MD / PhD PROGRAM HANDBOOK
2013 - 2014

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I. Mission

The MD/PhD Program at Thomas Jefferson University is a dual degree program that prepares students for careers in academic medicine.

Our program aims to provide our students with the skills to provide outstanding patient care, lead discovery in biomedical research, advocate for basic and translational research, assume leadership roles in biomedical research and the delivery of health care, and serve as role models for the next generation of physician scientists.

Our goal is to produce motivated and enthusiastic physician investigators who will elect a life-long career in biomedical research, translating fundamental discoveries into improved health care delivery, and serving as role models for the next generation of investigators.

II. History

The first dual degree at Jefferson was awarded in 1966 and the program was formalized in 2003 with the appointment of our co-directors: Scott A. Waldman, MD, PhD and Laurence Eisenlohr, VMD, PhD. Recent graduates have obtained their first or second choice postgraduate training position, most training at one of the top 25 U.S. medical centers in research. Those who have completed postgraduate training are in full-time faculty positions, pursuing careers as laboratory-based translational investigators or in patient-based clinical research.

III. Structure of the Program

TJU MD/PhD Administration

Name	Position in Program	Academic Position	Contact Information
Scott A. Waldman, MD, PhD	Co-Director	Professor & Chair, Pharmacology & Experimental Therapeutics	Scott.Waldman@jefferson.edu 901 College 215-955-6086
Laurence A. Eisenlohr, VMD, PhD	Co-Director	Professor, Microbiology & Immunology	Laurence.Eisenlohr@jefferson.edu 730 BLSB 215-503-4540
Gerald B. Grunwald, PhD	Chair, Steering Committee	Dean, Jefferson Graduate School of Biomedical Sciences	Gerald.Grunwald@jefferson.edu M63 JAH 215-503-8982
Joanne Balitzky	Administrative Director		Joanne.Balitzky@jefferson.edu 910 BLSB 215-503-6687

Our administrative structure allows greater control and involvement in setting standards and requirements for the both MD and PhD degrees.
Administrative oversight for the Program is provided by the MD/PhD Steering Committee, chaired by Dr. Gerald Grunwald, Dean of the Jefferson Graduate School of Biomedical Sciences and Professor of Pathology, Anatomy & Cell Biology, and is composed of faculty who represent seven departments involved in the scientific and/or clinical training of MD/PhD students. Members of the committee, in addition to the Program Co-Directors, include: Clara Callahan, Associate Dean for Admission in JMC and Professor in the Department of Pediatrics; Charles Pohl, MD, Associate Dean for Student Affairs in JMC and Professor in the Department of Pediatrics; Jeffrey Benovic, PhD, Professor and Chair of the Department of Biochemistry and Molecular Biology; Michael Root, MD, PhD, Associate Professor of Biochemistry and Molecular Biology; Hallgeir Rui, MD, PhD, Professor in the Department of Cancer Biology; and Ross Summer, MD, Associate Professor of Medicine, Division of Pulmonary and Critical Care. Administrative members include Joanne Balitzky, Administrative Director of the MD/PhD Program; Elizabeth Brooks, DPM, Director of Admissions for JMC; and Marc Stearns, Director of Admissions for JGSBS. There are also two student representatives to this committee, elected by the Jefferson Physician Scientist Association.

Day-to-day administrative duties are carried out by the Program Office, comprising the co-Directors and the Administrative Director. The Program Office closely coordinates all administrative functions, program meetings, and program activities.

The Administrative Director maintains student records and provides administrative support to the Program co-Directors. The Administrative Director also assists the Jefferson Physician Scientist Association with organizing their planned activities.

IV. Financial Support of MD/PhD Students

Students in the MD/PhD Program receive fellowship support for each year in the Program. This support provides for full college tuition as well as a stipend for living expenses. The fellowship support is renewable for each year in the Program, provided the student maintains the high level of academic performance required by the Program.

During the medical school years, stipend support is provided through JMC. Upon transition to graduate study, support will be through JGSBS for the Fall term only. Thereafter, and in all remaining JGSBS years students receive their stipend support from their PhD mentors. The MD/PhD Program has a policy that no mentor can have more than 2 MD/PhD students at one time, and no more than 1 from a single class.

Students are encouraged, in consultation with their research advisors, to identify appropriate sources of extramural support and to apply for such support. However, funding within the program does not depend on receiving such support. Since some agencies may limit the number of applications that may be submitted from any one institution, students should discuss their grant submission plans with the program

director early in the process so that any submissions can be appropriately coordinated.

Stipends are disbursed bi-weekly or monthly depending upon the funding source. As described above, funding sources will vary during time in the Program; students should be prepared to complete forms and/or receive different numbers of checks as funding source changes. Checks can be retrieved from the Jefferson Graduate School of Biomedical Science Finance Office located in room M63 Jefferson Alumni Hall. Any questions regarding stipend should be directed to the Finance Office at 215-503-0150.

The following items are included in the MD/PhD Fellowship:

Stipend: $27,540

Tuition and Fees: As appropriate for the school (JMC or JGSBS) of current enrollment.

Health and Dental Insurance: Not as part of fellowship during JMC years; health coverage during JGSBS years for student only. The student pays for health insurance during JMC years. During JGSBS years the student can pay an additional amount for dental coverage and / or dependent health coverage.

V. MD/PhD Advising

MD/PhD advising is not meant to duplicate or interfere with the primary guidance provided by the JMC Office of Student Affairs, PhD thesis mentor, student's research committee, or PhD Program responsible for each student. Instead, MD/PhD advising centralizes these activities, to ensure that each student makes appropriate progress and satisfies the expectations of the MD/PhD Program.

Students will meet regularly with the MD/PhD co-Directors to review progress, academic and research achievements, program and professional plans, and changes and concerns.

During JMC 1 and 2 students are advised by the MD/PhD co-Directors, in regular one on one meetings and group lunches. Meetings will focus on academic performance, integration into MD/PhD program specific curricular elements, personal well-being, selection of rotation mentors and laboratories, progress toward successful completion of USMLE Step 1, transition into the research phase of the program, and final selection of a thesis mentor and PhD Program.

During the JGSBS years, regular meetings with the MD/PhD co-Directors will continue, but primary guidance will be through the research committee. One member of the MD/PhD Steering Committee will be assigned to the research committee as an 'ex-officio' member, representing the MD/PhD Program. This member should always be notified of committee meetings as are the regular members of your committee.

VI. Activities

A number of MD/PhD Program specific activities supplement the training provided by JMC and JGSBS. These activities are instrumental in establishing a core identity,

promoting the unique development of physician scientists and allowing them to identify with a cohort group with similar goals and interests. (See Appendix H)

- Translational Research Journal Club meets monthly to provide opportunities for students in the MD/PhD program to read, interpret, synthesize, and present literature in translational science to peers and faculty. The journal topics specifically focus on translational research appearing in the highest impact scientific journals.
- Progress in Translational Research Seminar meets monthly to allow students to present the results of their ongoing thesis research. Research presentations highlight the translational applications of the research that will solve a clinical problem, impact patient care, or prevent disease in individual patients or populations.
- Case Studies in Molecular Medicine meets monthly to provide concrete case studies in which novel molecular concepts are applied to the development of new diagnostic and therapeutics modalities for patient management. This program challenges trainees to think critically about the realistic and practical applications of laboratory-based discoveries and provides a context for the processes, steps and timelines required for translation from bench to bedside.
- Physician Scientist Mentorship Series provides an opportunity for MD/PhD students to learn from active, successful and productive physician scientists about training opportunities, career pathways, and the integration and balance of laboratory and clinical activities and personal/professional life. Beyond these elements, this series also offers network opportunities and exposure to the science of eminent regional and national investigators. These talks are presented semi-annually in an informal, intimate and collegial dinner setting.
- Enrichment Course in Clinical Skills ensures the training and preparedness of MD/PhD students entering the clinical clerkship years of medical school and facilitates the transition from graduate school back into medical school. All trainees enroll in the Enrichment Course in Clinical Skills (GC 725) during their research years in JGSBS.
- MD/PhD Scholars Retreat annually provides an opportunity to showcase the scientific achievements of the students, disseminate important programmatic information in a peer-to-peer fashion, provide mentoring opportunities and further build community. Students from all stages of training are given the opportunity to present to and learn from other students. A keynote speech by an active physician scientist whose primary charge is to provide career insights. The evening includes dinner and social activities. Retreat program and activities are planned and organized by the Jefferson Physician Scientist Association (JPSA) in conjunction with the JPSA faculty advisor, Dr. Root and member of the MD/PhD program Steering Committee.
- Annual Orientation. MD/PhD program students have a separate orientation for an afternoon and evening, organized around a welcome barbecue. The afternoon is spent meeting their fellow students from all phases of the MD/PhD program. Experienced (upper class) students present information regarding specific elements of the program, including requirements, operations, and responsibilities. New matriculants learn about the preclinical training phase, the integration of MD/PhD program components, and the strategies and logistics of organizing rotations. There is time built into the orientation specifically for small group interactions to discuss survival skills in the earliest phases of training. After dinner, social activities are planned for attendees. Orientation is organized by JPSA under the direction of Dr. Root, their faculty advisor.

VII. Jefferson Physician Scientist Association

The Jefferson Physician Scientist Association (JPSA) was founded in Fall 2010 with the purpose of advancing the future of translational medicine and representing the position of MD/PhD student in academic and extracurricular matters. Membership includes all students enrolled in the MD/PhD Program and are primarily recruited at the annual MD/PhD orientation and welcome in early fall of each academic year. Officers are elected annually.

- President (2013-2014): Tamar Berger
- Secretary (2013-2014): Michael Quinn
- Treasurer (2013-2014): Kevin Quann
- VP for Academic Affairs (2013-2014): Tanziyah Muqeem (JMC) and Linh Vu (JGSBS)
- VP for Career Development (2013-2014): Lauren Rosenblum
- VP for Community and Cultural Affairs (2013-2014): Bill Wieczorek
- VP for Recruitment (2013-2014): Dante Merlino, Tara Retson

Academic Affairs: Sit on the MD/PhD Steering Committee and represent students at all stages of the program; serve as the leading student voice for recruiting, admissions and MD/PhD program direction and development. Organize 3 annual seminars: "Bench to Bedside"; "How to Choose Your MD/PhD Rotations"; "Clinical Rotations in Research".

Career Development: Plan and organize seminars on translation topics related to interests of JPSA members; promote a culture of translational medicine at TJU by developing relevant opportunities for PhD students (clinical mentor program) and MD students ("How to publish" seminar and "Journal Club" series).

Community and Cultural Affairs: Coordinate efforts to interact with groups and individuals outside the JPSA community; creating and maintaining an alumni network; serves as president of MD/PhD Social Committee; spearhead all social activities related to the annual retreat.

Recruitment: Represent students on admissions committee (non-voting); develop and organize interview days; 2nd look visits, and be the interface between applicants and current students.

VIII. Student Requirements

While ALL students are encouraged to participate in JPSA and recruiting activities while they are in the Program, the following are minimal requirements for graduation.

First Year

1. Attend MD/PhD Orientation
2. Attend Welcome Barbecue

3. Attend weekly meetings of Current Topics in Translational Biomedical Research each semester/session (students are automatically registered for GC 710 (F), 712 (Sp 1), 714 (Sp 2) and receive 3 credits in JGSBS).
4. Attend Annual Retreat
5. Attend Physician Scientist Dinners
6. Attend periodic meetings with MD/PhD co-Directors as required.
7. Select a summer rotation. This is a key decision for first year students and must be done in consultation with MD/PhD co-Directors. Students must advise the Administrative Director of their summer rotations.
8. Successfully complete all coursework requirements.
9. Complete research rotation report.

Second Year

1. Continue weekly meetings of Current Topics in Translational Biomedical Research each semester/session (students are automatically registered for GC 710 (F), 712 (Sp 1), 714 (Sp 2) and receive 3 credits in JGSBS).
2. Attend Welcome Barbecue
3. Attend Annual Retreat
4. Attend Physician Scientist Dinners
5. Attend periodic meetings with MD/PhD co-Directors as required.
6. Complete a second summer rotation if necessary; rotation selection must be done in consultation with MD/PhD co-Directors. Inform Administrative Director of the research rotation. Complete research rotation report.
7. Make a decision on mentor and PhD Program after meeting with the MD/PhD co-Directors. As you make your decision, please note that the MD/PhD Program has a policy that no mentor can have more than 2 MD/PhD students at one time, and no more than 1 from a single class. Since most thesis mentors participate in more than one PhD Program, decisions about which Program to select are based on discussions with the mentor, PhD Program Directors and MD/PhD co-Directors. Review Student / Advisor Compact with your mentor.
8. Successfully complete all coursework requirements.
9. Successfully complete USMLE Step 1 before June 30.

Special Notice for MD/PhD Candidates from the USMLE
(http://www.usmle.org/pdfs/bulletin/2012bulletin.pdf)

The common pathway for MD/PhD students involves completing the first two years of medical school and then moving to graduate school studies and research for a three- or four-year period. Following completion of PhD course work and all or most of their research projects, these students return to complete their two clinical years, thus completing the medical degree in seven to nine years after first matriculating.

The USMLE program recognizes that the recommended seven-year time limit may pose problems for medical licensure for some candidates with a combined degree (i.e., MD/PhD). For this reason, the USMLE program recommends to licensing jurisdictions that they should consider allowing exceptions to the seven-year limit for MD/PhD candidates who meet certain narrow requirements. The recommended requirements are as follows:

1. The candidate has obtained both degrees from an institution or program accredited by the LCME and regional university accrediting body.

2. The PhD studies should be in a field of biological sciences tested in the Step 1 content. These fields include, but are not necessarily limited to, anatomy, biochemistry, physiology, microbiology, pharmacology, pathology, genetics, neuroscience, and molecular biology. Fields explicitly not included are business, economics, ethics, history, and other fields not directly related to biological science.

3. A candidate seeking an exception to the seven-year rule should be required to present a verifiable and rational explanation for the fact that he or she was unable to meet the seven-year limit. Although these explanations will vary considerably, each licensing jurisdiction will need to decide on its own which explanation justifies an exception.

Students who pursue both degrees should understand that while many states' regulations provide specific exceptions to the seven-year rule for dual-degree candidates, others do not. Students pursuing a dual degree are advised to check the state-specific requirements for licensure listed by the FSMB.

<u>Third Year through Completion of PhD</u>

1. Continue weekly meetings of Current Topics in Translational Biomedical Research each semester/session; register for GC 710 (F), 712 (Sp 1), 714 (Sp 2), 1 credit each semester.
2. Attend Welcome Barbecue
3. Attend Annual Retreat
4. Attend Physician Scientist Dinners
5. Register and participate as appropriate in GC 725 Enrichment Course in Clinical Skill each Fall and Spring semester (2 credits each year in JGSBS).
6. Form research committee, including one ex-officio MD/PhD representative
7. Attend Ethics Case Conferences once a month during third year of PhD studies (fifth year in MD/PhD Program)
8. Complete GC 630 - Fundamentals of Clinical Trials

9. Complete Rotation on the Cancer Clinical Research Review Committee
10. Complete Rotation at Annals of Internal Medicine
11. Successfully complete all PhD requirements as set forth by the selected PhD Program
    a. required coursework
    b. regular research committee meetings
    c. comprehensive examination

Nearing the End of PhD

1. Contact JMC Office of Student Affairs Office and the assigned Dean of Student Affairs to initiate arrangements for return to JMC to complete clinical curriculum. This is especially important as planning needs to be made for the clinical rotation schedules. Planning ahead is important, and the JMC Student Affairs Office can provide further assistance with the administrative steps required for making this transition a smooth one.
2. Notify Administrative Director of the thesis defense date and the date for return to JMC.
3. Successfully complete defense of thesis including all PhD Program and JGSBS requirements.
4. Complete 'Third Year Primer' a week long refresher course for students returning to JMC 3 after extended leave of absence. JMC schedules this course and controls its timing (usually prior to the July start of the clinical curriculum).

Program Years 7 and 8: The Clinical Years

1. Present one Clinical Case Study in Molecular Medicine each year. Continue weekly attendance at Current Topics in Translational Biomedical Research as clinical schedule allows.
2. Attend Welcome Barbecue
3. Attend Annual Retreat. If unable to attend due to a professional conflict, notify the Administrative Director in advance.
4. Successfully complete JMC requirements

IX. Curriculum

A critical aspect of our MD/PhD Program is the integration of physician-scientist training across all years.

Year 1 (JMC 1) Course descriptions for JMC Blocks can be found on-line; MD/PhD Specific Course descriptions follow, see Year 3.

- Block I
  - Human Form and Development -- ANAT. 105 August - October
  - Introduction to Clinical Medicine I (Full Year)
- GC 710 Current Topics in Translational Biomedical Research I (1 cr.) -- Fall
- Block II
  - Molecular and Cellular Basis of Medicine -- BOIC. 105 November - January
- Block III & IV
  - The Systems -- IDPT. 105 February -- June
  - The Systems: Neuroscience -- IDPT. 150
- GC 712 Current Topics in Translational Biomedical Research II (1 cr.) -- Spring 1
- GC 714 Current Topics in Translational Biomedical Research III (1 cr.) -- Spring 2
- GC 930 Research Rotation (10cr.) -- Summer

1st Year Course Descriptions

ANAT. 105 Human Form and Development -- This course is a foundational course emphasizing key concepts in human development and gross anatomy. All major anatomical regions are covered from a combined lecture and dissection approach. Dissection sessions provide each student with an opportunity to verify all that he or she has been exposed to via reading and lecture regarding the gross structure of the human body, i.e., evidence-based medicine in its simplest form. The sequence in which the regions are approached are as follows: back, upper limb, thorax, abdomen, pelvis and perineum, lower limb, and head and neck. The didactic experience also includes several imaging lectures focusing on MRI, CT and routine radiographic approaches. There is a clear focus upon the anatomical relationships of structures and a continuous emphasis as to the clinical relevance of these relationships. Embryology lectures begin with gametogenesis and fertilization and then progress to a systemic approach to development. Clinical skills and surface anatomy sessions are also incorporated which serve to reinforce the concepts gleaned from lecture and dissection. These sessions are interspersed, where relevant, throughout the various regions as the course progresses. We also assess a number of competencies in this course in addition to basic medical knowledge, e.g., communication skills and professionalism, by using several peer assessment sessions during the dissection module. Computer-assisted instruction provides ample opportunity for review and self-directed learning. This course is taught concurrently with Introduction to Clinical Medicine.

BIOC. 105 Molecular and Cellular Basis of Medicine -- This core course presents basic concepts from the fields of molecular biology, genetics, cell biology, biochemistry, and cell physiology as they apply to current and future medical practice. Material is presented in lectures and problem-solving sessions with a case-based learning component. Topics include: DNA and RNA structure and function; protein structure and turnover; cellular structures; cell-cell communication; the cell cycle; genetics; cytogenetics; stem cell biology; cancer; cancer genetics; blood;

metabolism of carbohydrates, lipids, amino acids, and nucleotides; diabetes; osmotic forces, membrane potentials, action potentials, and synaptic transmission. This course serves as a foundation for the Block 3 Tissues and Organ Systems course, the Block 4 Neuroscience course, and courses in the second year.

IDPT. 105 The Systems I -- This course presents a coordinated discussion of normal structure and function of the human body at the tissue, organ-system and integrative regulatory level. Presentations of the microscopic anatomy of tissues and organ system precede discussions on the physiologic function and regulation of those tissues and systems. Microscopic Anatomy topics include: tissues (i.e., epithelium, connective and supportive tissues), muscle, nerve, blood, as well as tissues of the gastrointestinal, cardiovascular, immune, cutaneous, respiratory, renal, endocrine and reproductive systems. In addition, there is an introduction to histopathology at the systems level. Topics in Medical Physiology include the autonomic nervous system, smooth, skeletal and cardiac muscle function and regulation, gastrointestinal, cardiovascular, pulmonary, renal, exercise and endocrine physiology as well as acid-base and temperature regulation. Clinical Correlation lectures are presented for each physiological system. Teaching is done by lecture, video demonstrations, small group digital microscopy labs, computer simulations, and problem-solving sessions.

IDPT. 150 The Systems II: Neuroscience -- The first year ends with a six week section dedicated to the morphology (gross and microscopic) and function of the human nervous system with applications to clinical medicine. Topics include: anatomy and physiology of the brain and spinal cord, neurotransmitters, sensory and motor pathways, special senses, suprasegmental and cortical functions. Teaching is done in lectures, patient presentations in Grand Rounds format, small group laboratory exercises, small group clinical skills sessions, and small group case studies. This course is team taught in collaboration with eleven basic science and clinical departments.

Introduction to Clinical Medicine I -- The first year of medical school is a critical and pivotal time in the professional development of a physician. It is during this year that the life-long learning requisite to providing all patients with excellent medical care begins. This course is designed to introduce students to the tools needed to function skillfully in our evolving health care environment, as a clinician and as an integral part of the health care team. Topics include professionalism, medical ethics, system-based care, interprofessional care, medical informatics, evidence-based medicine, cultural diversity, and behavioral science. Clinical skills training include history-taking, communication and interpersonal skills, and basic physical exam skills. Educational venues include the classroom, small group settings, the clinical skills center, office-based practices, hospitals, and the community. Small group and other interactive teaching methods provide ample opportunity for active, collegial learning and reflection. This course provides the basis for clinical practice and weds the art of medicine with the science of medicine.

Year 2 (JMC 2) Course descriptions for JMC Blocks can be found at http://www.jefferson.edu/jmc/students/JMCCatalog2009.pdf

- Block I
  - Foundations of Pathology and Pharmacology -- IDPT. 200 August - September
  - Infection, Immunity and Disease -- MICR. 201 September - November
  - Introduction to Clinical Medicine II* -- IDPT. 201 September - April
- GC 710 Translational Journal Club I (1 cr.) -- Fall
- Block II
  - Clinical Skills/Physical Diagnosis -- IDPT. 204 November - May
  - Foundations of Clinical Medicine -- IDPT. 202 November - May
  - Introduction to Clinical Medicine II* -- IDPT. 201 September - April

  *Half day per week
- GC 712 Translational Journal Club II (1 cr.) -- Spring 1
- GC 714 Translational Journal Club III (1 cr.) -- Spring 2
- GC 930 Research Rotation (10cr.) -- Summer

2nd Year Course Descriptions

IDPT. 200 Foundations of Pathology/Pharmacology -- This module presents fundamental concepts in pathology and pharmacology in preparation for the integration of these disciplines in the Foundations of Clinical Medicine course. The pathology component focuses on mechanisms of disease, including cell injury, inflammation, wound healing, amyloidosis, environmental pathology, neoplasia, developmental/genetic diseases, and hemodynamic disorders. Students learn in lectures, case studies, and interactive discussion/review sessions.

In pharmacology, the concepts of pharmacodynamics, pharmacokinetics, pharmacogenetics, drug metabolism, toxicology, and clinical and translational research are presented. These principles are applied in the autonomic nervous system pharmacology section (lectures and a case-based workshop). Students learn the first of many classes of drugs they will learn throughout the year. Other key topics include use of drugs in special patient populations (neonates, pregnancy and nursing, children, and the elderly), medication adherence, over-the-counter drugs and botanical medicine, clinical and translational research, and federal drug laws applying to prescription medications. The Medical Letter on Drugs and Therapeutics is used to introduce concepts of independent lifelong learning about pharmacology and students take on online quiz about current issues. There is an online exercise using pharmacokinetics software and an in-class prescription-writing workshop. Students learn in lectures, in workshops, and with online exercises.

MICRO. 200 Immunity, Infection and Disease -- The objective of this course is to study how the immune system functions, how it contributes to the development of diseases and the relationship between the immune response and infectious diseases. The course provides the background for understanding the composition and mechanisms of the immune response, the diseases associated with the immune response, the biology of organisms which cause the infectious diseases of humans, the interaction between the immune system and infectious diseases and the pharmacology of therapies used to control immunological and infectious diseases.

This course is divided into three sections with Section 1 covering Immunology and Virology, Section 2 covering Bacteriology and Section 3 covering Parasitology, Mycology and Infectious Diseases. The course is comprised of lectures, clinical correlations and laboratory sessions. The goal of the clinical correlations is to present clinical applications of the material covered in the course. Laboratories cover areas, using a case based approach, that are deemed necessary to give a physician insight into obtaining and interpreting laboratory data for proper patient care. Procedures that can be done in a physician's office or in the emergency setting to help make tentative diagnoses are stressed.

IDPT. 201 Introduction to Clinical Medicine II -- The Introduction to Clinical Medicine II course seeks to help students understand the clinical implications of topics covered in the basic science courses. The course is closely linked to the other second year courses so that issues discussed in ICM II follow the modules of the IID and FCM courses. Much of the course is spent in small group sessions that lend themselves to informal discussion of clinical cases, articles from the medical literature and especially issues of professionalism and ethics. Students also attend Grand Round sessions where senior faculty members interview patients and discuss how the process of medical decision making takes form. During these sessions, students have the opportunity to interact with and ask questions of patients in order to better understand how medical diseases impact on the lives of these patients. Standardized patient interviews are conducted and videotaped with feedback to the students regarding interviewing skills. During ICM II Clinical Skills Sessions, students have the opportunity to examine patients with abnormal physical findings and to learn about the clinical presentations of various disease processes.

IDPT. 202 Foundations of Clinical Medicine -- The objective of this course is to expose the student to fundamentals of clinical medicine, integrating the specialties of medicine with clinical skills, pathology and pharmacology. The course is organized by systems: cardiovascular, dermatologic, gastrointestinal, hematologic, musculoskeletal, neurologic, ophthalmologic, pulmonary, renal/urologic, reproductive, and psychiatric. Each section starts with a review of the clinical skills specific to the system, followed by the salient pathology, providing the pathophysiologic basis of the disorders that affect the system. The important associated clinical entities are presented, including the pharmacologic basis of therapeutics for each set of disorders. Teaching methods include lectures, small group sessions, team learning exercises and interactive review sessions. This course is tightly integrated with IDPT 204, Clinical Skills and IDPT 201, Applications in Clinical Medicine, following the same organ system organization.

The Foundations of Clinical Medicine course is designed to serve as a transition from the basic sciences to clinical medicine. Every effort is made to keep the teaching and learning patient-centered, to foster an ethic of self-directed and life-long learning and to provide the student with the background necessary to succeed in the clinical years of their medical education. Resources provided in this course will also be useful background review for clinical rotations.

IDPT. 204 Clinical Skills/Physical Diagnosis -- This course provided a foundation for physical examination maneuvers and findings. It includes an introductory series of lectures followed by system-specific lectures which are integrated into the Foundation of Clinical Medicine course. Didactic sessions include the use of individual wireless stethophones for the teaching of cardiac and pulmonary sounds, and "hands-on" experiences at the Jefferson Clinical Skills Center with standardized patients and simulations. There is also a series of supervised encounters with hospitalized patients at TJUH and our local clinical affiliates. Assessment of students' knowledge and skills will takes place periodically throughout the course.

Year 3 (JGSBS 1) - A total of 70 credits are awarded for the first two years of regular medical school coursework, accounting for a substantial number of the credits required for the PhD thesis. In addition, 6 didactic credits and 20 research credits are awarded for MD/PhD specific coursework. Thus, MD/PhD students should be able to fulfill most remaining coursework early, providing significant time for bench research. Some courses are required of MD/PhD students in all PhD Programs and are listed below; other requirements are Program specific and listed with the appropriate PhD Program. As much of the remaining coursework as possible should be completed during JGSBS 1.

- GC 550 D -- **Foundations in Biomedical Science**, Tool Boxes (1 cr.) This course familiarizes the student with the powerful technologies used in scientific research.
- GC 640 -- **Research Ethics** (1 cr.) This graduate seminar course is designed to familiarize students with the ethical dilemmas inherent to the conduct of research. Topics to be discussed include codes of ethical behavior, research design, conflicts of interest, informed consent and the appropriate use of animals. The student will be required to prepare a paper on the analysis of one or more case studies.
- GC 710, 712, 714 -- **Current Topics in Translational Biomedical Research I, II, III** (1 cr. each, F, S1, S2) This course explores aspects of translational research and molecular medicine through the venues of Translational Research Journal Club, Progress in Translational Research Seminar, Ethics Case Conference, and Case Studies in Molecular Medicine. Meets 4 times per month.
- GC 725 - **Enrichment Course in Clinical Skills for Physician Scientists** (1 cr. each, F, S) During the first research year, students participate for one half day per month as teaching assistants in one or more medical school courses.

Years 4 through 6 (JGSBS 2, 3, 4) - These years are devoted primarily to the completion of thesis research projects and completion of any additional elective or required advanced courses specialty. Students still register for MD/PhD specific courses.

- GC 630 -- **Fundamentals of Clinical Trials** (3 cr.) This course introduces the fundamentals of design and analysis of clinical trials. Some of the design issues discussed include specifying and operationalizing the scientific question of interest, the role of a control group randomization, blinding, and sample size determination. The course focuses on statistical aspects of the analysis of clinical trials, including various statistical estimation and testing procedures, the intent to treat principle, interim analysis, and statistical and scientific inference. Students learn to critically review published reports of clinical trials through participation in small group discussions and individual written critiques.
- GC 710, 712, 714 -- **Current Topics in Translational Biomedical Research, I, II, III** (1 cr. each) This course explores aspects of translational research and molecular medicine through the venues of Translational Research Journal Club, Progress in Translational Research Seminar, Ethics Case Conference during JGSBS 3 only, and Case Studies in Molecular Medicine. Meets 4 times per month.
- GC 725 - **Enrichment Course in Clinical Skills for Physician Scientists** (1 cr. each, F, S) During these research years, the course is composed of two components: formal physical diagnosis rounds and morning report. Physical diagnosis rounds involve patients admitted to the medical services of Thomas Jefferson University Hospital. These rounds also are attended by a small group of medical residents. On these rounds, trainees are exposed to a diverse group of patients where auscultatory, visual, and tactile skills are practiced. After rounds students attend morning report where case presentations are used to develop differential diagnosis skills. Each student is required to attend at least one session (physical diagnosis rounds and morning report) per month. Each week's session is limited to 3 students and sign up is required beforehand.
- **Rotation on the Cancer Clinical Research Review Committee (CCRRC)** This committee of the Kimmel Cancer Center evaluates the scientific validity of patient-oriented studies in oncology at TJU. Rotation on this biweekly committee is an opportunity to obtain hands-on experience reviewing the scientific merit of clinical protocols. Trainees are supervised by Dr. SA Waldman, the Chairperson of the CCRRC, who guides analyses, addresses questions, and provides feedback. Trainees rotate on the CCRRC for 6 one hour meetings.
- **Critical Review of the Scientific Literature Rotation** The Annals of Internal Medicine is the flagship publication of the Philadelphia-based American College of Physicians-American Society of Internal Medicine (ACP-ASIM). It is considered the premiere worldwide internal medicine journal. Editor **Christine Laine, MD, MPH** has offered members of the MD/PhD Program unprecedented access to the editorial process through a 4-week rotation. Enrollees can participate in the weekly editorial and statistical meetings of the journal. Maximal benefit of the rotation is obtained when participants read a majority of the articles being discussed. *Therefore*,

participants should schedule the rotation during a period when they have the time to devote to preparation for each session.

Year 7 and 8 (JMC 3 and 4) -Course descriptions for JMC can be found on-line

- The clinical curriculum starts in July after the United States Medical Licensing Examination Step I and consists of 100 weeks as follows: 84 weeks of clerkship activity; two weeks of vacation during each December holiday period (total four); two weeks of vacation in June; two weeks of vacation immediately prior to graduation; eight weeks of vacation to be scheduled to fit the needs of the student. MD/PhD students should return to JMC in July whenever possible but may request a delay of up to 3 months in order to complete their thesis research. (See appendix F)

- *Requirements*
  - JMC 3
    - Six weeks of Family Medicine (FAMED. 350)
    - Twelve weeks of General Surgery, Surgical and Medical Sub-specialties (SURG. 350)
    - Twelve weeks of Internal Medicine and Neurology (MED. 350)
    - Six weeks of Pediatrics (PED. 350)
    - Six weeks of Psychiatry and Human Behavior (PSYHB. 350)
    - Six weeks of Obstetrics and Gynecology (OB/GYN. 350)
    - One Case Study in Molecular Medicine presentation
  - JMC 4
    - Four weeks of Senior Medicine
    - Four weeks of Scientific Foundations of Clinical Medicine or Advanced Basic Science (IDPT. 420)
    - Four weeks of Emergency Medicine/Advanced Clinical Skills (EMGR 400)
    - Four weeks of Inpatient Subinternship in either Family Medicine (FMED 402), Internal Medicine (MED 401), General Surgery (SURG 450) or Pediatrics (PED 402)
    - Four weeks of an Outpatient Subinternship in either Family Medicine (FMED 401 or FMED 406), Internal Medicine (MED 402), Obstetrics/Gynecology (OBGY 402), Pediatrics (PED 401), or Psychiatry and Human Behavior (PSYH 405 or PSYH 408)
    - Sixteen weeks of electives
    - One Case Study in Molecular Medicine presentation

3rd and 4th Year Course Descriptions

FAMED. 350 Clinical Clerkship -- Students focus on the diagnosis and management of acute and chronic problems in the outpatient setting; health maintenance, preventive medicine, psychosocial and life stage contexts, time management, and cost effective delivery of care.

SURG. 350 12-Week Surgery Clerkship -- Third Year Surgery Rotation consists of a six-week Clinical Clerkship Rotation and a six-week Surgery Specialty for a total of 12 weeks. Students will spend six weeks on a general surgery, three weeks on one surgery specialty service, and three weeks on a second surgery specialty service at either Thomas Jefferson University Hospital or one of the hospitals affiliated with Jefferson Medical College. During this twelve-week teaching block, the student is expected to assimilate the knowledge, skills, and attitudes concerning surgery that are expected of every physician. The students are assigned the responsibility of the preoperative evaluation of surgical patients and their postoperative care and participate in the surgical procedures performed on their assigned patients. Their work is closely supervised and evaluated, and they are encouraged to develop initiative and increasing responsibility. Students participate in patient rounds, conferences, and case presentations. Didactic material is presented by each of the participating hospitals and in a series of seminars at Jefferson. Each student is expected to develop a working clinical knowledge of general surgery, and have surgical knowledge common to all specialties. Students are given an End of Clerkship Surgery OSCE (Objected Structured Clinical Evaluation) at the end of the rotation and the results are included in the clinical clerkship grade. At the conclusion of the twelve-week teaching block, the faculty submits a clinical evaluation of each student's performance during the clerkship. The National Board of Medical Examiners Subject Examination in Surgery is required of all students and is administered at the conclusion of the clerkship. This final examination measures the core knowledge and problem solving abilities gained during the clerkship and is separately recorded in the transcript as Surgery 351.

Surgical Specialties -- This is a six-week rotation consisting of three-week rotations in two of the following disciplines.

- Anesthesiology -- The clinical curriculum in anesthesiology is directed at teaching the students those aspects of anesthesiology that should be understood by all practicing physicians. Preoperative evaluation, choice of appropriate anesthetic techniques, and postanesthetic problems that may develop are covered. Operating room experience demonstrates mask ventilation, the use of airway adjuncts, and endotracheal intubation.
- Neurological Surgery -- This course introduces the student to the field of Neurological surgery and the scope of neurological diseases. Specific emphasis is on cerebrovascular, neuro-oncologic and spinal diseases, and the principles underlying their management. The course will build on the neuroscience curriculum in which students participate at the end of their first year, as well as expand on the concepts derived in the general medicine and surgical core clerkships. Due to the diversity in the field of neurologic diseases treated at Jefferson the students will rotate between Thomas Jefferson University Hospital and Jefferson Hospital for Neuroscience. The curriculum encourages daily clinical exposure involving outpatients, inpatients and operating room experience. Students will also have the opportunity to participate in the Department's conference and lecture series.
- Ophthalmology -- The Department of Ophthalmology at Wills Eye Institute participates as a surgical specialty selective. Up to 10 students may choose ophthalmology for any three-week period. The rotation begins with an

introductory session in which the students will draw a partner's optic nerve area of the retina. A second introductory session covers the techniques of an ocular examination including familiarity with the slip lamp. Subsequently, there are eight lectures by faculty that cover various aspects of ophthalmology with emphasis on ocular abnormalities associated with systemic diseases. There are six resident supervised sessions which cover unknown case presentations. Following the morning didactic session, students are assigned to the general ophthalmology clinic, the emergency room, as well as the subspecialty and OR areas. Students are expected to attend selected resident education conferences, including Chiefs' Rounds each Friday morning and the Wednesday Noon-time neuro-ophthalmology conference. An open book take-home examination is completed during the course of the elective.

- Orthopaedics and Musculoskeletal Disease -- This course introduces the students to the scope of problems affecting the musculoskeletal system and the principles underlying their management. The students are divided among the University Hospital and its affiliates. Primary teaching sites include The Bryn Mawr Hospital, Lankenau Hospital, and Albert Einstein Medical Center. At each of these facilities, the students will work under the direction of Orthopaedic surgeons who will guide them through a series of inpatient, operative, and outpatient experiences reflective of the musculoskeletal problems seen and managed by an Orthopaedist. At Thomas Jefferson University Hospital, the students will spend three weeks in a weekly rotation to include: 1) One week learning inpatient management of Orthopaedic patients (including closed treatment of Orthopaedic injuries, perioperative and postoperative management, and evaluation and treatment of spinal cord injuries). 2) One week spent in the operating room and outpatient clinics of the inpatient services (adult reconstruction and spine) 3) One week assigned to individual faculty members in each of four other orthopaedic subspecialties (sports, shoulder and elbow foot and ankle, and hand) As an alternative, students may elect to rotate at the A.I. DuPont Institute in Wilmington, DE where they can receive a more intensive focus on Pediatric Orthopaedics (2 weeks) and a third week at Christiana Hospital for an exposure to general orthopaedics.
- Otolaryngology/Head and Neck Surgery -- Students in groups of seven are assigned to the Otolaryngology service for a total of three weeks. Lectures cover the important aspects of our field relevant to all facets of medicine. In addition, a manual covering core topics of Otolaryngology is distributed to all students at the beginning of the rotation. Students are expected to work with the residents and attendings on service and should plan to participate in seeing inpatients and rounding in the morning with the residents. Typically, rounds begin between 6:30 and 7:00 a.m. Clinical experience is provided in the office, hospital and operating room. Students should spend at least one to two days with an attending during their office hours and should otherwise anticipate time spent observing and participating in surgery. The rotation is graded based on participation of students during their time on service. Giving a presentation in a given topic makes students eligible to receive honors

provided they had good performance in their clinical duties. If students are unsure of a topic to present, guidance will gladly be provided.

- Urology -- This basic course introduces the student to the diagnosis and treatment of urologic disease. Responsibilities include: inpatient and outpatient evaluation, conferences, and operating room participation. The University and affiliated hospitals present a well-rounded curriculum, and opportunity for Grand Round presentations, and comprehensive lecture series that provide an excellent introductory exposure to modern urology.

MED. 350 Internal Medicine Clerkship -- Students are expected to perform or assist with admission evaluations, progress notes, and daily care and treatment of assigned patients. Students are required to act professionally at all times. Students are exposed to a variety of procedures, including phlebotomy, intravenous catheter placement, arterial blood sampling and central venous catheter placement. Students may have the opportunity to rotate on subspecialty services during their four weeks at Thomas Jefferson University Hospital. Reading is expected from Internal Medicine Essentials for Students, Cecil's, Harrison's or other textbooks of Internal Medicine. Students are evaluated by their house staff and attending preceptors at the end of the rotation, and are required to obtain mid-term feedback from them during their rotation so that they can work on their clinical skills throughout their clinical time in Internal Medicine.

PED. 350 Pediatrics Clerkship -- Pediatricians care for patients during the first two decades of life with a strong focus on disease prevention, anticipatory guidance and wellness; however, pediatrics also encompasses all the standard sub-specialty areas (e.g., cardiology, endocrinology, etc.) and several specialties that are unique to pediatrics (e.g., neonatology). Students spend six weeks on the core pediatric rotation where they learn and practice how to approach patients of different ages and are exposed to common clinical problems. Experiences in the inpatient, outpatient and newborn nursery ensure that every student sees a balanced patient mix. Students learn from a core "clinical case based" curriculum and enhance their interviewing, physical exam and technical skills at a clinical skills day, through structured direct observation and videotaping of patient interviews.
Students are expected to see patients on their own under the close supervision of an attending and/or senior resident and are actively involved in all aspects of patient care.

PSYHB. 350 Psychiatry Clerkship -- This core clinical experience prepares all physicians to recognize and plan treatment for the most prevalent psychiatric disorders. Students also learn techniques for managing their reactions to disturbing patent symptoms and behavior. In this clerkship students gain experience developing therapeutic relationships with patients and establishing treatment boundaries. Third-year students have the opportunity to evaluate and follow the progress of patients with a variety of psychiatric disorders. Students evaluate and follow patients under faculty supervision, observing and participating in all treatment, rehabilitative, and preventive programs within the clinical setting. The six-week clerkship is divided into two three-week clinical placements to provide breadth of exposure to patients, disorders, clinical teams and treatments. Core

clinical skills sessions and didactic seminars are scheduled for a half-day per week and attended by all students. Students learn to differentiate common mental-life problems that present to the general physician and can be treated in that setting from severe disorders that require specialized evaluation and management. Over the course of the clerkship student training and evaluation focus on increasing competence in the following aspects of clinical psychiatry: 1. Developing appropriate treatment relationships with patients; 2. Working effectively with a clinical team; 3. Demonstrating responsibility and accountability in patient care; 4. Growth in reasoning skills required in comprehensive case formulation; 5. Application of the general psychiatric knowledge base; and, 6. Mastery of clinical skills, especially ability to obtain a psychiatric history and conduct a comprehensive mental status examination. 6. Competence in treatment planning, including integration of psychiatric medications, behavioral and supportive psychotherapies, and practical problem-solving to improve patient quality of life.

OB/GYN 350 Obstetrics and Gynecology -- The aim of this clerkship is for students to learn basic skills, attitudes and knowledge essential for the care of women. The program in each location is designed to provide a parallel experience involving conferences, outpatient and inpatient activities. On obstetrics, the student is assigned in rotation to the office, to the delivery room, or to patients with complications who have been admitted to the hospital for evaluation and management. In the office, the student is exposed to the fundamentals of prenatal care for normal and complicated pregnancies. The delivery room experience affords the opportunity to observe and follow patients during labor and the postpartum period and to assist in their delivery. Selected patients with pregnancy complications admitted to the hospital are assigned to the student for evaluation. The student participates in their management under supervision of the resident staff and the faculty. On gynecology, the student is assigned in rotation to the office and to patients with a gynecologic disorder who have been admitted to the hospital. The student is responsible for the history and physical examination and is required to outline a course of management for each assigned patient. The student follows the course of the patient in the hospital with the resident staff under supervision by the faculty. Assignment to the operating room affords the opportunity to assist on surgical procedures performed on assigned patients. Correlation of surgical findings with the microscopic pathology is an integral part of the experience. At the completion of the course, the student should (1) have developed knowledge, attitudes and skills relevant to the care of the normal adolescent, reproductive and aging female specifically competently performing relevant history and genitourinary exam; (2) be able to identify patients requiring specialized obstetric and gynecologic consultation; and (3) have expanded knowledge in the social problems of the patient and of society.

IDPT. 420 Advanced Basic Science/Scientific Foundations of Clinical Medicine -- This is a four week course dedicated to revisiting the exciting interplay between the basic sciences and clinical medicine. Six clinical topics in different disciplines will each be reviewed for one or two days using varied educational styles. In addition, the course will feature “teaching how to teach“ with weekly interactive seminars. A weekly journal club will highlight critical reading skills with articles related to the

topics being presented that week. This course can substitute for Advanced Basic Science course.

IDPT. 425 Advanced Basic Science Independent Study -- Students may choose to fulfill the Advanced Basic Science requirement through independent study. Application materials and full instructions are available in the Office of the Registrar. Students must submit the request with a brief proposal that meets criteria described in the application. The independent study project can be developed in any of the sciences included in the first two years of the medical school curriculum. A specific faculty member must be identified who will supervise the independent study program. The goals of the independent study program must be described along with the scope of the student's involvement. Plans for a formal summary of the project at completion (such as an abstract, presentation, summary report) must be described. The program of study must be completed within a specific four-week block.

EMGR 400 Emergency Medicine/Advanced Clinical Skills -- The Emergency Medicine / Advanced Clinical Skills (EM/ACS) Clerkship is a mandatory rotation for all fourth-year Thomas Jefferson Medical Students. Students will work closely with Emergency Medicine (EM) attendings and residents in the diagnosis and management of patients who present to the Emergency Department (ED). Students will work between 24 and 32 hours per week in the Emergency Department. Students will attend didactic lectures, clinical skill laboratories, and patient simulations during the clerkship. Students will use the Patient Encounter Log System (PELS) during the clerkship. In addition, students will have the opportunity to take the Advanced Cardiac Life Support (ACLS) Course and or the Pediatric Advanced Life Support (PALS) course during the clerkship. At the end of the clerkship, all students will take a mandatory multiple-choice examination. The curriculum for the first Monday of the clerkship and every Friday during the clerkship will be held on campus at Jefferson. All students will attend the first Monday orientation day at Jefferson and all Friday teaching/testing days at Jefferson. During the other days, students will work in the Emergency Department at either Thomas Jefferson or one of the affiliates. Students will rotate through only one Emergency Department.

X. PhD Programs

The doctoral programs within the Jefferson Graduate School of Biomedical Sciences offer cutting edge interdisciplinary education and research training under the mentorship of nationally and internationally recognized faculty. The Director of the selected Program along with the MD/PhD co-Directors oversees the PhD training. In addition to selecting a mentor for PhD thesis research, each student will need to choose a PhD Program. This decision should be made in consultation with the thesis mentor, the MD/PhD co-Directors, and the Director of the PhD Program of interest. Many mentors participate in more than one PhD Program; thus multiple PhD Program Directors may need to be consulted before reaching a final decision. The JGSBS website is http://www.jefferson.edu/biomedical_sciences/

Name of Program	Program Director	Contact Information
Biochemistry & Molecular Pharmacology (BMP)	Michael Root, MD, PhD	802 BLSB 215-503-4564 Michael.Root@jefferson.edu
Cell & Developmental Biology (CDB)	Jan Hoek, PhD, Interim Director	271 JAH 215-503-5016 Jan.Hoek@jefferson.edu
Genetics, Genomics & Cancer Biology (GGCB)	Linda Siracusa, PhD	719 BLSB 215-503-4536 Linda.Siracusa@mail.jci.tju.edu
Immunology & Microbial Pathogenesis (IMP)	Matthias Schnell, PhD	531 BLSB 215-503-4634 Matthias.Schnell@jefferson.edu
Neuroscience (NS)	Manuel Covarrubias, MD, PhD	400 JHN 215-503-4340 Manuel.Covarrubias@jefferson.edu

XI. PhD Program Requirements for MD/PhD Students

JGSBS requires the completion of 180 credits for the PhD degree: 54 topical course credits including 18 outside the chosen program with the remainder being research credits. Because of credit transfer from JMC and JGSBS credits earned during JMC year 1 and 2 MD/PhD students usually easily fulfill minimal credit requirements. Course recommendations below were developed specifically for MD/PhD students. Admission to PhD candidacy requires successful completion of a Comprehensive Examination. The Thesis Defense requires a written theses and both a public and private defense of the thesis.

1. Biochemistry & Molecular Pharmacology
Director Michael Root, M.D., Ph.D.

The Biochemistry & Molecular Pharmacology PhD Program employs a multidisciplinary approach to train students in the rigors of experimental biomedical sciences and to prepare them for independent research careers. The curriculum is designed to convey the fundamentals of biochemistry, molecular biology, pharmacology, cell biology, and genetics. The education is reinforced at the bench in cutting-edge research laboratories broadly grouped into three research emphases: Molecular and Cellular Pharmacology, Chemical and Structural Biology and Molecular Biology and Gene Regulation. Students graduating from this program will have the comprehensive scientific foundation and technical expertise to excel in all areas of biomedical research..

- BI 525 -- Genetic Information Transfer -- 3 credits
- BI 710/720/730 – Seminar -- 1 credit each for 9 terms
- BI 910/920/930 – Research -- variable credit
- GC 550D -- Foundations in Biomedical Sciences - Tool Boxes -- 1 credit
- GC 640 -- Research Ethics -- 1 credit
- GC 730 -- Planning & Writing a Research Grant -- 1 credit
- NS740 -- Applied Statistics in Neuroscience -- 2 credits
- PR 613 -- Macromolecular Structure & Function I -- 3 credits

2. Cell and Developmental Biology
Interim Director: Jan Hoek, Ph.D.

The Cell and Developmental Biology Program is intended for students of outstanding ability who are preparing for a career that includes research in cell biology, developmental biology, and/or the pathobiology of disease.

- CB 611 -- Advanced Topics in Cell Biology -- 3 credits
- CB 616/626/636 -- Current Topics in Molecular Cell Biology -- 1 credit each
- CB 625 -- Molecular Mechanisms of Development -- 3 credits
- CB 710/720/730 -- Seminar -- 1 credit each
- CB 740 – Mechanisms of Personalized Medicine –- 1 credit
- CB 910/920/930 – Research -- variable credit
- GC 550D -- Foundations in Biomedical Sciences - Tool Boxes -- 1 credit
- GC 640 -- Research Ethics -- 1 credit
- GC 660 -- Statistical Methods for Data Analysis -- 3 credits
- GC 665 – Cell Signaling –- 4 credits
- GC 730 -- Planning & Writing a Research Grant -- 1 credit

3. Genetics, Genomics, & Cancer Biology
Director: Linda D. Siracusa, Ph.D.

The Genetics, Genomics, & Cancer Biology program is designed to take a multidisciplinary approach to the field by providing the student with a strong basic knowledge of genetics, biochemistry, cell biology, and molecular biology, with additional exposure to other areas of related interest. The ultimate goal of this

program is to provide aspiring students with the background, training and experience necessary to launch careers as independent scientific investigators.

- GC550D -- Foundations in Biomedical Sciences - Tool Boxes -- 1 credit
- GC 633 -- Topics in Bioinformatics -- 3 credits
- GC 640 -- Research Ethics -- 1 credit
- GC 730 -- Planning & Writing a Research Grant -- 1 credit
- GE 612 -- Genetics of Model Organisms -- 3 credits
- GE 636 -- Regulation of Cell Cycle and Apoptosis -- 3 credits
- GE 637 -- Advanced Human Genetics -- 3 credits
- GE 651 -- Pathobiology of Cancer -- 3 credits
- GE 652 -- Molecular Basis of Cancer -- 2 credits
- GE 710/720/730 – Seminar -- 1 credit each
- GE 910/920/930 – Research -- variable credit
- NS740 -- Applied Statistics in Neuroscience -- 3 credits

4. Immunology & Microbial Pathogenesis
Director: Matthias Schnell, Ph.D.

The IMP Program is designed to take a multidisciplinary approach to the field by providing the student with a strong basic knowledge of immunology, microbiology, biochemistry, cell biology, and molecular biology, with additional exposure to other areas of related interest. The ultimate goal of this program is to provide aspiring students with the background, training and experience necessary to launch careers as independent scientific investigators.

- GC550D -- Foundations in Biomedical Sciences - Tool Boxes -- 1 credit
- GC 640 -- Research Ethics -- 1 credit
- GC 730 -- Planning & Writing a Research Grant -- 1 credit
- IMP 505 B –Immune System in Health and Disease -- 2 credits*****
- IMP 530 -- Infection and Immunity -- 3 credits
- IMP 631 -- Advanced Cellular Immunology -- 3 credits******
- IMP 632 -- Molecular Immunology -- 3 credits******
- IMP 655 -- Advanced Topics in Microbial Pathogenesis -- 3 credits
- IMP 712/722/732 – Seminar -- 1 credit each
- IMP 910/920/930 – Research -- variable credit
- NS740 -- Applied Statistics in Neuroscience -- 3 credits

  ****** *discuss requirement with Program Director, may not be necessary*
  ******* *either IMP 631 or 632 is required; suggest course available in 1st year*

5. Neuroscience
Director: Manuel Covarrubias, M.D., Ph.D.
Associate Director: Piera Pasinelli, Ph.D.

This interdisciplinary program offers students the opportunity to conduct research in diverse areas including, neurodegenerative disorders, neuropathic pain, circadian cycles, synapse development, epilepsy, neuropharmacology, etc.

- GC 550D Foundations in Biomedical Sciences - Tool Boxes 1 credit
- GC 640 Research Ethics (CRN 70263) 1 credit
- GC 730 Planning & Writing a Research Grant 1 credit

- NS 601 Profiles in Neuroscience Research 1 credit
- NS 616, 626, 636 Journal Club 1 credit each
- NS 690 Neuropharmacology 3 credits
- NS700 Cellular Neurophysiology 3 credits
- NS 710, 720, 730 Seminar Series 1 credit each
- NS 715 Cell & Molecular Neuroscience 3 credits
- NS740 Applied Statistics in Neuroscience 3 credits
- NS 910/920/930 Research variable credit

Continue participating in Journal Club and Seminar in Years 3 and 4.

Individually, all students take the comprehensive exam by the end of the second year of enrollment in the graduate program. To initiate the process, the student submits a one-page abstract of his/her intended thesis work to the Curriculum Committee (typically, by the end of Spring I of the second year of study. MD/PhD students may take the comprehensive exam by the end of the first year in the PhD program. If a student wishes to pursue this option, she/he and her/his thesis advisor must consult with the Directors of the Neuroscience Program.

Course Descriptions

BI 525: Genetic Information Transfer -- 3 Credits
Prerequisite: GC 550 or equivalent
This course focuses on current advances of molecular biology research for the understanding of genetic information transfer from DNA to RNA to protein. Topics include DNA replication, repair, and recombination, RNA transcription, processing, and regulation, protein synthesis, ribosome, and quality control. The course will contain formal lectures, as well as student presentations, and two examinations.

BI 614: Macromolecular Structure & Function II-- 3 Credits
Prerequisite: PR 613
The course will introduce students to the biological role of ligand binding and catalysis with an emphasis on experimental techniques to study the function of macromolecules. Topics include bimolecular, multivalent, cooperative and competitive binding kinetics and thermodynamics and methods for their study (dialysis, fluorescence, biosensor, calorimetry), an overview of enzyme chemical mechanisms, and detailed discussion of enzyme kinetics including single and multisubstrate reactions, steady state and pre-steady state methods, inhibition kinetics and allostery.

BI 710, 720, 730: Seminar I, II, III -- 1 Credit each
The purpose of this course is to provide a forum for the presentation and critical evaluation of recent publications in biology, including the experimental approaches taken and the conclusions drawn. The course consists of a series of oral student presentations to be discussed and evaluated by two attending faculty members following the seminar. As a part of the course, the students are expected to attend

the department's guest speaker seminars and meet with the speakers to further discuss their work. Assigned reading.

BI 910, 920, 930: Research -- Credits variable
Under the supervision of a member of the graduate faculty and guidance of a thesis research committee, the student will learn research design, methodology, and experimental techniques relevant to the graduate program. Research leading to the doctoral thesis is a major requirement for the Ph.D. degree and will occupy a dominant part of the student's time and attention.

CB 611: Advanced Topics in Cell Biology -- 3 Credits
The objective of this course if to teach advanced concepts in topical areas of molecular cell biology. Emphasis is placed on novel and controversial topics. Teaching is based on didactic lectures by faculty members and presentation/ discussion of original literature by the students. Recent topics have included: structure of membrane proteins, signaling complexes, visual signal transduction, membrane trafficking, calcium signaling, systems biology, transcriptional regulation and cell death/apoptosis.

CB 616. 626, 636: Current Topics-MCB I, II, III -- 1 Credit each
Meetings of faculty and students organized as a journal club and research in progress series, which alternate biweekly to discuss selected current literature and student progress with their thesis research, respectively.

CB 625: Mechanisms of Development -- 3 Credits
This course builds on topics covered in GC550 and applies them to mechanisms of cell differentiation and development. There is a strong emphasis on cell biology, biochemistry and genetics as student explore such dynamic cell processes as polarity, communication, migration, signaling, and morphogenesis. This course is designed to help develop student skills in analyzing and presenting papers; each didactic lecture is accompanied by a student run analysis of a relevant paper from the literature. There also is an intensive grant writing component to this course through which students are provided with one on one faculty assistance during each phase of their writing process.

CB 710, 720, 730: Seminar I, II, III -- 1 Credit each
Seminar series where visiting scientists and departmental faculty are invited to present research seminars.

CB 740: Mechanisms of Personalized Medicine – 1 Credit
The course is intended to introduce personalized medicine into the graduate school curriculum. An attending Pathologist, Resident and PhD student will jointly discuss a de-identified clinical case. The resident will present the medical background and pathology and the graduate student presents the underlying mechanism and relevant genomic/proteomic/metabolomic analysis. All students will review relevant materials prior to attending the session and are expected to actively participate in the discussion. Typical attendees include faculty, residents, fellows and PhD students. The course will be moderated by the course Director

or Co-Director.

CB 910, 920, 930: Research -- Credits variable
Under the supervision of a mentor from the program faculty and guidance of a thesis research committee the student will learn research design, methodology, and experimental techniques and perform independent research necessary to complete their approved thesis research.

GC 550 D: Foundations in Biomedical Science, Tool Boxes -- 1 Credit
This course will familiarize the student with the powerful technologies used in scientific research.

GC 630 -- Fundamentals of Clinical Trials (3 cr.) This course introduces the fundamentals of design and analysis of clinical trials. Some of the design issues discussed include specifying and operationalizing the scientific question of interest, the role of a control group randomization, blinding, and sample size determination. The course focuses on statistical aspects of the analysis of clinical trials, including various statistical estimation and testing procedures, the intent to treat principle, interim analysis, and statistical and scientific inference. Students learn to critically review published reports of clinical trials through participation in small group discussions and individual written critiques.

GC 633: Topics in Bioinformatics -- 3 Credits
An intermediate to advanced level course for students with a working knowledge of biochemistry, protein chemistry, molecular biology, genetics and basic bioinformatics skills. The course will cover topics in information theory, information technology, database structure formats, local and global sequence alignments, matrices, dynamic programming methods, network and pathway modeling, advanced phylogenetics, whole genome alignments, pharmacogenetics, chemoinformatics, proteomics, and protein modeling.

GC 640: Research Ethics -- 1 Credit
This graduate seminar course is designed to familiarize students with the ethical dilemmas inherent to the conduct of research. Topics to be discussed include codes of ethical behavior, research design, conflicts of interest, informed consent and the appropriate use of animals. The student will be required to prepare a paper on the analysis of one or more case studies.

GC 665: Cell Signaling -- 4 Credits
This course will focus on the regulation of cell function through an understanding of signal transduction mechanisms. Emphasis will be placed on cell biology aspects of signaling pathways, structure-function of signaling proteins, dysregulation of

signaling pathways in disease and the mechanism of action of drugs that target signaling proteins.

GC 730: Planning & Writing Research Grant -- 1 Credit
This course is designed to provide students with instruction and practical experience in the art of planning and writing a research grant proposal. Students will become familiar with the structure of a research grant, including the development of the major sections of a grant proposal such as specific aims, background and significance, and experimental design. Development of the experimental design section will include approaches to discussion of experimental rationale, detailed research methods, expected results and interpretations, and potential pitfalls and alternatives. Students will also learn about the peer review process and how to critique a grant proposal. NIH-style grants will serve as the model for this course, although the general principles of grant organization and writing will be applicable to all research grants. Students will gain practical experience by sequential production of three written documents: (1) an NIH-style Specific Aims Page, (2) a Research Plan based upon expansion and development of one specific aim, and (3) an NIH-style critique of a grant proposal.

GE 612: Genetics of Model Organisms -- 3 Credits
This course explores advanced (beyond those covered in the GC 550 core course) topics in the molecular genetics of eukaryotes. Primarily centered on mammalian genetics and using the mouse as a model system, it also covers selected topics in the yeast, Drosophila and zebra fish model systems. After a brief review of the principles of Mendelian genetics, including equal segregation and independent assortment, the course will cover (among other topics): the mouse as a genetic model, manipulating the mouse genome, genetic mapping of single and complex traits, non-Mendelian inheritance and epigenetic modification of the genome, bioinformatics and mouse models of human disease. The course will conclude with topics of interest in the non-mammalian systems.

GE 636: Regulation of Cell Cycle and Apoptosis -- 3 Credits
Factors controlling cell growth and mechanisms initiating cell proliferation will be discussed. Foremost will be a consideration of proto-oncogenes and their role in the regulation of cell cycle traverse. Mechanisms of proto-oncogene activation to oncogenes and the role of oncogenes and suppressor genes in uncontrolled cell proliferation and cell transformation will be discussed via a consideration of original papers and student presentations. Assigned reading.

GE 637: Advanced Human Genetics -- 3 Credits
This mammalian genetics course assumes a basic knowledge of molecular biology, molecular genetics and classical genetics. It covers a wide range of topics from clinical cytogenetics, Mendelian genetics with examples of specific diseases, population genetics and multifactorial inheritance, to physical mapping, genome informatics, mutation detection and more diseases that exemplify certain genetic principles. Finally, functional genomics, including DNA microarray analyses and applications and SNPs (single nucleotide polymorphisms) and applications are introduced.

GE 651: Pathobiology of Cancer -- 2 Credits
Spring II
The course covers the classification of human cancers, characteristics of neo-plastic cells, epidemiology of cancers, causes of cancer, experimental carcinogenesis and the immune response against neoplastic cells. Lectures and discussions are held on these individual topics. Assigned readings.

GE 652: Molecular Basis of Cancer -- 2 Credits
This advanced seminar course emphasizes the molecular and genetic basis of neoplasia, including oncogene activation, tumor suppressor genes, chromosomal translocation and deletions. Models of multistep tumorigenesis in transgenic mice.

GE 710, 720, 730: Seminars in Genetics I, II, III -- 1 Credit each
Students and faculty report on recent developments in areas of research interest on departmental research projects. Visiting scientists are also invited to pre-sent seminars.

GE 910, 920, 930: Research -- Credits variable
Under the supervision of a member of the graduate faculty and guidance of a thesis research committee, the student will learn research design, methodology, and experimental techniques relevant to the graduate program. Research leading to the doctoral thesis is a major requirement for the Ph.D. degree and will occupy a dominant part of the student's time and attention.

IMP 505 A : Fundamentals of Immunology - 2 Credits
A comprehensive course encompassing the major areas of Immunology: innate immunity, immune receptor diversity; antigen processing and presentation; T and B cells. The format for this course will involve both lecture and discussion of specific topics, and students will be encouraged to acquire an understanding of classical and modern immunological concepts through analysis of their experimental bases. Discussion of critical techniques in Immunology will be incorporated throughout the course. Assigned reading.

IMP 505 B: Immune System in Health and Disease – 2 Credits
Prerequisite: IMP 505A or equivalent.
The course discusses the role of the immune system in maintaining health: immune tolerance, microbial immunity; transplantation; tumor immunology. The format for this course will involve both lecture and discussion of specific topics, and students will be encouraged to acquire an understanding of classical and modern immunological concepts through analysis of their experimental bases. Discussion of critical techniques in Immunology will be incorporated throughout the course. Assigned reading.

IMP 530: Infection and Immunity -- 3 Credits
Prerequisite: IMP 505 A and B or equivalent
This course provides students with an introduction to the field of microbial immunology. Lectures will focus on immune responses to infectious agents; how

pathogenic organisms evade immune-mediated elimination; how immunization protects against infection. Organisms ranging from viruses through bacteria to protozoa, helminths, and arthropods will be studied.

IMP 631: Advanced Cellular Immunology -- 3 Credits
Prerequisite: IMP 505 A and B or equivalent
This course emphasizes current concepts and controversies in ontogeny, cellular interactions, activation and regulation of normal and defective immune responses primarily through discussion of current literature.

IMP 632: Molecular Immunology -- 3 Credits
Prerequisite: Prerequisite: IMP 505 A and B or equivalent
This course concentrates on the molecular and genetic basis of lymphocyte receptor signal transduction, activation, and maturation. Emphasis will also be placed on the role of cytokines and interaction molecules for antigen recognition and cytotoxic mechanisms. The immunogenetics of MHC and non-MHC molecules and their impact upon immune responses will also be discussed. Through assigned reading and discussion of notable scientific literature in these areas, students will gain a basic understanding of the current concepts.

IMP 655: Advanced Topics in Microbial Pathogenesis -- 3 Credits
This advanced course will present examples of how pathogens cause disease in their hosts and emphasize the molecular mechanisms of pathogenesis for the three major types of microbial pathogens: bacteria, parasites, and viruses. Basic course work in Microbiology, Immunology, and Cell Biology is a prerequisite for this course.

IMP 712, 722, 732: Current Literature in Immunology I, II, III -- 1 Credit each
A weekly presentation and discussion of recent literature in Immunology for students and faculty. Students will present on a rotating basis and are encouraged to participate in the general discussion.

IMP 910, 920, 930: Dissertation Research -- Credits variable
Under the supervision of a member of the graduate faculty and guidance of a thesis research committee, the student will learn research design, methodology, and experimental techniques relevant to the graduate program. Research leading to the doctoral thesis is a major requirement for the Ph.D. degree and will occupy a dominant part of the student's time and attention.

NS 616, 626, 636: Neuroscience Journal Club I, II, III - 1 Credit each

NS 710, 720, 730: Seminar I, II, III -- 1 Credit each
This course exposes graduate students to current topics in neuroscience with oral presentations from faculty from within or outside the university. Students matriculated into the neuroscience graduate program are required to register for the neuroscience seminar. However, the seminar is open to all TJU students, faculty and staff. This seminar series is an excellent forum for students with interest in neuroscience to be exposed to a diverse range of topics, to observe experienced presenters, and network with TJU neuroscientists as well as invited speakers.

NS 715: Molecular / Cellular Neuroscience -- 3 Credits
This course provides a detailed analysis of molecular and cellular neuroscience through the combination of didactic lectures and journal article based discussions. An emphasis will be placed on approaches used to investigate questions in several general ideas, including developmental neuroscience, cellular signaling, second messengers and the molecular genetic basis of behavior and disease. Lectures and discussion of primary literature expand on and deepen understanding in particular areas of molecular and cellular neuroscience introduced Neuro I. In addition a section on molecular genetic control of neurologic function and behavior will introduce new concepts and approaches to the study of neuronal dysfunction and disease. The inclusion of primary literature in the course promotes an understanding of analytical approaches to questions in neuroscience as well as critical scientific thinking. The primary literature also makes more accessible to students many of the techniques used in molecular and cellular neuroscience. Moreover the combination of didactic and discussion sessions for each topic allows the integration of knowledge acquisition with an analytical assessment of experimental molecular and cellular neuroscience.

NS 740: Applied Statistics in Neuroscience -- 2 Credits
This course serves as a graduate level introduction into applied data analytic strategies focused in the neurosciences. An understanding of hypothesis testing, the relationship of design and analysis, and the interpretation of statistical tests of significance will be strongly emphasized. Methods for collecting and organizing study data, including an introduction to data analytic software such as SPSS and SAS, will be discussed. The ultimate objective of the proposed course is to provide graduate level neuroscience students will sufficient skill to independently enact various forms of data analysis.

NS 910, 920, 930: Research -- Credits variable
With the guidance and supervision of a member of the neuroscience graduate program faculty and a thesis research committee, the student will develop a research project and acquire the necessary technical expertise to conduct the research project. Research time towards the completion of a doctoral thesis will occupy a dominant part of the students time in more advanced years of study.

PR 613: Macromolecular Structure & Function I-- 3 Credits
Prerequisite: GC 550 or equivalent
Protein and nucleic acid structure and function; focusing on energetic forces that guide folding, and computer modeling to predict structures. To reveal protein and nucleic acid structures we will study optical spectroscopy (absorbance, fluorescence, circular dichroism), electrophoresis, mass spectroscopy, magnetic resonance spectroscopy, and X-ray crystallography. We aim to develop critical, analytical and problem-solving abilities in structural biology. Lectures on Monday and Friday will be supplemented by problem sessions or hands-on experience on Wednesdays, in the classroom, laboratories, or offices.

Thomas Jefferson University MD/PhD Program Organizational Chart

Program Office

Co-Directors

Administrative Director

Steering Committee
JGSBS Dean, Chair
Executive Subcommittee
JMC Vice Dean for Research
Faculty Representatives
JPSA Representatives

External Advisory Board
Perry Halushka, MUSC, Chair*
Robert Siliciano, JHSM
Sharon Welling, JHSM
Paul Insel, UCSD
Lawrence 'Skip' Brass, U PA

Executive Subcommittee
S. Waldman, Chair
Co-Directors
Administrative Director
JMC Dean of Admissions
JMC Dean of Student Affairs
JGSBS Dean

Admissions Subcommittee
L. Eisenlohr, Chair
Co-Directors
Administrative Director
PhD Program Directors

Progress Subcommittee
JGSBS Dean, Chair
Co-Directors
Administrative Director
JMC Dean of Student Affairs

Curriculum Subcommittee
H. Rui, Chair
Co-Directors
JGSBS Dean
Administrative Director
JPSA Representatives

Jefferson Physician Scientists Association (JPSA)

MUSC - Medical University of South Carolina
JHSM - Johns Hopkins School of Medicine
UCSD - University of California, San Diego
U PA – University of Pennsylvania

GC 710, 712, 714 - Current Topics in Translational Biomedical Research I, II, III - 1 credit each

Course Coordinators: Dr. Waldman, Dr. Eisenlohr, Dr. Root

The course meets three or four weeks per month during each session: Fall, Spring 1 and Spring 2

Course Components and Schedule:

Progress in Translational Research Seminar - 1st Monday; 12-1 PM

Allows students to present the results of their ongoing thesis research. Research presentations highlight the translational applications of the research that will solve a clinical problem, impact patient care, or prevent disease in individual patients or populations. Student presentation will be evaluated by attending faculty.

Case Studies in Molecular Medicine - 2nd Wednesday; 5-7 PM

Provides concrete case studies in which novel molecular concepts are applied to the development of new diagnostic and therapeutics modalities for patient management. This program challenges trainees to think critically about the realistic and practical applications of laboratory-based discoveries and provides a context for the processes, steps and timelines required for translation from bench to bedside.

Ethics Case Conference – 4th Tuesday; 12-1 PM Required while in JGSBS 3 (year 5 of MD/PhD Prorgram)

MD/PhD trainees participate in a monthly conference that focuses on ethical issues in research and medicine. The format for these conferences is small group discussion and case-based. Faculty and trainees select pre-reviewed case studies from the literature that form the focus for directed discussion at the conference. The specific focus of these conferences is experimental research ethics. Faculty mentors provide guidance in the development of the presentation and provide trainees with constructive criticism.

Translational Research Journal Club - 4th Wednesday; 5-7 PM

Provides opportunities for students in the MD/PhD program to read, interpret, synthesize, and present literature in translational science to peers and faculty. The journal topics specifically focus on translational research appearing in the highest impact scientific journals.

Evaluation: Students are evaluated for attendance, participation and presentation skills. Grading is Satisfactory / Unsatisfactory.

Model Month in JCGS	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Monthly MD/PhD Program Components							
•Research in Progress (1 h/month)	1	2	3	4	5	6	7
•Case Studies in Molecular Medicine (1 h/month)	8	9	10	11	12	13	14
•Ethics Case Conference (1 h/month)	15	16	17	18	19	20	21
•Journal Club (1 h/month)	22	23	24	25	26	27	28
•Clinical Skills (4 h/month, actual day varies)	29	30	31				

RESEARCH in PROGRESS EVALUATION

Student's Name _____

Reviewer's Name _____

Date _____

A. Answer questions below as follows:

1 = Excellent; 2 = Acceptable; 3 = Below Expectations

A. Based on the presentation, the student appears to:

a) clearly grasp the objective (s) of the research. _____

b) understand the significance of the results to date. _____

c) understand the limitations of the results to date. _____

d) understand the future course of experiments to be done. _____

e) show the necessary laboratory skills and technical ability to carry on the research._____

B. With regard to the presentation the student exhibits the ability to:

a)organize data _____

b) exchange ideas _____

c) respond to questions and critiques _____

Comments:

Synopsis of Research Performed During Summer Lab Rotation

STUDENT:_____	**MENTOR: _____**
Student Signature: _____ _____	**Mentor Signature:** _____ _____
Synopsis: limit text to box:	

FACULTY EVALUATION OF LABORATORY ROTATIONS

Name of Student: _____ **Period of Rotation:**_____ _____

Name of Preceptor: _____

1=Excellent 2=Acceptable 3=Below Expectations

1. a) Effort during rotation period _____
   b) Ability to organize available time _____
   c) Ability to conceptually grasp the aims of the rotation _____
   d) Ability to learn methods _____
   e) Experimental precision and accuracy _____
   f) Ability to interpret results _____
   g) Ability to amicably work alongside others in laboratory _____
   h) Success in achieving and completing goals set for rotation _____

2. Overall prediction of this student's potential to do independent research.

3. Please list in order of importance your opinion of this student's greatest strengths and weaknesses.

4. Final Grade (Satisfactory / Unsatisfactory): _____

Signature:_____

Flexible Re-entry for MD/PhD Students in JGSBS/JMC Transition

The Jefferson MD/PhD program includes two major transition points between Jefferson Medical College and the Jefferson College of Graduate Studies. The first occurs when students complete year JMC2, including completion of Step 1, and take leave of absence from JMC to pursue their four years of graduate study and associated research. The second occurs when students complete their thesis research and return to year JMC3.

It is preferred that MD/PhD students complete all phases of their graduate study, including defense of their thesis, prior to returning to JMC in time to join a new cohort beginning JMC year 3. However, the nature of scientific research is such that it is sometimes difficult to complete their studies at a predetermined time based upon the academic calendar, and thus occasionally an MD/PhD student would greatly benefit from the ability to delay their return to JMC for a short period. This could have a significantly positive impact on the completion of their research project, resulting publications, and completion and defense of their scholarly thesis. In the absence of any flexibility, the student must choose to either delay their return to JMC for an entire year, or suboptimally curtail their research and/or delay their thesis defense until after they have returned to JMC.

Thus, MD/PhD students may request a delay in their return to JMC3, of up to three months, to return no later than October to join up with the cohort of JMC3 students. This would require the student to present a defined plan and timeline for completion of both their graduate studies and their remaining JMC requirements. This plan must receive approval from their thesis advisor and thesis committee, their respective PhD and MD/PhD program directors, their JMC student affairs dean, and the JMC promotions committee.

In granting this flexibility, the student would understand that they may not receive their first choice or sequence of electives, and may have to utilize vacation time to schedule and complete their JMC3 and JMC4 requirements.

These exceptions would be few in number, as most students complete their transitions on time, and there are typically only five MD/PhD students in any one annual cohort.

Annals of Internal Medicine Rotation
K30 Training Program in Human Investigation

Introduction:
The Annals of Internal Medicine is the flagship publication of the Philadelphia-based American College of Physicians. It is considered the premiere worldwide internal medicine journal. Editor in Chief **Christine Laine, MD, MPH** has offered members of the K30 Program in Human Investigation program unprecedented access to the editorial process through a 4-week rotation. Enrollees can participate in the weekly editorial and statistical meetings of the journal. Maximal benefit of the rotation is obtained when participants read a majority of the articles being discussed. *Therefore, participants should schedule the rotation during a period when they have the time to devote to preparation for each session. Time periods with heavy clinical or administrative activities do not provide the time to maximize the benefit of each meeting.*

Rotation Coordinators:

Thomas Jefferson University
Walter Kraft, MD
1170 Main, 132 S. 10th St, Philadelphia, PA
215 955 9077 walter.kraft@jefferson.edu

Annals of Internal Medicine
Christine Laine, MD, MPH
215 351.2527 claine@mail.acponline.org

Administrative Assistant: Renee Wise, RWise@mail.acponline.org

Rotation Goals:
Participants will:
- Observe and participate in the editorial process of a major medical journal
- Understand the accepted statistical standards for high quality clinical research
- Incorporate the critical assessment of research observed in the editorial process to their personal research projects

Duration:
4 weeks

Meeting Times:
Editorial Meetings: Every Thursday, 4-6 PM
Statistical Meetings: 3-4 PM, prior to each editorial meeting.

Location:
ACP
5th floor, 190 N. Independence Mall West, Philadelphia (at the corner of 6th and Race St, which is a 10 minute walk from the Jefferson Medical College Campus)

Prerequisites:
Participants should have completed GC 660, Statistical Methods of Data Analysis (or equivalent). Completion of track courses in Epidemiology (GC 655) or Clinical Trial design (GC 630) is helpful, but not required.

Reference Texts:
The following resources will be available for loan from the Division of Clinical Pharmacology:

Lang TA, Secic M. *How to Report Statistics in Medicine.* Philadelphia, American College of Physicians; 1997

Guyatt G, Rennie D, Ed. "Users Guide to the medical literature", Chicago, AMA Press, 2002

Rotation Guidelines:

Editorial Process at the Annals

Articles submitted for publication in the Annals are first screened by one of three deputy editors. Articles felt to be candidates for publication are sent to outside reviewers for comments. Articles with the reviewer comments are distributed to the associate editors one week before meetings. The associate editors each have a specific area of expertise. An associate editor is asked by the deputy editors to serve as a primary reviewer for each manuscript presented to the group.

After discussion during the editorial meetings, the Editor meets with the deputy editors to decide the fate of each of the articles.

Following editorial review, some articles are also evaluated for statistical validity at a statistical meeting held Thursdays at 3 PM.

Scope of Participation

Participants are expected to read most of the articles prior to each meeting. Individuals with germane expertise can participate in the discussions of a manuscript. In addition, participants should use the reference texts to review topics discussed at the editorial meetings. Participants should provide a short written evaluation of the rotation during the feedback session with the course coordinator.

Annals format

Participants should read a few of the last issues of the Annals to get an idea of focus of the journal and familiarity with the following types of articles:

- Systematic reviews
- Policy positions
- Original articles
- Brief communications

- Updates
- Academia and Clinic

Scott Library has a subscription to the Annals. The Division of Clinical Pharmacology has back issues of the Annals available for use, as well as access to PDF files from the excellent web site www.annals.org.

Obtaining Manuscripts

Manuscripts are delivered by courier the week of the editorial meeting.

Securing Access to the ACP Building

All visitors to the ACP should bring a form of identification and will need to obtain a building pass. Prior to the orientation session with Dr. Laine, participants should confirm that the front desk has their name as an expected guest.

Schedule

Week		Suggested Activities
1	Orientation at TJU	• Meet with Walter Kraft for overview and distribution of texts • Read recent editions of The Annals to review journal format • Contact Dr. Christine Laine and provide her with a local address for courier delivery of manuscripts
2	Orientation at ACP	• 2:30 PM- Meet with Dr. Laine; obtain temporary pass • 3:00 PM-Attend statistical meeting • 4-6 PM- Attend Editorial meeting • 6-6:30 PM- Attend meeting with Editor and deputy editors
3	Editorial Meeting	• 4-6 PM- Attend Editorial meeting • 6-6:30 PM- Attend meeting with Editor and deputy editors
4	Editorial Meeting	• Write editorial review of a manuscript prior to meeting • 4-6 PM- Attend Editorial meeting • 6-6:30 PM- Attend meeting with Editor and deputy editors
5	Final meeting and feedback	• Write editorial review of a manuscript prior to meeting • 4-6 PM- Attend Editorial meeting • 6-6:30 PM- Attend meeting with Editor and deputy editors and final feedback • Schedule time to discuss rotation at TJU with Walter Kraft

MD/PhD PROGRAM SPECIFIC REQUIREMENTS BY YEAR

YEAR 1 – JMC 1	• Pre-entry Research Rotation (optional)
	• MD/PhD Orientation
	• Current Topics in Translational Biomedical Research
	  o Student Research Seminar – 1st Monday, noon
	  o Case Study in Molecular Medicine – 2nd Wednesday, 5pm
	  o Translational Research Journal Club – 4th Wednesday, 5 pm
	• MD/PhD Retreat – usually October, Saturday all day
	• Physician Scientist Dinners
	• Summer Research Rotation

YEAR 2 – JMC 2	• Current Topics in Translational Biomedical Research
	  o Student Research Seminar – 1st Monday, noon
	  o Case Study in Molecular Medicine – 2nd Wednesday, 5pm
	  o Translational Research Journal Club – 4th Wednesday, 5 pm
	• MD/PhD Retreat – usually October, Saturday all day
	• Physician Scientist Dinners
	• Complete USMLE Step 1 before June 30
	• Summer Research Rotation, if needed
	• Identify thesis Research Mentor and PhD Program

YEAR 3 – JGSBS 1	• Current Topics in Translational Biomedical Research
	  o Student Research Seminar – 1st Monday, noon
	  o Case Study in Molecular Medicine – 2nd Wednesday, 5pm
	  o Translational Research Journal Club – 4th Wednesday, 5 pm
	• Enrichment Course in Clinical Skills – Dr. Grunwald
	• MD/PhD Retreat – usually October, Saturday all day
	• Physician Scientist Dinners

YEAR 4 – JGSBS 2	• Current Topics in Translational Biomedical Research
	  o Student Research Seminar – 1st Monday, noon
	  o Case Study in Molecular Medicine – 2nd Wednesday, 5pm
	  o Translational Research Journal Club – 4th Wednesday, 5 pm
	• Enrichment Course in Clinical Skills – Dr. Majdan, one half day per month
	• GC 630 – Fundamentals of Clinical Trials
	• MD/PhD Retreat – usually October, Saturday all day
	• Physician Scientist Dinners

YEAR 5 – JGSBS 3	• Current Topics in Translational Biomedical Research
	  o Student Research Seminar – 1st Monday, noon
	  o Case Study in Molecular Medicine – 2nd Wednesday, 5pm
	  o Translational Research Journal Club – 4th Wednesday, 5 pm
	• Ethics Case Conference – 4th Tuesday, noon

	• Enrichment Course in Clinical Skills – Dr. Majdan, one half day per month • Rotation on Cancer Clinical Research Review Committee (CCRRC) – Dr. Waldman, 6 one hour meetings • MD/PhD Retreat – usually October, Saturday all day • Physician Scientist Dinners

YEAR 6 – JGSBS 4	• Current Topics in Translational Biomedical Research
	  o Student Research Seminar – 1st Monday, noon
	  o Case Study in Molecular Medicine – 2nd Wednesday, 5pm
	  o Translational Research Journal Club – 4th Wednesday, 5 pm
	• Enrichment Course in Clinical Skills – Dr. Majdan, one half day per month
	• Critical Review of Scientific Literature – Rotation at Annals of Internal Medicine – Dr. Koch
	• MD/PhD Retreat – usually October, Saturday all day
	• Physician Scientist Dinners
	• Complete 'Third Year Primer', JMC's Clinical Refresher course before returning to JMC in July

YEAR 7 – JMC 3	• Present one Case Study in Molecular Medicine • MD/PhD Retreat – usually October, Saturday all day; if no clinical conflict • Physician Scientist Dinners – if no clinical conflict
YEAR 8 – JMC 4	• Present one Case Study in Molecular Medicine • MD/PhD Retreat – usually October, Saturday all day; if no clinical conflict • Physician Scientist Dinners – if no clinical conflict