Human Pathophysiology and Translational Medicine (HPTM) Graduate Program: Training Guidebook 2015-2016

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The program guidebook provides basic information concerning the Human Pathophysiology and Translational Medicine (HPTM) Ph.D. Program. The guidebook contains information concerning the organization of the program, advising and registration, curriculum requirements and instructional methods, competencies that guide student training, and important information concerning milestones of doctoral training, such as the qualifying process and doctoral candidacy. In addition to these core program requirements, the guidebook defines student responsibilities, professional conduct, support services, and related topics.

INTRODUCTION

The Human Pathophysiology and Translational Medicine (HPTM) Ph.D. program is designed to provide an integrated understanding of the human body as a multicomponent system through the rigorous training of students in the mechanistic pathophysiology of human diseases, while simultaneously developing the methodological skills necessary to translate basic scientific knowledge into improvements in clinical medicine; this area is known as T1 translational research. The educational philosophy of the program is rooted in collaborative learning activities designed to build understanding across multiple scientific and clinical disciplines. Scientific content is learned simultaneously with scientific process.

ADMINISTRATION

Although a graduate school program, the HPTM program exemplifies multidisciplinary collaboration across the University. HPTM is housed administratively in the UTMB Institute for Translational Sciences (ITS), which underlines the commitment for innovative science at the interface of basic and clinical sciences, and also capitalizes on the faculty and scientific expertise and resources within the Graduate School and the School of Medicine. This collaboration engages HPTM students in an innovative educational curriculum guided by the acquisition of specific competencies, and driven by experiences and situations that resemble the professional practice of translational scientists, while promoting the development of the self-regulatory skills necessary for students to engage in autonomous learning across their scientific careers. The program will involve mentoring by basic science and clinical faculty in Multidisciplinary Translational Teams (MTTs), as well as a core curriculum designed to foster the critical skills needed to conduct translational research. Elective courses address or supplement the scientific content areas needed for specific dissertation research requirements identified by mentors.

CURRICULUM

The curriculum is based on stepwise acquisition of competencies that are guided by the *authentic performances of translational scientists* (see Table 1). General competency categories include biomedical content knowledge, communication, research skills, management, teaching, professionalism, and external services. The courses integrate experiences, such as projects, research, writing, and presentation skills, so that each course provides opportunities to develop competencies across multiple categories. Through this combination of core and elective educational elements, we anticipate that graduates of the HPTM program will exhibit the following competencies: a) possess a broad understanding of the normal structure and function of the human body; b) demonstrate a broad understanding of alterations in structure and function of the body and its major organ systems that correlate to specific human disease and/or injury; c) be knowledgeable in molecular biochemical and cellular mechanisms important in maintaining physiological homeostasis of organisms; d) identify and develop meaningful pre-clinical models of human disease; e) appreciate limitations of current standards of care for human disease; f) identify therapeutic and/or diagnostic needs within their field of research,, and g) develop leadership skills to collaborate effectively with academic physicians (clinicians) and other healthcare professionals to conduct effective and efficient translational research; g) acquire abilities to adapt to constant changes in the academic and regulatory environment; h) ability to manage administrative aspects of laboratory work including budgets, compliance, and generation of a beneficial work environment; i) ability to communicate effectively with clinicians, other scientist, the media, and the lay public; j) develop refined skills in grant writing and procurement of funding; k) abide by ethical principles and federal, local, and institutional policies and regulations; l) apply knowledge of basic principles of pedagogy to instructional design for teaching within higher education settings.

Instruction. Teaching methodology will be based entirely on active learning modalities, such as Process Oriented Guided Inquiry Learning, a "student-centered instructional approach that simultaneously develops discipline content mastery and key process skills such as critical thinking, effective communication, and teamwork" (www.pogil.org). In each POGIL session, students will work in a small group in which each group member has a defined role. To ensure adequate preparation, pre-class assignments will be given and many class sessions will begin with a short graded quiz covering the preparatory material. In class, students will work through specifically designed guided inquiry materials that will lead them through the steps of interpreting information, formulating their own valid conclusions, and applying what they have learned to reinforce the developed concept. Scientific content areas will be connected to main themes organized around core principles in physiology.

Core Principles of Physiology [Michael J. et al., The "Core Principles" of physiology: What should students understand? *Advances in Physiology Education* (2009) 33:10-16]:

1) Evolution
2) Ecosystem and environments
3) Causal Mechanisms (causal mechanisms can be understood by application of the laws of physic and chemistry)
4) The cell is the basic unit of life
5) Structure/Function relationships
6) Levels of organization (organisms function at different levels of organization simultaneously)
7) Information Flow (information flows within and between cells and between the organisms and the environment)
8) Matter/energy transfer and transform (energy and matter is obtained from the external world which in then transformed to build the organism and perform work)
9) Homeostasis

PROGRAM OF STUDIES

The HPTM Program requires that all full-time students take a minimum of 9 semester credit hours of course work in each academic term. HPTM is intended to be a four-year doctoral program and all students will be guided to complete their studies and milestones within this timeframe. Programming requires a commitment to full-time doctoral work for the duration of the program.

Core Courses. All students in the program will take the same set of required courses prior to completing qualifying examinations and entering candidacy (See Table 2). By virtue of the unique, inter-professional nature of the curriculum, HPTM students are not required to take BBSC core courses. Rather, HPTM students will participate in problem---based learning and small group laboratory sessions a l o n g s i d e medical students in the Basic Science Core Courses of the Integrated Medical Curriculum during their first year of training. These courses include: Gross Anatomy and Radiology (GAR), Molecules, Cells, and Tissues (MCT); and Pathobiology and Host Defense (PHD). To complement these courses, HPTM students will enroll in the foundational course, The Practice of Translational Science, which is divided into four, 8---week modules across Year 1 of the program. Modules 1 and 2 will run concurrent with GAR and MC, and Module 3 will be concurrent with PHD in the Integrated Medical Curriculum. Module 4 will run concurrent with initial laboratory rotations and clinical encounters (LR/CE), which begin in the Spring semester of the first year. Course topics in the Practice of Translational Science Modules are topics in biomedical disciplines that are aligned with the cases in PBL.

Other Training. To conclude the first year of the curriculum, HPTM students will register for an inter-professional research course in the Summer Term of the first year, completing a team-based project alongside medical students in the Translational Research Track. Longitudinal enrichment activities for HPTM students will expose them to the clinical environment, regulatory requirements involved in human and animal research, and other relevant topics after completion of the first year of inter-professional activities and courses.

Electives. Students will take elective courses relevant to their specific area of research interest and as directed by members of the Multidisciplinary Translational Teams of the Institute for Translational Science (ITS). Upon advisement from their mentors, HPTM students may enroll in relevant BBSC coursework. For example, some students have enrolled in virology, immunology, or cancer mechanisms courses following advisement from their mentors. Following advancement to candidacy, students will register for the dissertation credits for the remainder of their graduate studies. Continued participation in the Translational Research Seminar Series (TRSS) will be the only non---research based course requirement after candidacy.

Assessment. Student assessment will be multi-modal and linked to defined competencies. These assessments may include oral presentations, debates, activities, quizzes, examinations, reflective papers, team projects, and group grant work. If absences are necessary due to illness or other justifiable circumstances, the faculty in charge of the class should be notified as early as possible. Appropriate make-up work may be provided for students at the discretion of the co-directors. Two unexcused absences will result in a 5% decrease in the final course score.

Rubrics. In particular, rubrics may be used to assess submitted work products, presentation performances, or projects. HPTM rubrics outline sets of criteria that are used to evaluate learner efforts towards attaining the competencies expected of translational researchers. HPTM uses primarily four kinds of rubrics: peer assessment, teamwork, written work, and oral presentations. We review and revise existing rubrics to ensure they continue to support the learning goals of any assignment. Grading is based on a three-tier system: Meets expectation, above expectations, or below expectations.

The expected performance to meet the expectations of the HPTM program would generally fall between 80% to 90%. Scores above this are considered to exceed expectations. Students may challenge a grade on any graded component. Any appeals for grading changes must be submitted to the faculty responsible for the writing and grading of the question(s) within 10 business days after the return of the graded examination to the student. The following are examples of general rubrics to be used:

Sample rubric for written assignments.

Dimension	Meets expectation
Argument and reasoning	• The argument is articulated clearly. • Reasoning is supported by relevant and accurate evidence with discussion of implications.
Structure	• Ideas are presented in a logical and coherent progression. • Ideas are interesting and support the central argument. • There are strong topic sentences that guide the reader.
Clarity and mechanics	• Sentences are concise and well crafted. • Vocabulary is appropriate and precise. • Reader can effortlessly discern the meaning. • No distracting spelling, punctuation, or grammatical errors. • Proper citations.

Sample rubric for oral presentations.

Dimension	Meets expectation
Presentation mechanics	• Suggested rules for presentations (to be discussed) are followed. • Eye contact: Holds attention of entire audience with the use of direct eye contact, seldom looking at notes. • Body language: Movements seem fluid and help the audience visualize. • Poise: Displays relaxed, self-confident nature about self. • Enthusiasm: Demonstrates a strong, positive feeling about topic during entire presentation. • Voice: uses a clear voice and correct, precise pronunciation of terms.
Subject knowledge	• Answers all questions with appropriate explanations and elaboration.
Structure	• Information and ideas are presented in a logical, interesting, and coherent progression. • Graphics and visual aids explain and reinforce text and presentation. • Presentation has no misspellings or grammatical errors.

COURSE DESCRIPTIONS (as of Fall 2013)

PRACTICE OF TRANSLATIONAL SCIENCE, MODULES 1-4 (POTS 1-4)
HPTM 6291, 6292, 6293, 6294
(2 CREDITS)
This course will serve as the foundation for all students in the HPTM curriculum, providing active learning opportunities in a series of longitudinally integrated modules over the first year and start of the second year. This will not be a traditional lecture-based course, but rather, scientific content will be presented through guided inquiry methods promoting problem solving, analytical thinking, data analyses, active learning and cooperative group interactions.

The POTS course will emphasize the disciplines of physiology, pathology, and pathophysiology because they are, justifiably, regarded as the bridge between the basic and clinical sciences and because these disciplines that provide an integrated understanding of the human body as a multi-component system. Course content will be presented through a combination of classroom, laboratory, and relevant authentic environments. Activity-driven approaches will emphasize student-centered processes in order to develop the skills necessary for life-long autonomous learning, discipline authentic performances and to achieve the expected competencies (i.e., the integration of knowledge, skills, and attitudes necessary for a successful translational research career).

The POTS course is expected to build a contextual framework for clinical encounters, laboratory rotations, research focus-specific course work, and the qualifying exam in Year 2. Types of activities and enduring educational materials products could include case-based learning sessions, problem sets, journal article discussions, data analysis, experiment unpacking exercises, critical reading and discussion, autopsy observation, and relevant translational research guest presenters.

Prerequisites: Enrollment in HPTM
Terms offered: I, II, III, IV
Year offered: Annually (POTS 1-4, Tuesdays and Thursdays)
Hours per week: 4

HPTM 6405
GROSS ANATOMY AND RADIOLOGY FOR HPTM (GAR-HPTM)
(4 CREDITS)

GAR is the first basic science course presented in the curriculum; its prime goal is to provide the students with a basic understanding of the gross anatomy and radiology of the entire body. The clinical relevance of anatomy will be emphasized. Students will also participate in gross anatomy laboratory sessions. GAR aims to promote the development of student-directed problem solving skills, while encouraging teamwork. This course will introduce the student to the majority of nearly 10,000 terms commonly used in medicine today, providing a common foundation for communication in a multi-disciplinary team. HPTM students will participate in inter-professional problem-based learning (PBL) group activities with medical students in the Translational Research Track in the School of Medicine. HPTM faculty members will facilitate small groups. GAR-HPTM is an 8 week long course that runs concurrently with the Practice of Translational Science Course (POM) in Module 1. HPTM students will participate in all GAR course activities (lectures, PBL sessions, assessment, and cadaver laboratory practicums) alongside medical students in the course.

Prerequisites: Enrollment in HPTM
Terms offered: Fall only (1st 8 weeks)
Year offered: Annually
Hours per week: 15-17 hours including lab, lectures, PBL

HPTM 6332
MOLECULES, CELLS, TISSUES FOR HPTM (MCT)
(3 CREDITS)

The objectives of MCT are to help the HPTM student gain at least a secondary level understanding of the homeostatic structure and function of tissues, cells, and molecules and provide a foundation for subsequent courses and translational research; as well as, help students develop problem-solving skills focusing on biomedical issues related to the basic sciences, including microscopic anatomy; cell biology and physiology; biochemistry; molecular biology; genetics; and pharmacology.

Students will also participate in laboratory sessions on histology. Students will participate in inter-professional problem-based learning (PBL) activities with medical students in the MCT will further develop a shared basic medical vocabulary sufficient to communicate with clinicians. Translational Research Track in small groups, facilitated by faculty members of the HPTM program. HPTM Students will explore some topics covered in this course in more depth in the parallel Practice of Translational Science Course (POTS), and as progressing with graduate training in translational research. MCT will further promote collaborative skills through inter--- professional education, in which medical students and graduate students learn with, from, and about each other.

Prerequisites: Enrollment in HPTM
Terms offered: Fall only (2nd 8 weeks)
Year offered: Annually
Hours per week: 12-15 hours including lab, lectures, PBL

HPTM 6406
PATHOBIOLOGY AND HOST DEFENSE FOR HPTM (PHD)
(4 CREDITS)

Students will participate in inter-professional small group, Problem-Based Learning activities with medical students in the Translational Research Track. Small groups will be facilitated by faculty members of the ITS. Students will also participate in laboratory sessions concerning pathology. The major science disciplines covered in the Pathobiology and Host Defense Course include Pathology, Microbiology and Immunology. The lectures, small group sessions and laboratories are generally initiated with a clinical situation. Students will be expected to develop an understanding of applicable basic science concepts underlying clinical disease states. Students will, in part, develop a system for categorizing general pathologic processes that underlie diseases in all of the organ systems and outline and describe chains of causality for basic pathophysiologic mechanisms, which comprise the pathogenesis of disease.

Prerequisites: GAR-6405, MCT-6332, POTS-6291, POTS-6292
Terms offered: Spring only (1st 8 weeks)
Year offered: Annually
Hours per week: 15-17 including lab, lectures, PBL

HPTM 6306
LABORATORY ROTATION AND CLINICAL ENCOUNTERS (LR/CE)
(3 CREDITS)

An important component of training translational researchers is to provide exposure to the clinical realities of human disease and/or injury. In addition to the traditional laboratory rotation, HPTM students will be provided a focused opportunity to observe patients with disease and/or injury relevant to their specific area of scientific research. HPTM students, with guidance from clinical mentors, will participate in clinical encounter opportunities appropriate to their area of research interest. Students will be expected to participate in 4 clinical encounter sessions during the first 18 months of study. Examples of the types of clinical encounters for students in the infectious disease area may include: a trip to the infectious disease outpatient clinic, inpatient consult service, visits to diagnostic laboratories (microbiology, molecular diagnostic and serology labs) in UTMB hospitals or to the UTMB Autopsy service. At the Autopsy service, students will have an opportunity to view and participate in an autopsy, usually working with one or more medical students. Students recruited into our Hepatitis and Hepatocellular Cancer MTT will, in conjunction with their laboratory rotation, spend 1-2 hours/week "shadowing" either a radiation oncologist, medical oncologist, or surgical oncologist during their normal clinic, and attend a one-hour weekly tumor board meeting to gain insight into the multidisciplinary approaches used to treat cancer patients.

Prerequisites: GAR-6405, MCT-6332, POTS-6291, POTS-6292
Terms offered: I, II, III
Year offered: Annually
Hours per week: 20 hours, Schedule determined by mentor

HPTM 6295
INTERPROFESSIONAL TRANSLATIONAL RESEARCH DESIGN COURSE
(2 CREDITS)

The Inter-professional Translational Research Design (TRIPOD) course will team HPTM students with medical students in the translational research track in an 8 week required course focused on biostatics and epidemiology in the context of research use, leading students through the processes of identifying a research question, generating a hypothesis, and reviewing the literature to develop a study rationale. Experimental design including basic statistical approaches will be discussed. Other topics such as protection of human subjects, the search for funding sources, writing IRB protocols and grant applications. Students will critique research designs to evaluate the strengths and weaknesses of different techniques and approaches. Students will work in small teams (2-4 students) that include at least one PhD and one MD student. Defined weekly interim assignments will lead the students towards the final research proposal. Faculty mentors will also provide enrichment experiences regarding technical approaches and/or clinical relevance that will be tailored to each group's research topic. These enrichment sessions will include time in a laboratory observing/learning laboratory techniques and/or time in a clinical settings. The final product of the course will be a translational research project presentation or research proposal in poster format to be presented at a campus---wide medical research poster session. The research proposal will be graded based on scientific soundness, and evidence of inter-professional teamwork.

Prerequisites: Enrolled in HPTM Program or Translational Research Track (TRT), School of Medicine
Terms offered: Summer only
Year offered: Annually
Hours per week: 6 Hours per week

HPTM 6109
TRANSLATIONAL RESEARCH SEMINAR SERIES (TRSS)
(1 CREDIT)
This seminar series will team physicians and basic scientists to give presentations that illustrate the bi-directional collaborative nature of translational research. The goal of this seminar series is to demonstrate the important functions of inter-professional communication in driving successful translational research projects. Seminars will be held one evening per month and is worth one credit per term.
Students will participate in discussion with the professors after the seminar.

Prerequisites: Enrolled in HPTM Program or TR Track in SOM
Terms offered: I, II
Years offered: Annually
Hours per week: Vary

HPTM 6097
RESEARCH HOURS
(3–9 CREDITS)
Formal research directed toward the Doctor of Philosophy degree programs. Grading will be based upon the student's level of performance as reported by the student's research supervisor and will be assigned as satisfactory or unsatisfactory in a Mentor Report. Work is designed to introduce students to the techniques and philosophy of scientific research and to guide them in the development of a research problem in their major area of concentration. At the end of the registered term, students are required to write a one-page description of their research work. This course is taken after a student has passed the qualifying exam. Each student may enroll in this course for a maximum of three terms before becoming a candidate.

Prerequisites: Approval of Program Advisor
Terms offered: I, II, III
Year offered: Annually
Hours per week: Variable

HPTM 6099
DISSERTATION RESEARCH HOURS
(3-9 CREDITS)
Formal research and writing leading to the preparation and completion of the dissertation is required for the Doctor of Philosophy degree under the direction of the student's supervisory committee. Grading will be based upon the student's level of performance as reported by the chairperson of the student's supervisory committee and will be assigned as satisfactory, needs improvement or unsatisfactory. The HPTM Program will continue the theme of inter-professional collaborations in the conduct of translational dissertation research by utilizing co-mentoring teams composed of a basic scientist and physician from the Institute for Translational Sciences (ITS) Multidisciplinary Teams (MTTs) to guide each student's dissertation project. Both mentors will be involved in guiding the development, implementation and completion of the student's dissertation research project. The rationale for co-mentored research projects is that this mechanism will continue the student's exposure to both the scientific and clinical perspectives of a disease or injury state, and facilitate the further development of their inter-professional communication skills. Grading will be based upon the student's level of performance as reported by the chairs of the student's supervisory committee and will be assigned as satisfactory, needs improvement or unsatisfactory.

Prerequisites: Admission to candidacy for the Ph.D. degree
Terms offered: I, II, III
Year offered: Annually
Hours per week: Variable

Students registering for Dissertation are expected to continuously enroll for a total of 9 credit hours each semester until degree completion.

PRINCIPLES AND PROFESSIONAL STANDARDS

Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right to privacy, and show respect for research animals and property. Students must apply an ethical decision---making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the

Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

While appropriate resources, faculty modeling, and other training opportunities will guide the student in these areas, demonstrating the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others ultimately is the responsibility of each HPTM student. Students must always recognize they represent the program, the University, and the professionalism of the scientific profession to which they aspire. Questions about professional conduct may be directed to any HPTM faculty member or the graduate school Deans.

STUDENT INQUIRIES

HPTM faculty can generally address any inquiries that students may have during the course of the program. The Educational Coordinator can address issues and questions related to registration, degree requirements, curriculum requirements, room scheduling for curriculum activities, travel, tuition waivers, other training, examination procedures, qualifying process, poster formats and resources, assessment and grading rubrics, leaves of absence, payroll, student orientation, annual milestones of graduate training, graduate research assistantship (GRA) appointments, benefits, and general functions of the Institute for Translational Sciences (ITS). Your assigned HPTM mentor, instructor, or the Program Director should address inquiries concerning coursework, grading, course requirements, grants, research rotation placements, dissertation committee, or research topic selection.

ADDITIONAL INFORMATION

ESSENTIAL FUNCTIONS REQUIRED FOR COMPLETION OF PROGRAM

The following description details essential functions (abilities) needed to complete the Human Pathophysiology and Translational Medicine (HPTM) degree program.

Observation (to Include the Various Sensory Modalities)

Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. Students must be able to read written documents and hear in situations when not able to read lips. For instance, students must be able to observe and comprehend an instructor's/mentor's physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient's gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences, as applicable.

Communication

Communication skills are an essential function of learning and disseminating scientific information, and research. The academic or professional scientist teaches, conducts experiments with team members, interprets and reports results, and shares information with others. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, the public, and university visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, the public, and university visitors. They must be able to understand, respond to questions asked, or problems formulated, and ask pertinent questions in a one-on-one, small or large-group format.

Psychomotor Skills

Students must have sufficient motor capacities and mobility to attend class. Students must be able to conduct laboratory experiments at a standard-height or adapted-height laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must be able to type and perform data entry and analysis using a standard or adapted computer keyboard. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, cytometers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Due to the anticipated and potential clinical applications of research conducted by students in the HPTM program, students will conduct human cadaver dissections in the Gross Anatomy course and attend an autopsy case(s). These program requirements require students to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate samples, using acceptable protocols and reagents in quantities as appropriate to their research, including hazardous materials such as radio---labeled materials and hazardous chemicals.

Intellectual and Cognitive Abilities

Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each student must become proficient in the statistical analysis and interpretation of experimental observations.

Professional and Social Attributes

Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to high-pressure environments with competing demands and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. The program expects students who are punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors appropriate to the environmental and situational demands.