Sample Program Plan

Fall Semester of First Year

1. General Human Physiology (4 credits)

Basic functions of cells, tissues and organ systems are presented with homeostasis and physiological reserve as the central emphasis. Regulatory mechanisms which govern the performance of each physiological system are covered, as are the limits of performance of these systems. The course includes lectures and small group interactive discussions. This course is team taught with Drs. Cowley, Greene, Forster, Mattson, Lombard, and Raff, responsible for sections of their expertise.

2. Supplement to Physiology (1 credit)

Each Friday, faculty who lectured that week discuss the lecture material with the students.

3. Molecules to Cells (5 credits)

Emphasis is on the structure and function of proteins and on metabolic processes in cells.

4. Readings and Research in Physiology (1 credit)

This course will give credit for the laboratory rotations completed by the students.

Spring Semester of First Year

Students are required to complete the first two courses listed below. Students choose from the other courses (taught by faculty outside of Physiology) as needed to meet the 9-credit requirement.

1. Special Topics in Physiology (1 credit)

Under the direction of a senior faculty, manuscripts in a specialized field of Physiology are discussed and critiqued.

2. Readings and Research in Physiology (1 credit)

This course will cover the laboratory rotations completed by the students.

3. Integrated Neuroscience (4 credits)

This course utilizes a multidisciplinary approach to present current knowledge about integrated structural and functional properties of the mammalian nervous system.

4. Classical and Molecular Genetics (3 credits)

This interdisciplinary course provides students with a foundation in classical and molecular genetics, model systems genetics, the replication, repair, and recombination of the genetic material, developmental biology, cancer, and genomics.

5. Biochemistry and Molecular Genetics of the Cell (5 credits)

This course covers mechanisms for the transduction of extracellular signals across cell membranes and through the cytoplasm.

During the summer between the first and second year, the courses listed below are required. The students also begin research in the laboratory they have chosen for their dissertation.

1. Seminar (1credit)

Students will receive credit for presenting a seminar and attending all seminars in the department. Students enroll in seminar each summer in the program.

2. Biostatistics for Health Sciences (1credit)

This course covers the most basic and commonly used statistical concepts in the health sciences. Topics include descriptive statistics, estimation and hypothesis testing for designs involving more than two variables, linear regression and correlation, binomial topics and contingency tables, and analysis of variance.

Fall and Spring Semester of the Second Year

The emphasis shifts more to the research laboratory with about 50% of time completing initial research for their dissertation. During each semester of the 2nd year, the students are required to take five course credits from the options listed below. Courses 2 to 5 are required.

1. Advanced Systems Physiology courses (Cardiovascular, Respiratory, Renal, Endocrine)

These are five separate courses each for 1 credit taught, respectively, by Drs. Greene, Forster, Mattson, Raff, and Lombard. The courses are taught in a "journal club" format where the emphasis is on not only acquisition of basic knowledge, but also on critical evaluation of research papers, identification of gaps in knowledge, design of studies, and synthesis and communication of knowledge. These courses are offered either semester depending on student interest. There is no requirement to take any of these advanced courses, but the program directors and individual student mentors counsel the students on course selection.

2. Boundaries of Science and Medical Practice (1 credit)

This course (fall semester) is team-taught by Drs. Forster, Twining (Biochemistry), and Marcdante (Medicine). This course provides background relevant to translational research. At the end of this course, the students must identify gaps between basic science knowledge and clinical practice for specific clinical questions pertinent to their area of research and they must propose appropriate experiments that are feasible and compliant with regulatory and ethical issues.

3. Physiological Genomics (5 credits)

This course, (spring semester) taught by Dr. Geurts, is a combination lecture and discussion course on the theory and methods of elucidating gene function.

4. Fundamentals of Grant Writing (1 credit)

This course (spring semester) will cover the fundamentals of grant writing including, formulating aims, and developing preliminary data. Each student will develop a pre-doctoral fellowship application. We

expect these grants will be submitted for funding to sponsors such as NIH or the American Heart Association.

5. Ethics and Integrity in Science (2 credits)

This course (fall semester) taught by Bioethics faculty provides the basis for understanding the ethical issues related to basic scientific and medical research, including, conflict of interest, animal and human subject research, mentor/mentee responsibilities, peer review, responsible authorship and publication, fraud and misconduct, and governmental, institutional, and researcher responsibilities.

6. Research Ethics Discussion (2 credits)

The course is directed by members of the Bioethics Faculty and provides facilitated discussions of a series of topics in research ethics. Discussions are led by members of the Basic Science faculty including Physiology and are focused on ethical issues that commonly come up in biomedical research. The course is meant to not only reinforce the basic ethics taught in "Ethics and Integrity in Science" which is a prerequisite, but also to explore the gray areas of the individual topics. The intent is to offer students illustrative examples of ethical issues that might arise in their careers, to emphasize the ethical principles that apply in such situations, and the provide practical guidance on how these types of situations should be correctly handled.