FROM DONNA BROWN (4112 PLANT SCIENCES; dbrown14@umd.edu). The "Report of the Preliminary Exam" form MUST BE RETURNED DIRECTLY TO THE PROGRAM DIRECTOR AFTER THE EXAM. Once the exam is passed, you must also fill out a form entitled "Application for Admission to Candidacy," get signatures on this and return it to the Graduate School.

COMPLETION OF THE DISSERTATION RESEARCH

The ability to do independent research must be demonstrated by an original dissertation on a topic approved and developed by the procedures outlined in this document.

If the dissertation research involves the use of vertebrate animals, animal use protocols must be approved by the campus Animal Care and Use Committee. If the

dissertation research involves human subjects, the research must be approved by the departmental human subjects review board and/or the campus Institutional Review Board. If the dissertation research involves hazardous materials, either biological or chemical, or recombinant RNA/DNA, the research must be approved by the appropriate university committee. These research assurances must be approved prior to the initiation of any dissertation-related research.

The members of the student's Advisory Committee should also serve on the Dissertation Examination Committee, with the research advisor serving as chair. As required by the rules of the Graduate School, a faculty member from a unit other than the department in which the student's research advisor holds tenure will be nominated to the Dean of Graduate Studies and Research as the Dean's Representative. The Dean's Representative must be a tenured member of the UMCP Graduate School.

Students planning to defend their dissertations should schedule (through the MOCB office) a public seminar during the semester in which they intend to hold the defense. The seminar should be presented prior to the scheduled defense. It is preferred, but not required, that this seminar be presented through the MOCB Seminar Series.

THE DOCTORAL DISSERTATION DEFENSE

A. Establishment of the Dissertation Examining Committee.

The Dissertation Examining Committee is appointed by the Dean of the Graduate School, in accordance with the policies listed below.

1. *Eligibility.* A student is eligible to defend a dissertation if the student :

(a) has advanced to doctoral candidacy, (b) has met program requirements for a dissertation defense, (c) is in good standing as a graduate student at the university, (d) is registered for at least one credit, (e) has a valid Graduate School-approved Dissertation Examining Committee, and (f) if this is the second defense, the defense has been approved by the Graduate School.

2. *Dissertation Examining Committee membership.* The committee must consist of a minimum of five members, at least three of whom must be Regular Members of the University of Maryland at College Park (UMCP) Graduate Faculty. Additional committee members may be required or invited to serve at the discretion of the program. Each member of the Dissertation Examining Committee must be a

member of the Graduate Faculty of UMCP; membership categories are as follows: Regular Member; Associate Member; Adjunct Member; Special Member.

3. *Nomination of the Dissertation Examining Committee* . Membership on a Dissertation Examining Committee requires nomination by the student's advisor and the Director and approval by the Dean of the Graduate School. The nomination of a Dissertation Examining Committee should be provided to the Graduate School at least six weeks before the date of the expected dissertation defense. The dissertation defense cannot be held until the Graduate School approves the composition of the Dissertation Examining Committee. Furthermore, if the Graduate Faculty status of any member of an approved Dissertation Examining Committee changes, the approval of the Dissertation Examining Committee may be void, and a new Dissertation Examining Committee nomination form may be required to be approved by the Graduate School.

4. *Research assurances*. All research assurances must be approved prior to the initiation of any dissertation-related research, and the approvals must be provided to the Graduate School at the time the student submits the Nomination of Examining Committee form.

5. *Chair*. Each Dissertation Examining Committee will have a chair, who must be a Regular Member of the Graduate Faculty or, by special permission, has been otherwise appointed by the Dean of the Graduate School. Dissertation Examining Committees may be co-chaired upon written recommendation of the Director with the approval of the Dean of the Graduate School; at least one of the co-chairs must be a Regular Member of the UMCP Graduate Faculty.

6. *Representative of the Dean of the Graduate School*. Each Dissertation Examining Committee shall have appointed to it a representative of the Dean of the Graduate School. The Dean's Representative should have some background or interest related to the student's research. The Dean's Representative must be a tenured Regular Member of the Graduate Faculty at the University of Maryland at College Park and must be from a department other than the mentor's academic unit. The Dean's Representative may not be a faculty member participating in MOCB.

7. *Special Members*. Upon nomination by the Director and approval by the Dean of the Graduate School, individuals who have been approved for Special Membership in the Graduate Faculty may serve on a Dissertation Examining Committee. However, these individuals must be in addition to the required three Regular Members of the College Park Graduate Faculty. (To nominate an individual to serve as a Special Member, the Director needs to

submit to the Graduate School the nominee's *curriculum vitae*, a nomination form, and a letter of support.)

8. *Service of former UMCP faculty members.* Graduate Faculty who terminate employment at UMCP (and who do not have emeritus status) retain their status as members of the Graduate Faculty for a twelve-month period following their termination. Thus, they may serve as members and chairs (but not as Dean's Representatives) of Dissertation Examining Committees during this twelve-month period if they are otherwise eligible. After that time, they may no longer serve as chairs of Dissertation Examining Committees, although, if granted the status of Special Member of the Graduate Faculty, they may serve as co-chairs.

Professors Emeriti and Associate Professors Emeriti may serve on Dissertation Examining Committees provided they are Members of the Graduate Faculty; unless granted special permission by the Graduate Dean, only those with regular membership in the Graduate Faculty can chair Dissertation Examining Committees or serve as the Dean's Representative.

B. Procedures for the Oral Defense.

1. *Oral defense requirement.* Each doctoral candidate is required to defend orally his or her doctoral dissertation as a requirement in partial fulfillment of the doctoral degree.

2. *Committee preparation.* The members of the Dissertation Examining Committee should receive the dissertation at least ten working days before the scheduled defense. Should the Dissertation Examining Committee deem it reasonable and appropriate, it may require submission of the dissertation more than ten working days in advance of the defense.

3. *Attendance at the defense.* Oral defenses must be attended by all members of the student's officially established Dissertation Examining Committee as approved by the Dean of the Graduate School. All defenses must be open to UMCP Graduate Faculty. Should a last-minute change in the constitution of the Dissertation Examining Committee be required, the change must be approved by the Dean of the Graduate School in consultation with the Director and the chair of the student's Dissertation Examining Committee.

4. *Location of the defense.* Oral defenses must be held in university facilities that are readily accessible to all members of the Dissertation Examining

Committee and others attending the defense. The chair of the Dissertation Examining Committee selects the time and place for the examination.

5. *Notice.* Notice of the doctoral defense must be publicized by the program at least five working days prior to the defense.

6. *The Dean's Representative.* The responsibilities of the Dean's Representative are to ensure that the procedures of the oral defense are in compliance with those of the Graduate School and to report to the Dean of the Graduate School any unusual problems experienced in the conduct of the defense. The Dean's Representative must be identified at the beginning of the defense. The Dean's Representative votes on the decision to pass or fail.

7. *Invalidation of the defense.* The Dean of the Graduate School may void any defense not carried out in accordance with the procedures and policies of the Graduate School. In addition, upon recommendation of the Dean's Representative, the Dean may rule an oral defense to be null and void.

8. *Student presentation.* The student is permitted to briefly present a summary of the dissertation, emphasizing the important results and giving an explanation of the reasoning that led to the conclusions reached.

9. *Opportunity for questioning by members of the Dissertation Examining Committee.* The chair invites questions in turn from each member of the Dissertation Examining Committee. The questioning may continue as long as the Dissertation Examining Committee feels that it is necessary and reasonable for the proper examination of the student.

10. *Conclusion of the defense.* After questioning has been completed, the student and any others who are not members of the Dissertation Examining Committee are asked to leave the room, and the Dissertation Examining Committee discusses whether or not the dissertation (including its defense) has been satisfactory. The Committee has the following alternatives:

a. To accept the dissertation without any recommended changes and sign the Report of Examining Committee.

b. To accept the dissertation with recommendations for changes, and, except for the chair, sign the Report of the Examining Committee. The chair will check the dissertation and, upon his/her approval, sign the Report of Examining Committee.

c. To recommend revisions to the dissertation and not sign the Report of Examining Committee until the student has made the changes and

submitted the revised dissertation for the Dissertation Examining Committee's approval. The Dissertation Examining Committee members sign the Report of Examining Committee if they approve the revised dissertation.

d. To recommend revisions and convene a second meeting of the Dissertation Examining Committee to review the dissertation and complete the student's defense.

e. To rule the dissertation (including its defense) unsatisfactory. In that circumstance, the student fails.

Following the defense, the chair, in the presence of the Dean's Representative, must inform the student of the outcome of the defense. The chair and the Dean's Representative both sign a statement indicating which of the above alternatives has been adopted. A copy of this statement is to be included in the student's file in the program office, and a copy is given to the student.

11. *Passage or failure.* The student passes if one member refuses to sign the Report but the other members of the Dissertation Examining Committee agree to sign, before or after the approval of recommended changes. Two or more negative votes constitute a failure of the candidate to meet the dissertation requirements. In cases of failure, the Dissertation Examining Committee must specify in detail and in writing the nature of the deficiencies in the dissertation and/or the oral performance that led to failure. This statement is to be submitted to the Director, the Dean of the Graduate School, and the student. A second defense may be permitted if the student will be in good standing at the time of the proposed second defense. A second defense requires the approval of the Director and the Dean of the Graduate School. If the student fails the second defense, or if a second defense is not permitted, the student's admission to the graduate program is terminated.

SUBMISSION OF THE DISSERTATION

The dissertation, in a format approved by the Graduate School, is to be submitted on-line at <<http://dissertations.umi.com/umd>> to the Graduate School and one hard copy is to be submitted to the MOCB Program after final approval of the dissertation by the Dissertation Examining Committee. See the *Thesis and Dissertation Manual*, available from the Graduate School, for the details of this process.

THE FACULTY AND THEIR RESEARCH INTERESTS

- Ibrahim Z. Ades, Ph.D., UCLA, 1976.** *Second messengers and signal transduction pathways.*
- Norma M. Allewell, Ph.D., Yale University, 1969.** *Biochemical basis of diseases of nitrogen metabolism; functional and regulatory mechanisms of multisubunit protein.*
- James B. Ames, Ph.D. University of California, Berkeley, 1992.** *Structure and Mechanisms of Signal Transduction.*
- Eric Baehrecke, Ph.D., University of Wisconsin, 1992.** *Steroid regulation of development in Drosophila.*
- Dorothy Beckett, Ph.D., University of Illinois, Urbana-Champaign, 1986.** *Molecular recognition and allostery in the multi-functional Biotin Repressor.*
- Spencer A. Benson, Ph.D., University of Chicago, 1978.** *Mechanisms of bacterial evolution and genetic regulation of function of bacterial envelopes.*
- Volker Briken, Ph.D., University of Paris (France), 1998.** *Molecular mechanisms of host pathogen interactions and their importance for the virulence of Mycobacterium tuberculosis.*
- Philip N. Bryan, Ph.D., University of Tennessee - Oak Ridge National Laboratory, 1979.** *Protein folding and stability.*
- Catherine Carr, Ph.D., University of California at San Diego, 1984.** *Processing of temporally ordered information in the CNS.*
- Caren Chang, Ph.D., California Institute of Technology, 1988.** *Molecular genetics of ethylene signal transduction in plants.*
- Gary D. Coleman, Ph.D., University of Nebraska, 1989.** *Expression and function of vegetative storage proteins in plants.*
- Marco Colombini, Ph.D., McGill University, 1974.** *Molecular mechanism underlying the voltage control of membrane channels.*
- James N. Culver, Ph.D., University of California at Riverside, 1991.** *Molecular biology of plant viruses and plant-virus interactions.*
- Jeffrey J. DeStefano, Ph.D., University of Connecticut, 1990.** *Mechanisms of viral replication in eukaryotes.*
- Jonathan D. Dinman, Ph.D., Johns Hopkins Univ., 1988.** *Post-transcriptional control of gene expression.*
- Jocelyne DiRuggiero, Ph.D., University Claude Bernard in Lyon France, 1989.** *Archaeal molecular biology, comparative and functional genomics.*
- Shyam K. Dube, Ph.D., Kansas State University, 1961.** *Plant protection; UV-B; flavonoids; soybean chalcone synthase gene family.*
- Edward Eisenstein, Ph.D., Georgetown University, 1985.** *Control of oligomeric regulatory enzymes.*
- Catherine C. Fenselau, Ph.D. Stanford University, 1965.** *Drug/protein interactions; biological mass spectrometry.*
- Kenneth Frauwirth, Ph.D. Stanford University of California-Berkeley 1997.** *T cell activation and peripheral tolerance mechanisms; regulation of lymphocyte metabolism.*
- Elisabeth Gantt, Ph.D., Northwestern University, 1963.** *Plant Cell and Molecular Biology, Isoprenoid Synthesis.*
- Lian-Yong Gao, Ph.D., University of Kentucky, 1999.** *Molecular mechanisms of bacterial pathogenesis and host defense; bacterial toxins, secretion mechanisms, and molecular/cellular interactions with host; zebrafish model of tuberculosis (TB) infections.*

- Barbara Gerratana, Ph.D., University of Wisconsin, 2001.** *Determination of the Transition State Structures and Mechanisms of Enzymatic and Nonenzymatic Reactions Through Kinetic Isotope Effects.*
- Michael K. Gilson, Ph.D., Columbia University, 1988.** *Molecular modeling and computational chemistry.*
- Eric S. Haag, Ph.D., Indiana University, Bloomington 1997.** *Molecular and functional evolution of nematode sex determination.*
- Iqbal Hamza, Ph.D., State University of New York at Buffalo School of Medicine, 1998.** *Cell Biology and Genetics of Micronutrient Metabolism.*
- J. Norman Hansen, Ph.D., UCLA, 1968.** *Genetics and functions of bacterial peptide antibiotics.*
- Osnat Herzberg, Ph.D., Weizman Institute of Science, Israel, 1982.** *Application of x-ray crystallography in the study of protein structure and function.*
- Bruce Howard, M.D., University of California at San Francisco, 1972.** *Mammalian cell cycle regulation and chromatin-mediated gene silencing mechanisms.*
- Steven W. Hutchison, Ph.D., University of California at Berkeley, 1982.** *Role and regulation of Type III protein secretion.*
- Douglas A. Julin, Ph.D., University of California at Berkeley, 1984.** *DNA-protein interactions in DNA repair and recombination.*
- Jason Kahn, Ph.D., University of California at Berkeley, 1990.** *Protein-nucleic acid interaction.*
- June Kwak, Ph.D., Pohang University of Science and Technology, 1997.** *Guard cell ABA and Ca²⁺ signal transduction/Single cell-type functional genomics.*
- Zhongchi Liu, Ph.D., Harvard University, 1990.** *Molecular genetics of flower development in Arabidopsis.*
- George H. Lorimer, Ph.D., Michigan State University, 1972.** *Mechanism of chaperonin-assisted protein folding.*
- Michael C. Ma, Ph.D., University of Wisconsin, Madison, 1978.** *Insect reproductive physiology and neuroendocrinology.*
- John P. Marino, Ph.D., Yale University, New Haven, CT 1995.** *Biomolecular NMR spectroscopy applied to understanding RNA-RNA and RNA-Protein Interactions.*
- Roy Mariuzza, Ph.D., Universite de Paris VII, France, 1985.** *Molecular basis of antigen recognition by the immune system.*
- Ian H. Mather, Ph.D., University College of North Wales, 1971.** *Expression and function of mammary glycoproteins.*
- David M. Mosser, Ph.D., North Carolina State University, 1983.** *Innate immunity to Microbial Pathogens.*
- John Moulton, Ph.D., University of Oxford, England 1970.** *Computer modeling techniques for the study of protein structure and function.*
- Stephen Mount, Ph.D., Yale University, 1983.** *Pre-mRNA splicing.*
- Frederic Mushinski, M.D., Harvard University, 1963.** *Oncogenes, anti-oncogenes and protein kinase C in proliferation, differentiation, and carcinogenesis.*
- Marshall Nirenberg, Ph.D., University of Michigan, 1957.** *Development of the nervous system.*
- Donald Nuss, Ph.D., University of New Hampshire, 1973.** *Engineering viruses to understand and control fungal pathogenesis.*
- David O'Brochta, Ph.D., University of California at Irvine, 1985.** *Biological consequences*

- and molecular genetics of transposable elements in insects.*
- John Orban, Ph.D., Australian National University, 1985.** *Biomolecular NMR spectroscopy.*
- Mary Ann Ottinger, Ph.D., University of Maryland, 1977.** *Neuroendocrine regulation of endocrine and behavioral aspects of reproduction.*
- Keiko Ozato, Ph.D., Kyoto University, Japan, 1973.** *Gene regulation in the immune system.*
- Richard Payne, Ph.D., Australian National University, 1982.** *Mechanisms of visual excitation and signal transduction in photoreceptors.*
- Daniel R. Perez, Ph.D., University of Nebraska, Lincoln, NE 1995.** *Interspecies transmission, pathogenesis and modulation of immunity of avian influenza viruses in avian and mammalian hosts.*
- Leslie Pick, Ph.D., Albert Einstein College of Medicine, Bronx, NY, 1986.** *Embryonic development, evolution and axon guidance in Drosophila.*
- Tom E. Porter, Ph.D. - University of Minnesota, 1988.** *Endocrinology of Growth.*
- Michael Potter, M.D., University of Virginia, 1949.** *Mechanisms in malignant development of lymphocytic cells.*
- Kevin Ridge, Ph.D., University of Pittsburgh, 1989.** *Structure and function of proteins of the visual system.*
- Siba K. Samal, Ph.D., Texas A & M University, 1985.** *Molecular biology of pathogenic animal viruses.*
- Anne Simon, Ph.D., Indiana University, 1983.** *Molecular biology of plant-virus interactions.*
- Harold Smith, Ph.D., Columbia University, New York, NY, 1994.** *Functional genomics of cellular differentiation.*
- Theo Solomos, Ph.D., Cambridge University, England, 1963.** *Biochemistry of plant senescence.*
- Wenxia Song, Ph.D., Kansas State University, 1991.** *Processing and presentation of antigen by major histocompatibility complex (MHC) class II in B cells.*
- Daniel C. Stein, Ph.D., University of Rochester, 1981.** *Regulation of lipooligosaccharide biosynthesis in Neisseria gonorrhoeae.*
- Richard Stewart, Ph.D., University of Michigan, 1984.** *Signal transduction in microorganisms.*
- Raymond St. Leger, Ph.D., University of Bath, 1987.** *Genetic engineering of plants for resistance to insects.*
- Arlin Stoltzfus, Ph.D. University of Iowa, 1991.** *Bioinformatics; simulation and analysis of gene, protein and genome evolution.*
- David Straney, Ph.D., Yale University, 1987.** *Regulation of gene expression and development in filamentous fungi.*
- Sergei Sukharev, Ph.D., Moscow State University, 1987.** *Biochemistry and biophysics of mechano-sensitive channels.*
- Heven Sze, Ph.D., Purdue University, 1975.** *Biochemistry and molecular biology of ion pumps, co-transporters and channels.*
- Mendel Tuchman, M.D., Sackler School of Medicine, Tel Aviv University, 1978.** *Translational research of genes and proteins involved in nitrogen metabolism.*
- Vikram N. Vakharia, Ph.D., University of Kansas, 1983.** *Molecular virology and vaccine development.*
- Inder K. Vijay, Ph.D., University of California at Davis, 1971.** *Developmental regulation of mammary glycoprotein synthesis.*
- Stephen M. Wolniak, Ph.D., University of California at Berkeley, 1979.** *Biology of cell motility, mitotic mechanisms, and signal transduction.*
- Louisa Wu, Ph.D., University of California, San Diego, 1995.** *Host defense against pathogens; signal transduction and cell-cell signaling in the innate immune response in insects.*

Shunyuan Xiao, Ph.D., Huazhong Agricultural University, China, 1992. *Molecular mechanisms of plant disease resistance.*

Xiaoping Zhu, Ph.D., Huazhong Univeristy of Wisconsin-Madison, Madison, WI, 1997. *Functions of MHC class I-related molecules and the regulation of immune responses in infectious disease.*

CURRENT STUDENTS AND THEIR ADVISORS

Bradley Akitake	Dr. Sukharev
Reshma Anthony	Dr. DeStefano
Courtney Busch	Dr. DiRuggiero
Wayne Cabral	<i>No advisor appointed</i>
Sripriya Chellappan	Dr. Gilson
Megan Dougherty	Dr. Stewart
Sudeshna Dutta	Dr. Baehrecke
Laura Ellestad	Dr. Porter
Danielle Kelleher	Dr. Haag
Caroline R. Li	Dr. Pick
Eugene Melamud	Dr. Hutcheson
Jessica Miller	<i>No advisor appointed</i>
Himan Mookherjee	Dr. Gilson
Michael Muchow	Dr. Porter
Malini Mukherjee	<i>No advisor appointed</i>
Buvaneswari Narayanan	Dr. Herzberg
Nirupama Narayanan	Dr. DeStefano
Subhamoy Pal	Dr. Wu
Abbhiraami Rajagopal	Dr. Hamza
David A. Rozak	Dr. Bryan
Walter Schlapkohl	Dr. Mushinski
Matthew D. Servinsky	Dr. Julin
Zhen Shi	Dr. Moulton
Mathangi Srinivasan	Dr. Frauwirth
Rachael Strong	Dr. Fenselau
Ramanand Subramanian	Dr. O'Brochta
Li Tao	Dr. Mather
Aswani Valiveti	Dr. Ames
Vijayakala Vydeeswaran	Dr. Straney
Kimberly Williams	Dr. Potter
Yongpan Yan	Dr. Moulton
Yiyuan Yin	<i>No advisor appointed</i>
Peng Yue	Dr. Moulton
Robert Zambon	Dr. Wu