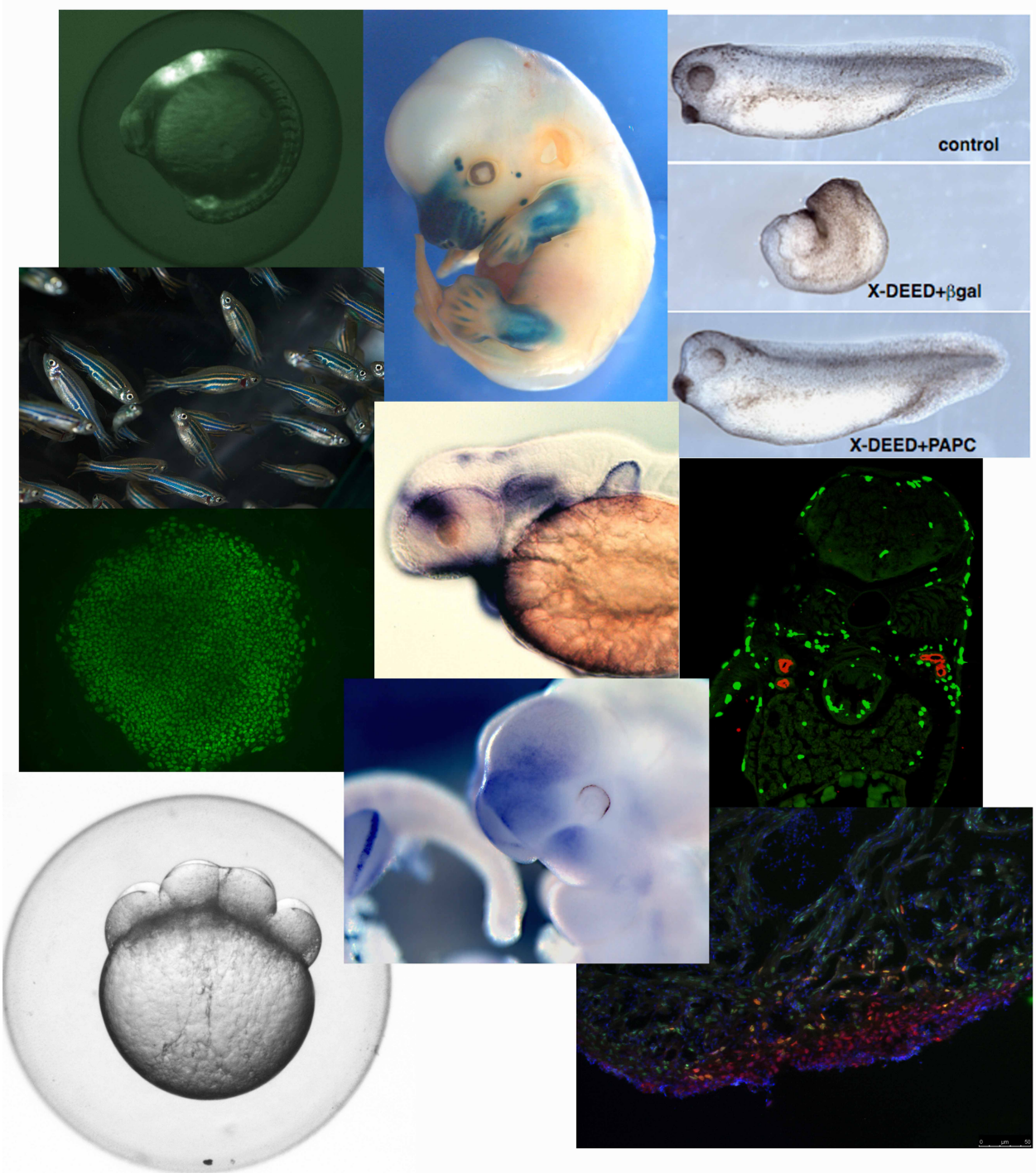
MOLECULAR GENETICS & DEVELOPMENTAL BIOLOGY
FACULTY/STUDENT GUIDE: 2019-2021



INTRODUCTION

The Molecular Genetics and Developmental Biology (MGDB) graduate program provides an exceptionally exciting and vigorous academic environment for highly motivated and qualified students to prepare for a rewarding career in biomedical research. The members of the faculty have a wide diversity of interests and are pursuing research projects that address fundamental, contemporary issues in biology and medicine. We are also committed to postgraduate education and share as a major objective the integration of students into the most important aspects of our investigative work. The MGDB program brings together faculty in both basic and applied sciences, including researchers from the School of Medicine, University of Pittsburgh Cancer Institute, Magee-Womens Research Institute and Biological Sciences. MGDB research is at the cutting edge of many emerging fields, including developmental and reproductive biology, stem cell biology, proteomics, computational biology and genomics. Our work has direct relevance to acute injury, congenital disorders, cancer, diabetes, muscular dystrophy and other genetic diseases. The faculty members in the MGDB program have diverse research interests and are exploring questions that address fundamental and critical issues in biomedical research. Faculty research interests can be broadly divided into three major areas:

Developmental and Reproductive Biology: Researchers in this area are focused on the broad scope of developmental events including early embryonic patterning, organogenesis, and the transition from gamete to a reproductive organism. Projects in this area utilize both human and model organisms to bring together diverse aspects of the cell and developmental biology and their impact on disease pathology.

Stem Cell and Regenerative Biology: Researchers in this area are focused on the basic mechanisms controlling (1) embryonic stem (ES) cells, as well as adult stem cell growth, and induced pluripotent stem cells and (2) tissue regeneration. Specific projects include eye, heart, kidney, and liver regeneration, genetic and epigenetic mechanisms that regulate ES cell differentiation, control of the cell cycle in hematopoietic progenitor cells and muscle stem cells, and regulation of gene expression in germ stem cells.

Molecular Genetics and DNA Repair: Researchers in this area are focused on signaling and transcriptional responses of cells to their environment. Project examples include glucose-induced kinase responses in yeast, immunoglobulin gene expression and B-cell development, transcriptional responses of macrophages to cytokines and inflammation, and coupling of growth factor receptors to phospholipases and phosphoinositides. Mechanisms controlling DNA damage repair, and the relationship of misregulation of DNA repair to cancer and chromosomal abnormalities. Myc/Max transcription factors, Bcr-Abl and Src tyrosine kinases, and the p53 and Rb tumor suppressor proteins.

For a more detailed description of individual faculty research, please visit the MGDB graduate program website. (http://www.mgdb.pitt.edu)

I. DOCTOR OF PHILOSOPHY DEGREE

A. ADMISSION

All interested students apply for admission through the Interdisciplinary Biomedical Graduate Program, not directly to the MGDB program.

Students for the Interdisciplinary Biomedical Graduate Program are selected from a large pool of highly qualified national and international applicants. They are graduates of prestigious colleges and universities with superior research interests and talents. Only students seeking the PhD degree are encouraged to apply.

Requirements for admission include a baccalaureate degree in a natural or physical science or engineering program. Candidates should possess a minimum grade point average of 3.2 (on a scale of 4) or its equivalent from an accredited institution.

Prior research experience is highly desirable and letters of recommendation from faculty familiar with the applicant's research accomplishments are particularly valuable to the evaluation process.

Selected applicants will be invited for an interview at the University of Pittsburgh. Funds to cover travel expenses are available. In certain circumstances, the Graduate Studies Admissions Committee may choose to conduct a telephone interview with the prospective candidate.

Foreign applicants from countries other than Canada, Australia, the United Kingdom and New Zealand are required to take the Test of English as a Foreign Language (TOEFL) and provide official score reports from both the spoken (TSE) and written (TWE) parts of the examination.

The deadline for receipt of applications is December 15 for admission to the subsequent fall term. However, early applications are encouraged, and offers may be extended to suitably qualified candidates before the application deadline.

B. FINANCIAL AID

Financial support with remission of tuition and fees is available to all graduate students in the program. Students may be supported from the following sources:

1. **Dean's Fellowships.** All applicants are supported through the Dean's office during the first year of study. Support consists of tuition remission and a stipend for the first year of graduate study. The remaining years of study are supported by training grants or individual faculty research funds.
2. **Research grants to individual faculty members.** Students involved in thesis research are frequently supported from research grants to their major advisor. It is the policy of the Program that the amount provided by faculty members for student support will be such that the total stipend received by the student from all departmental or medical school student support funds shall be neither greater nor lesser than the stipend level designated by the Interdisciplinary Biomedical Graduate Program. Student stipend support by faculty research grants will begin at the conclusion of the Dean's Fellowship support.
3. **Training Grants.** A limited number of students involved in thesis research are supported by training grants in specific programs. In order to be eligible for these funds, the student's major thesis advisor must be training faculty on that specific training grant.
4. **Foundation and Government Fellowships.** Qualified first-year students are strongly encouraged to apply for these prestigious and highly competitive awards.

All Ph.D. degree candidate students are expected to receive a stipend regardless of the sources of support. If the amount of the stipend a student receives from any source is less than the current year stipend rate, the sponsor of the student is expected to make up the difference.

The University will provide individual health insurance under the graduate student plan. An option to purchase family coverage is available at a cost, which is the difference between family coverage and individual coverage.

As part of the Program's intention to provide the greatest opportunity to develop scholarship and research skills, stipends are intended to support full-time commitment on the part of the student to successfully complete his/her graduate training in a reasonable period of time.

C. INTERDISCIPLINARY BIOMEDICAL GRADUATE PROGRAM

All students admitted to the Ph.D. program in the School of Medicine join the Interdisciplinary Biomedical Graduate Program (IBGP). The IBGP committees supervise the first-year curriculum, oversee student research rotations and evaluate students until they join one of the specialized programs at the end of the first year. The IBGP is designed to facilitate the matching between students and their areas of research interest, and to encourage the timely progression of students through the process of matriculating at the University of Pittsburgh, School of Medicine. The activities of the IBGP are governed by the Graduate Council.

C.1. First-year Curriculum

The Foundations of Biomedical Science is the IBGP core course, which is required of all first year IBGP students. It meets for two hours per morning for the first semester and is supplemented by small group sessions twice a week in the afternoons. This course is designed to provide an overview of the fundamental elements of contemporary biomedical science that should be common to all students, regardless of their interests. A course in experimental design and analysis, offered in the summer at the end of the first year, is also required. Finally, all students are required to take Scientific Ethics and the Responsible Conduct of Research. This class incorporates a discussion of ethics into a series of career development presentations. Students are required to attend all lectures in this course within the first two years in the program.

After the first semester there is considerably more flexibility in the choice of classes. Each program offers one or more classes in the second semester and the schedules for the classes generally do not overlap. Students should choose second semester classes based on their own interests and the requirements of the programs they anticipate joining. Consultation with their mentor is required prior to enrolling in classes for the second semester.

In unusual cases, a student’s educational background may preclude the need to take one or more of the courses offered by the IBGP. In this situation, the student should meet with the appropriate course director who may recommend that requirements be waived or that the student take an exam to place out of the course.

If a student fails to achieve a passing grade in any course, make-up exams may be offered. This is entirely at the discretion of the course director, and students concerned about performance in a course should discuss this with the director at the earliest opportunity.

C.2. Research

Laboratory research is the major component of any biomedical Ph.D. program. The IBGP supervises the process of research rotations during the first year. Students are expected to complete three research rotations during the first year. At the end of each rotation, the student is required to complete a written report that is prepared according to the style suggested for contributors to the Journal of Biological Chemistry. When the written report is complete, the rotation mentor will review the performance of the student and assign a letter grade for the rotation. Failure to maintain satisfactory laboratory performance will result in dismissal from the program.

It is generally expected that the three rotations will be performed in different laboratories of members of the IBGP training faculty. This will provide the student with an adequate opportunity to identify an area of research interest and to establish a relationship with a potential dissertation advisor. It is possible for students to take a fourth rotation if necessary. There are several circumstances where the requirement for three rotations or laboratories might be relaxed. For example, if a student has completed a Masters degree thesis based on original research, a report of this project may be submitted in place of a rotation report. Alternatively, students may want to do a second rotation in the same laboratory if they have already identified a dissertation advisor, or may even want to rotate in a laboratory outside of the IBGP. Requests to modify the rotation requirements must be made, in writing, to the Dean of Graduate Studies.

D. TRANSFERRING FROM THE IBGP TO A DEGREE GRANTING PROGRAM

At the end of the first year, students will undergo the preliminary evaluation by the STEP committee and, on successful completion, will transfer into one of the four specialized, degree granting programs. The choice of program is likely to be dictated by the choice of dissertation advisor. The process of moving into a specialized program should occur as follows:

1. Identify a dissertation advisor. This decision is based on rotation experiences, particular research interests, exposure to faculty during classes and talking with other graduate students.
2. Receive permission from the advisor to join the laboratory. Most of the training faculty will welcome students into their laboratories. However, certain circumstances may prevent a student from joining the lab of choice. If a laboratory is already full, if there is not sufficient funding available to support an additional student, or if the rotation work was not sufficient, a faculty member may decline to take a student.
3. Identify the appropriate program. Many of the training faculty have appointments in two programs, so a student may choose the program that best fits their interests.
4. Petition the program director in writing for admission into that program. The program director will determine whether you have met the course requirements for the program or may suggest second year classes to take. Students may want to meet with program directors of programs in which they are interested near the end of the first semester to determine which classes are recommended for the second semester. Successful completion of the Foundations of Biomedical Science core course is a requirement for entering the MGDB graduate program.

E. DEGREE REQUIREMENTS

E.1. Requirements for a Ph.D.

The Interdisciplinary Biomedical Graduate Program is comprised of formal course work and original laboratory research, which is designed to allow attainment of a Ph.D. in 4-6 years. The University requires students seeking the Ph.D. degree to engage in a minimum of one term of full-time doctoral study, which excludes any other employment except as approved by their departments. The Ph.D. degree work must be completed within a period of 10 years from the student's initial registration for graduate study. If the student has received credit for a master's degree appropriate to the field of study, then all requirements for the Ph.D. degree must be completed within eight years.

A minimum total of **72 credits are required** to satisfy the Ph.D. requirement. Of these, **32 credits must come from approved courses and lab rotations**, not including Dissertation

Research.

E.2. Requirements for a Masters Degree.

Students are not admitted to the MGDB graduate program to attain a M.S. degree. In certain cases, however, it may be necessary that a student in the Ph.D. program be transferred to a terminal M.S. degree program. Students pursuing a M.S. degree in MGDB will be required to complete the same course work as described for the Ph.D. program during the first year and to prepare and successfully defend a Masters Thesis.

F. COURSES

All students in the first term will enroll in the Foundations of Biomedical Science core course. Students in the MGDB Program must fulfill the remainder of their degree requirements by enrollment in the required and elective courses approved by the MGDB Program. A brief description of courses offered by the MGDB Program can be found at the MGDB website.

Required courses:

- Foundations of Biomedical Sciences 12 credits
- Model Organisms 2 credits
- Developmental Mechanisms of Human Disease 2 credits
- Scientific Ethics and Responsible Conduct of Research 1 credit
- Research in Progress Seminar (six semesters) 1 credit per term
- Laboratory Rotation 1 credit per rotation
- D2K Biomedical Experimental Design & Analysis 3 credits
- Graduate Student Writing Seminar 2 credits

Students will be graded by the A-F system (letter grade) for all required courses (exception: Research Seminar). A written report of each Laboratory Rotation will be required as part of the Laboratory Techniques grade. This report is to be graded by the project advisor. If an incomplete ("I") grade is given by a faculty member to a student in this course, a memo must be prepared by the faculty member and sent to the graduate student advisor and the student, stipulating what measures must be taken and the time frame within which the student is to make up the grade.

In order to effectively involve all students in active participation in all aspects of the Graduate Program, we strongly recommend that entering graduate students who are not fluent in English take a University course in conversational English. This may be taken without credit if desired, but in any event any grade from such a course will not contribute to the student's QPA for the Graduate Program.

Elective Courses:

A total of at least three elective courses must be taken in the second and third years. Two courses are required from within the MGDB program, and one may be chosen from outside the program (either a 2000 or 3000 level course) for a minimum of 7 credits. The MGDB program offers the following electives:

A. Reproductive Development from Model Organisms to Humans (3 cr)
B. DNA Repair Journal Club (1 cr)
C. Genome Instability and Human Disease (3 cr)
D. Molecular Mechanisms of Longevity & Aging (2 cr)

Overview of the Path towards Obtaining an Advanced Degree

First Year, First Term	
• Foundations of Biomedical Science	12 credits
• Laboratory Rotation	1 credit
First Year, Second Term	
• Developmental Mechanisms of Human Disease	2 credits
• Model Organisms	2 credits
• Laboratory Rotation	1 credit
• One elective (optional)	2-3 credits
• Directed study	1-9 credits
First Year, Third Term	
• Laboratory Rotation	1 credit
• Scientific Ethics and Responsible Conduct of Research	1 credit
• D2K Biomedical Experimental Design & Analysis	3 credits
• Select thesis advisor/lab (before July 1)	
End of First Year: Evaluation and promotion to the second year based on grades in courses and reports from Laboratory Rotations.	
Second Year	
• Continuation of elective course work in anticipation of completion of courses by the end of the second year (possibly third).	
• Graduate Student Writing Seminar	
• Research in Progress Seminar	
• Comprehensive Examination. Prepare written proposal on the thesis project and defend it by oral examination before a committee of 3 faculty members.	
• Choose Thesis Committee	
• Advancement to candidacy for the Ph.D.	
Subsequent Years	
• Research in Progress Seminar	
• Full time devoted to thesis research	
• Write and defend thesis	
• Graduation!	

Progress evaluation:

A preliminary evaluation at the end of the first year assesses student progress. Subsequently, each program evaluates progress in appropriate ways, including a comprehensive exam generally taken at the end of the second year. Upon successful completion of the comprehensive exam, students will propose a doctoral committee and present a dissertation proposal as promptly as possible.

An annual review of all MGDB students will be conducted by the Steering Committee. If a significant deficiency is identified, the student will receive an unsatisfactory rating and may be placed on probation. Specific recommendations within a designated time frame will be given. Failure to remedy the unsatisfactory areas may result in dismissal from the program. A decision of dismissal shall be made by a majority vote of the Steering Committee.

Grades:

University policy dictates that the student must have a cumulative grade point average (QPA) of at least 3.0 for graduation. This grade is computed on the basis of course credits only, and students are graded on an A to F basis in required and elective courses. The Program requires that the student obtain a minimum of a B grade in all required courses and maintain a QPA of 3.0. Only A through F grades are employed for the QPA computation. If a student has failed to maintain the minimum grade requirement, the faculty must decide whether to dismiss the student from the Program or allow the student to retake any required course for which a grade less than a B was received, as well as restore a minimum QPA of 3.0; such students will be on probation. Students on probation will be eligible for tuition remission but no automatic provision for stipends will be made. It will be the student's responsibility to seek out research support.

G. FACULTY ADVISOR

During the first two terms in residence, each student is expected to interview the Program faculty members regarding possible research areas for their dissertation. In the third term after completion of the Preliminary Evaluation, the student will choose an advisor who will give assistance on the decision about the subject of the dissertation research program and who will remain in close consultation with the student about various aspects of the research as it unfolds. The student must submit to the Director of the Program written notification of the choice of a faculty advisor. Students enrolled in the MGDB Program may select a thesis advisor only from the MGDB Program faculty. Current MGDB Program faculty and their research interests are listed on the MGDB web site.

H. RESEARCH CREDITS

Students enrolled in the M.S. program will register for MSMGDB 2500 for their research accreditation. Students enrolled in the Ph.D. program will register for MSMGDB 3500 for their research accreditation. Laboratory research is the major component of any biomedical Ph.D. program. Failure to maintain satisfactory laboratory performance may result in the student being placed on probation. Failure to remedy the problems in laboratory research may result in dismissal from the program by a vote of the MGDB Steering Committee.

I. COMPREHENSIVE EXAMINATION AND ADMISSION TO CANDIDACY

1. Introduction: The Comprehensive Examination will be administered after the student has completed his/her second-tier course work, has decided on the general area of his/her thesis research and has chosen a major advisor. A student who obtains a M.S. degree or enters the program with a M.S. degree must take the Comprehensive Examination within 1 year of matriculation.

The student will be required to submit a proposal in the format of a research grant (see description below). Once the written proposal is submitted, the student shall receive at least a one-week notice of the oral defense date. The oral defense will typically take place within 3 to 4 weeks of submission of the written proposal. NIH instructions for format should be followed except as amended by MGDB Program guidelines. **The proposal should be clearly, logically and carefully written in proper English.** The student will submit the proposal to the Comprehensive Examinations Committee chairperson who shall establish a panel of faculty members to evaluate each student's written proposal. Unacceptable written proposals shall constitute a failure of the

written portion of the exam. Submission of acceptable proposals will allow passage into the oral examination that will test the student's understanding of both the contents of the research proposal and the basic concepts underlying the contents. The student is graded on a pass/fail structure. A simple majority vote of the panel decides the grade. In the event of a failure of the oral exam, the student shall be given one opportunity to retake the oral examination. A second failure shall result in the dismissal of the student from the program or recommendation that the student transfers to the M.S. degree program for the completion of his/her training.

2. Format of the Comprehensive Examination: The Comprehensive Examination is based on the student's thesis research area (see below). A letter will be sent to the student by May 1 notifying him/her of the due date of the proposal (approximately 45 days from receiving the letter). The examination will require that the student submit and defend a proposal in the format of a research grant with the following guidelines rigorously adhered to:

a. The proposal is expected to be conceptually well-founded and adequately documented. **The student is responsible for preparing an original research proposal. Dissertation advisors and others may be consulted on specific scientific issues, but the document must be prepared exclusively by the student. Advisors may not edit the written proposal for style or content or coach the student for the oral defense. Attribution to published and unpublished sources must be comprehensive**. The written proposal must be **original to the student**, although the project may have been previously outlined in the advisor's grant. The proposal should not be verbatim or slightly modified version of any published or unpublished papers the student may have written with the advisor or anyone else. The proposal is to be well organized, written in a coherent, grammatically correct style, and should describe ***original*** and ***innovative*** experiments that will accomplish the stated aims and objectives of the research. The Specific Aims and Experimental Plan sections of the proposal must include **only** those experiments that have not already been done in the advisors or any other laboratory. The written proposal cannot consist of just a collection of experiments, but must include well-defined hypotheses and rationale as well as the significance of the proposed experiments. How the expected results will benefit the field of research also should be discussed.
b. The written research proposal will adhere to the following page guidelines:
    i. Title Page
    ii. Specific Aims – limit 1 page
    iii. Research Strategy – limit 6 pages (This includes the Significance, Background and Approach)
    iv. Literature Cited -Must include complete citation with all authors, year, title, journal, volume, inclusive pages. References should be limited to relevant and current sources, published or unpublished, that are pertinent to the proposed research. – limit 4 pages
c. Under no circumstances shall the proposal (including title page), contain more than 12 pages of single space type, with half-inch margins on all sides. The type font should be Arial, size 11 and line spacing should have no more than 6 lines of text within a vertical line.
d. The research proposal must be converted to a PDF (Acrobat) format for electronic submission. At the end of this document, the advisor's specific aims must also be included for the examination committee to determine if the proposal is original. The file should be named as: [student's last name][year].pdf

3. Administration:

a. The student shall have 45 days from the time of the notification by letter (see Eligibility above) to submit the completed proposal. Shortly after notification, the Comprehensive Exam Committee Chair will meet with the student to discuss these guidelines, answer questions, and to clarify the extent to which the student's thesis advisor, faculty, post-docs and students may be used as a resource. Students shall take no more than four weeks from their laboratory work in the writing of their Comprehensive Examination proposal. Upon completion, all documents shall be submitted electronically, via email, to the Comprehensive Exam Committee Chair and the Program Coordinator by 5:00 P.M. on the due date. A copy of the Specific Aims of the advisor's grant(s) on the specific area should also be included. A copy of the student's written proposal will be given to the advisor who will be asked to certify that the proposal complies with the standards set forth in Section 2a. Examination proposals submitted after the deadline must be accompanied by a letter from the student that states the reasons for late submission and a justification for acceptance of the proposal. The Comprehensive Exam Committee Chair and the Program Director will review all cases of late submission and inform the student within 2 working days whether the examination proposal has been approved for submission. Rejection of the proposal will be counted as a failing grade on the examination.

b. As soon as possible ***(preferably within two weeks of submission of the proposal)***, the Comprehensive Exam Committee Chair, with the advice of appropriate faculty members, shall establish for each student's proposal a panel of faculty members (exam panel and its chairperson) competent to evaluate the subject of the research proposal. The Comprehensive Exam Committee Chair will distribute copies of the student's proposal to members of the selected panel within two weeks after the submission date.

c. Each Exam panel shall consist of three members, with at least one member outside of the MGDB Program. It will be the responsibility of the exam panel chairperson to poll the panel members as to the acceptability of the written proposal, and, if acceptable as submitted, to convene the panel for an oral examination. If a majority of the panel find the written proposal unacceptable, the panel chairperson shall notify immediately the Comprehensive Exam Committee Chair, who shall convene a meeting of the panel, with or without the student in attendance, to review the reasons why the proposal was deemed unacceptable. An unacceptable written proposal shall constitute failure of the written part of the comprehensive exam. The exam panel chairperson shall submit to the Comprehensive Exam Committee Chair a written evaluation of the proposal and reasons for failure. The Comprehensive Exam Committee Chair shall forward copies of the critique to the director of the MGDB Program, the MGDB Program Coordinator, the student and the student's advisor. Based on these critiques and guidelines, the student must submit a revised version of the proposal by email directly to the exam panel, the Comprehensive Exam Committee Chair, the Program Coordinator and the MGDB program director within three weeks.

d. In the case of an unacceptable written proposal, the exam panel, MGDB program director and Comprehensive Exam Committee Chair will evaluate the resubmission and will determine if the proposal is acceptable for passage into the oral exam. Failure at this stage will result in the dismissal of the student from the program or recommendation that the student transfer to the M.S. degree program for the completion of his/her training. The student's Thesis Advisor shall not serve on a panel established to evaluate one of his/her students.

4. Oral Examination Process:

a. Presuming an acceptable written proposal, the oral examination for each student will be scheduled as soon as feasible after submission of the written proposal (preferably within three weeks).
b. At the beginning of an oral examination, and in the absence of the student, the Comprehensive Exam Committee Chair (or a person designated by him/her) will briefly address the committee, communicating the ground rules for the examination.
c. The oral examination will be held in a closed session, with only the student and the three members of the exam panel in attendance. The student will begin the examination with an oral presentation (not to exceed 15 minutes) of the research proposal. The oral examination shall not exceed two hours, inclusive of the student's opening presentation. The research proposal shall be the sole document available to the student during the oral examination.
d. It will be the exam panel's task to evaluate the student's understanding of both the contents of the research proposal and the basic concepts underlying them.
e. At the end of the oral examination, the exam panel will vote in private to pass/fail the student. A simple majority shall prevail; ABSTENTIONS WILL NOT BE PERMITTED. There shall be no conditional pass/fail decision. After the panel vote, the panel chair will immediately notify the student of the decision and evaluation of performance. A critique written by the exam panel chairperson, evaluating the exam performance and the pass/fail decision, shall be submitted to the Comprehensive Exam Committee Chair who shall distribute copies to the Director of the graduate program, the Program Coordinator, the student and the student's advisor. Students and their thesis advisors shall be formally notified of the exam outcome by a letter from the Graduate Program Coordinator.
f. Students failing the oral exam will be given one more opportunity to retake the exam. The exam panel will provide reasons for failure to the student, the MGDB Program Director, Program Coordinator and the Comprehensive Exam Committee Chair within two days after the exam. The student, the exam panel, the Comprehensive Exam Committee Chair and MGDB Program Director will decide on another convenient time to hold the oral (within two weeks). The second oral exam committee will consist of two members from the original exam panel and the Comprehensive Exam Committee Chair. These members will vote at the end of the exam to pass/fail the student. A second failure shall result in the dismissal of the student from the program or recommendation that the student transfer to the M.S. degree program for the completion of his/her training.
g. A "pass" shall be warranted when both of the following conditions are met: (i) the written proposal is considered acceptable as presented, and (ii) the student has performed knowledgeably in the oral defense of the proposal.

J. THESIS COMMITTEE

Before admission to candidacy for the Ph.D. degree, the student proposes for approval a committee of five faculty members to serve as the Thesis Committee. The primary responsibility of the Thesis Committee shall be to advise the student in the effective analysis of a research problem and to approve a body of original research of sufficient quality to form the basis for the Ph.D. dissertation.

Within three weeks after the student has passed the Comprehensive Examination, the student should submit to the Thesis Advisor the proposed membership of the Doctoral Committee, together with the title and a one-page abstract of the proposed thesis research. The Doctoral Committee shall consist of at least five faculty members of the SOM Graduate Faculty, including

a minimum of three MGDB program faculty members. The major advisor is included in the committee, however another faculty member from the MGDB program must be designated as the Chair of the Thesis Committee. Along with the major advisor, each thesis committee shall include a minimum of four other Graduate Faculty Members, at least one of whom should be from another graduate program of the University or from the Graduate Faculty of another institution. The members of the Doctoral Committee may be drawn from the MGDB Program faculty as early as the beginning of the second year of training. Upon the advisor's approval of the composition of the proposed thesis committee, the student should officially request faculty members to serve on his/her Doctoral Committee. The student is responsible for submitting the names of the proposed Doctoral Committee to the MGDB Program Coordinator, for approval by the MGDB Program Director.

The first meeting of the Doctoral Committee shall be held within three months after the committee has been appointed, at which time the committee should approve a student's proposal for the doctoral research problem. At least one week prior to this meeting and all subsequent meetings, the student shall provide each committee member with a copy of a written research proposal/summary of research accomplished to date. A recommended format would include a short summary or introduction to the proposed research problem, a brief statement of specific aims, an outline of the methods proposed to achieve the specific aims and a list of references most pertinent to the research problem, including the titles of the papers. After the first meeting, it is suggested that the Doctoral Committee meets semi-annually to review the student's research progress, but the Doctoral Committee shall meet no less than once per year. A simple majority of the Doctoral Committee determines actions of the committee. After each meeting, the committee chairperson must submit a brief progress report to the program coordinator of the MGDB Graduate Program. The Coordinator will then forward the summary update to the student, the Program Director and all thesis committee members.

K. DISSERTATION AND FINAL ORAL EXAMINATION

The student's dissertation must provide evidence of original scholarly research of sufficient quality to be published in a leading scientific journal. Laboratory work for which a student receives wages is not eligible for any part of the dissertation research. The Thesis Committee will meet at the time the student's research is ostensibly complete and will authorize the student to begin writing the thesis. The style and format of the thesis must conform to the standards set forth by the Graduate Council of the University. The thesis advisor and chairperson of the Thesis Committee will read preliminary drafts of the thesis and will approve the final copy for submission to the Thesis Committee.

The final copy will be submitted to the Thesis Committee as noted below. The thesis defense will consist of a public seminar on the subject of the dissertation followed by an examination by the Thesis Committee. This latter examination may be attended by nonmembers of the Doctoral Committee who make prior request, but such visitors may not participate in the questioning. Approval of the thesis will be granted if there is no more than one dissenting vote by full members of the Thesis Committee exclusive of the major advisor. The degree will be granted by the School of Medicine.

All graduate students must be on active status (i.e., must have been registered for a minimum of three credits during a twelve-month period) and must register for at least one credit during the term in which they are graduated. Students who complete all the degree requirements in one term but are graduated in the next may petition the dean for a waiver of this requirement. A student who is on inactive status must be re-admitted and registered for three credits in order to be graduated.

The following procedures and requirements have been stipulated by the School of Medicine. These requirements must be met before the last day of the term in which the student has applied for graduation.

1. At least one month prior to the defense:
    a. The student will make arrangements with the Program Coordinator for final defense. The student must submit information to the Graduate Studies Office via their official website (https://somgrad.pitt.edu/current-students/graduation/phd-graduation). This information will then be forwarded by this office to the University Times for publication (must be received within the stipulated time frame for this publication). The announcement will also be sent to the Graduate Faculty Members of the School of Medicine.
    b. Each member of the student's Thesis Committee should be given a draft of the thesis no earlier, or later, than two weeks before the final defense.
2. After the thesis defense, the following should be brought to the Graduate Studies Office (as one package):
    a. One copy of the final approved dissertation (unbound, final corrected version), with title page signed by all thesis committee members
    b. Three additional copies of the abstract (350 word maximum double-spaced), initialed in the upper right-hand corner by the student's advisor
    c. Signed Dissertation Defense Report (obtained from MGDB Program Coordinator prior to the defense)
    d. Signed Dissertation Approval Report (obtained from MGDB Program Coordinator prior to the defense)
    e. Signed ETD Approval Form (obtained from MGDB Program Coordinator prior to the defense)
    f. 3 copies of the title page
    g. 1 copy of the dissertation committee membership page
    h. Submit the alumni form and CV electronically as directed on the SOM graduation website (the links are in the detailed email we send out at the time of application for graduation).

II. MASTER OF SCIENCE DEGREE

The Program does not formally accept students for the Master's degree. This degree is available to students who do not complete the Ph.D. program.

A. Financial Aid

All full-time students enrolled in the M.S. Program are eligible for waiver of tuition. Once a student has joined the laboratory of his/her thesis advisor, the student is supported by the research grant of the thesis advisor at a level equivalent to the stipend received by students in the Ph.D. degree program.

B. Faculty Advisor

Selection of the faculty advisor is as described for the Ph.D. degree program.

C. Thesis Committee

The Thesis Committee for an individual student shall consist of his or her thesis supervisor and at least two other members, one of whom may be chosen from outside the Program faculty. The proposed composition of the student's thesis committee, together

with the title and one-page abstract of the proposed thesis research, must be submitted by the major advisor to the Student Evaluations Committee within six months after the choice of a major advisor, as described for the Thesis Committee.

The student's Thesis Committee must meet with the student at least twice a year, at which time the student must submit a progress report and the committee discusses his/her research project and general progress. The student's Thesis Committee, through the major advisor, must forward a copy of the progress report with accompanying evaluation to the Student Evaluations Committee and to the Director of the Graduate Program following each six-month meeting. A simple majority of the Student Evaluations Committee determines actions of the committee.

D. Degree Requirements

a. The student must successfully complete the first-year core curriculum and receive a B or higher in all required courses and laboratory rotations.
b. There are no additional advanced topic courses required beyond the first-year core curriculum.
c. The student must complete a one year research project leading to an M.S. thesis. The thesis must be defended before a thesis committee.
d. A total of 24 credits meets the University requirements for the M.S. degree. The University mandates that the M.S. degree work must be completed within a period of 5 years of full-time enrollment. Award of the M.S. degree for work which has extended beyond the 5-year limit requires special permission of the Graduate Council of the University.

E. Grades

A final QPA of 3.0 is needed to obtain the M.S. degree.

F. Comprehensive Examination and Preliminary Evaluation

The Preliminary Evaluation for Ph.D. students serves as the Comprehensive Examination for M.S. students.

Following satisfactory completion of the required course work and satisfactory performance on the comprehensive examination, the student shall proceed to complete the research requirement for the M.S. degree. If, however, the student has failed to maintain a QPA of 3.0 in required course work, or if the performance on the comprehensive examination has been unsatisfactory, the MGDB Steering Committee shall decide, by majority vote, whether the student shall be given an opportunity to remedy the deficiency or be dismissed from the Program.

G. Thesis and Final Oral Examination

The scope of the research project should be carefully planned to ensure completion within a reasonable period of time (as close to the two-term minimum as possible). Laboratory work for which a student receives wages is not eligible for any part of the thesis research.

M.S. candidates must be registered as full-time students during the execution of thesis research. Thus, those individuals who complete the course requirements on a part-time basis shall be required to matriculate as full-time students for completion of the degree. During this research period the Program encourages and expects from the M.S. candidate the same vigorous full-time commitment to the successful completion of the graduate training as it does of Ph.D. candidates.

The student's thesis must provide new knowledge and evidence of original scholarly research of sufficient quality to be published in a leading scientific journal. The

Thesis Committee will meet at the time the student's research is ostensibly complete and will authorize the student to begin writing the thesis. The committee shall consist of three members of which at least one may be from outside the MGDB Program faculty. The composition of the thesis committee and the nature of the research must be approved by the Student Evaluations Committee as outlined for Ph.D. candidates. The responsibilities of the Master's Thesis Committee are essentially the same as described for the Doctoral Thesis Committee.

The style and format of the thesis must conform to the standards set forth by the Graduate Council of the University. The faculty advisor and one or more members of the Thesis Committee will read preliminary drafts of the thesis and will approve the final draft for submission to the Thesis Committee for final approval.

The final copy will be submitted to the Thesis Committee at least two weeks prior to the date of the thesis defense. The thesis defense must take place at least two weeks before the degree is to be conferred. The thesis defense shall consist of an oral presentation of the thesis by the student, followed by the student's response to questions from the floor. This thesis defense, or final examination, is open to the public and will be conducted by the Thesis Committee. Following approval of the thesis, the M.S. degree will be granted by the School of Medicine.

All graduate students must be on active status (i.e., must have been registered for a minimum of three credits during a twelve-month period) and must register for at least one credit during the term in which they are graduated. Students who complete all the degree requirements in one term but are graduated in the next may petition the Dean for a waiver of this requirement. A student who is on inactive status must be readmitted and registered for three credits in order to be graduated.

The following procedures and requirements have been stipulated by the School of Medicine. These requirements must be met before the last day of the term in which the student has applied for graduation.

1. At least one month prior to the defense:
   a. Student will make arrangements with his/her graduate program for final defense. The information will be relayed to the Office of Graduate Studies in letter form stating student's name, graduate program, degree sought, title of dissertation, date, time and place.
   b. Each member of the student's Thesis Examining Committee will be given a draft copy of the thesis to prepare for final defense. One copy of the draft thesis is deposited at the Graduate Studies Office.

2. After the thesis defense the following should be brought to the Graduate Studies Office (as one package).
   a. One copy of the final approved dissertation (unbound, with any needed corrections already made). The title page should have the signatures of all Committee Members. Two extra copies of the title page should accompany the thesis.
   b. A letter from the Program Director giving official notice that the candidate has fulfilled all the academic requirements (change of status and grade cards should accompany this letter).
   c. An official receipt [PITT-1453(383)] from University Cashier (G-7 Thackeray Hall) for payment of dissertation binding/microfilming fees.
   d. Please also note that students are required to submit an electronic version of the thesis using the ETD submission process as required by University Policy.

III. REGISTRATION PROCEDURE

During registration for each succeeding term, each student will confer with his or her advisor about curriculum choices. Note that the Director of the Program will attempt to maintain an annotated course list to assist students and advisors in decisions about specific course offerings as they relate to a particular student's curriculum. After students transfer into MGDB, they will send their Enrollment Form to the MGDB Program Coordinator, who will lift the hold from their account, and the student will then be able to log in and self-register for the semester. Each candidate for graduation must file an official application for a graduation card in the Graduate Studies Office early in the term in which he/she expects to graduate.

IV. STUDENT ORGANIZATION

Graduate students within the Medical School have a Biomedical Graduate Student Association (BGSA) with elected officers. The organization holds meetings to discuss academic matters as well as other items of interest to the students and the graduate program. One elected member of the BGSA is invited to meetings of the Graduate Program faculty. In addition, student representatives will serve on the Examinations Committee, the Curriculum Committee, the Admissions Committee and the Seminar Committee. The student representation at faculty and committee meetings provides a regular channel of communication between the entire faculty and the student body.

V. COURSE DESCRIPTIONS

Required courses must be given by the faculty even if only one student in the program is registered. Course format is at the discretion of the course director. Elective courses for which there is no substitute at the University of Pittsburgh or Carnegie Mellon University and for which there is a perceived need must be given if there is one or more student(s) enrolled. In the event of faculty/student disagreement concerning the need for an elective course, the Director of the MGDB Program will make the final decision.

Foundations of Biomedical Science
Taught under the auspices of the Interdisciplinary Biomedical Graduate Program of the School of Medicine.

INTBP 2000 Foundations Lecture (Fall - 8 credits)
John P. Horn and Staff
Primary objectives of the course are to explore mechanisms controlling cell, tissue and organ function, and to develop an understanding of the experimental evidence supporting these concepts through an integrated presentation of material from biochemistry, cell biology, genetics, immunology, microbiology, neurobiology, pathology, pharmacology, and physiology. The development of critical thinking skills will be emphasized through an evaluation of experimental evidence and reading of the primary literature.

INTBP 2005 Foundations Conference (Fall - 4 credits)
John P. Horn and Staff
Contemporary approaches to problem-solving in biology, as well as principles underlying modern methods of biomedical research will be integrated with the lecture component of the course through an analysis of mechanisms underlying biological phenomena. Students will present

papers, critically analyze data and devise experimental approaches to biomedical problems considered in lecture.

INTBP 2010 Laboratory Research Rotation (1 credit)

John P. Horn

This lab is designed to introduce the student to relevant laboratory methods as well as the layout and conceptualization of experiments. The course will serve to acquaint the student with the laboratory process, and to facilitate his/her selection of a lab for dissertation research. Students are required to register for and complete rotations through three different laboratories, thereby ensuring broad exposure to method and practice.

INTBP 2290 Scientific Ethics and the Responsible Conduct of Research (Summer - 1 credit)

John P. Horn

The course is an introduction to the basic ethical issues that arise in the course of conducting scientific research. It is intended for graduate students and fellows in the biomedical sciences who have completed at least one year of graduate work. The course will composed of informal lecture presentations followed by discussion of issues in small groups.

INTBP 2013 D2K: From Data to Knowledge (D2K) – Biomedical Experimental Design & Analysis (Summer - 3 Credits)

John P. Horn

Experimental biologists formulate hypotheses and models, design experiments, collect data and conduct analyses to draw conclusions. Deep understanding of biological principles requires d2k – the translation of data into knowledge that transcends first-order conclusions. This course for first year PhD students in the biomedical sciences will examine basic principles of experimental design, together with measurement and sources of experimental error. The course will provide a practical 'hands on' introduction to the quantitative tools required for experimental research using cellular, molecular and & systems based methods. Topics will include: goals of experimental design, making measurements, principles of parametric and non-parametric statistical inference, use of MS excel, GraphPad prism and r, design of publication graphics and a brief introduction to big data approaches. Students will work in small groups to construct capstone projects by making 'YouTube' style videos to illustrate key principles of experimental design and analysis.

MSMGDB 2525 Developmental Mechanisms of Human Disease (Spring - 2 credits)

Michael Tsang & Judy Yanowitz

This course covers principles of developmental biology and how embryonic developmental pathways impinge on human disease. Topics include congenital organ related disease, stem cell based reproductive events relating to disease. Prerequisites: Foundations of Biomedical Science or permission of the course director.

MSMGDB 2535 Model Organisms (Spring - 2 credits)

Donghun Shin & Michael Tsang

This course covers the use of vertebrate and invertebrate model organisms in biomedical research. Topics include the use of several models including: mouse, rat, zebrafish, xenopus, C. elegans, and Drosophila. Special emphasis will be placed on the strengths that specialized techniques of each organism provide to the research community in understanding the etiology of disease.

MSMGDB 3530 Genome Instability and Human Disease (Spring - 3 credits)

Patricia Opresko, Ben Van Houten and Chris Bakkenist

Mechanisms that maintain genome stability allowed the origin of species. DNA damage is

omnipresent and DNA repair and DNA damage tolerance mechanisms are interwoven in systems that control transcription, replication, cell division, signal transduction, cell death and evolution. More than 40 distinct human diseases are caused by defects in DNA repair, including syndRomes of impaired development, immunodeficiency, cancer predisposition, neurodegeneration, and premature aging. This course will emphasize the molecular biology and biochemistry of DNA repair, placing these mechanisms into the context of other cellular processes as they pertain to health and disease. Environmental, clinical and endogenous sources of DNA damage will be discussed. An understanding of the fundamental role of DNA repair mechanisms in immunology, oncology, neurology, and aging will be central to all lectures.

MSMGDB 3540 Reproductive Development from Model Organisms to Humans
(Every Other Fall – 3 credits)
Judy Yanowitz
This course focuses on the molecular aspects of the transition from gamete to a reproductive organism. The course progresses through the building of germ cells, fertilization and stem cell participation to sex determination, gonad morphogenesis, puberty, menopause and pregnancy. This course highlights both human and model organisms to bring together diverse aspects of the cell and developmental biology of reproductive tissues and their impact on disease pathology.

MSMGB 3560 Molecular Mechanisms of Longevity & Aging
(Spring – 2 credits)
Arjumand Ghazi
This is a course for those interested in obtaining in-depth knowledge and critical understanding of the molecular underpinnings of aging and the current state of Geroscience research. The course will be conducted in four modules. Module I will provide a historical perspective on aging research with a focus on major discoveries in model organisms and human studies. Module II will involve detailed examination of the molecular hallmarks of aging and Module III will focus on the links between cellular, tissue and organismal senescence. In Module IV, contemporary studies on 'quality of life'/Healthspan and advances in anti-aging therapies will be explored.

MSMGDB 2550 Research in Progress Seminar (Fall and Spring - 1 credit)
Jeff Gross
A weekly Research In Progress Seminar presented by students and post-doctoral fellows. Weekly attendance and participation by all MGDB students is required.

MSMGDB 2590 Directed Study (Fall, Spring & Summer 1-9 credits)
Kara Bernstein
A laboratory course providing the student an opportunity to carry out a laboratory project under the direction of a member of the Program prior to admission to candidacy for the PhD.

MSMGDB 2500 MS Thesis Research (Fall, Spring & Summer 1-9 credits)
Kara Bernstein
Laboratory projects to fulfill the requirements for the Masters of Science degree.

MSMGDB 3500 PhD Dissertation Research (Fall, Spring & Summer 1-14 credits)
Kara Bernstein
After advancement to candidacy for the PhD degree, students enroll in this course to pursue original experimental laboratory research, the results of which will provide the substance of their doctoral dissertation. A minimum of 40 credits of this course are required for the PhD degree in the School of Medicine.

Seminar Program

Attendance and active participation at the students' departmental seminar series is considered to be a regular and important activity of all graduate students.

VI. STRUCTURE OF THE GRADUATE PROGRAM FACULTY

A. DIRECTOR OF GRADUATE PROGRAM

The Director of the MGDB Program administers the program, appoints all committees, calls meetings, advises the students, and is responsible for monitoring their progress. The Director position is for a three-year term.

B. VICE DIRECTOR OF GRADUATE PROGRAM

The Vice Director of the MGDB Program assists the Director as requested by the Director in the administration of the MGDB program. Special emphasis is placed on recruitment and admissions. The Vice Director assumes the Director position upon vacation of the position. The Vice Director is elected by a majority vote of the Steering Committee and serves for a three-year term.

C. STEERING COMMITTEE STRUCTURE

The Steering Committee is the standing committee of the Graduate Program. In addition, a member of the program faculty serves as a representative to the Admissions, Curriculum and Recruiting Committees of the Interdisciplinary Biomedical Graduate Program. The Steering Committee is composed of faculty from the Graduate Program who are appointed for a three-year term by the Director.

The Steering Committee is composed of the Director, Vice Director and five members at-large from the MGDB program. It is recommended that the committee have at least one member from each of the three main thematic areas. The Steering Committee is responsible for developing policies and procedures for the MGDB graduate program, for administering selection of graduate faculty, for supervision of various committee activities and for making final decisions in cases where students are placed on probation or dismissed from the program. One of the members at-large shall serve as the Education Organizer. The Education Organizer is responsible for administering the Comprehensive Examination to graduate students.

D. STANDING COMMITTEES – 2019-2022

GRADUATE PROGRAM DIRECTOR
Dr. Kara Bernstein

VICE DIRECTOR
Dr. Arjumand Ghazi

STEERING COMMITTEE
Dr. Cecilia Lo
Dr. Yoel Sadovsky
Dr. Tom Smithgall
Dr. Michael Tsang
Dr. Donghun Shin (Education)

VII. Molecular Genetics and Developmental Biology Program Graduates

Serkan Alkan, Ph.D. 2004
Mentor: Dr. Christine Milcarek
The HNRNP F And HNRNP H' Are Mammalian 3' mRNA Processing Factors Acting Through Guanine Rich Sequences

Elife Bagci, Ph.D. 2007
Mentor: Dr. Ivet Bahar
Mathematical modeling and simulation of apoptosis and nitric oxide effects

Kristen Bartoli, Ph.D. 2010
Mentor: Dr. William Saunders
Discovery and Characterization of the Interphase Function of Mitotic Motors in Protein Synthesis

Matthew Boyer, Ph.D. 2010
Mentor: Dr. Tau Cheng
DNMT3b's Role in Hematopoietic Stem Cells

Lauren Brilli Skvarca, Ph.D. 2015
Mentor: Dr. Neil Hukriede
Acute kidney injury in zebrafish larvae as a regeneration model for drug discovery

Susan Burke, Ph.D. 2009
Mentor: Dr. Donald Scott
Regulation Of The L-Type Pyruvate Kinase Gene By Glucose And cAMP In Islet Beta Cells

Frank Cackowski, Ph.D. 2009
Mentor: Dr. David Roodman
Osteoclasts Are Important for Bone Angiogenesis

Kasey Cargill, Ph.D. 2019
Mentor: Dr. Sunder Sims-Lucas
The Role of Hypoxia in Metabolism and Nephron Development.

Andrew Carson, Ph.D. 2006
Mentor: Dr. Saleem Khan
Transcriptional Regulation During The Papillomavirus Life Cycle And Elimination Of Infection Using Homologous Recombination

Rakshita Charan, Ph.D. 2011
Mentor: Dr. Paula Clemens
Deubiquitinating enzyme A20 and its role in NF-kappaB regulation: Implications for treatment of Duchenne muscular dystrophy.

Hyun-Jung Choi, Ph.D. 2004
Mentor: Dr. Thomas Smithgall
Molecular Mechanisms of HIV Nef-induced Src Kinase Activation and Survival Signaling in Myeloid Cells

Sherin David, Ph.D. 2020

Mentor: Dr. Kyle Orwig
Stem Cell and Tissue-Based Therapies for Male Infertility

Chatchanan Doungkamchan
Mentor: Kyle Orwig
Gene Therapy for Male Infertility

Devin Dressman, Ph.D. 2002
Mentor: Dr. Eric Hoffman
AAV-Mediated Gene Transfer To Models Of Muscular Dystrophy: Insights Into Assembly Of Multi-Subunit Membrane Proteins

Lia Rae Edmunds, Ph.D. 2015
Mentor: Dr. Edward Prochownik
Regulation of metabolism by the oncoprotein c-Myc

Saman Eghtesad, Ph.D. 2010
Mentor: Dr. Paula Clemens
Effects of manipulating the immune system on dystrophin gene transfer and dystrophic phenotype in striated muscles of Duchenne muscular dystrophy model, mdx mouse

Lori Ehrlich, Ph.D. 2005
Mentor: Dr. David Roodman
IL-3-Mediated Osteoblast Inhibition in Multiple Myeloma

Adetunji Fayomi, Ph.D. 2018
Mentor: Dr. Kyle Orwig
Stem cells and spermatogenic lineage development in the primate testis

Louis Ghanem, Ph.D. 2005
Mentor: Dr. Richard Steinman
The Role and Regulation of p21 in Myelopoiesis

Hiyaa Ghosh, Ph.D. 2008
Mentor: Dr. Paul Robbins
Regulation Of Translation And Transcription By Sirt1: Potential Novel Mechanisms For Regulating Stress Response And Aging

Stephen Godin Ph.D. 2016
Mentor: Dr. Kara Bernstein
The Shu complex is a conserved regulator of Rad51 filament formation

Constantinos Hadjipanayis, Ph.D. 2005
Mentor: Dr. Neal DeLuca
Radiosensitivity Enhancement Of Human Glioblastoma Multiforme By A Herpes Simplex Virus Vector

Susan Harrison, Ph.D. 2007
Mentor: Dr. Paula Monaghan
Sall1 regulates neuronal differentiation and progenitor cell maturation in the developing forebrain

Andrew Hertsenberg, Ph.D. 2015
Mentor: Dr. James Funderburgh
Stem Cells for the Treatment of Corneal Fibrosis

Basak Isin, Ph.D. 2008
Mentor: Dr. Ivet Bahar
The Activation Mechanism Of Rhodopsin Explored By Multiscale Methods

Sara Jackson, Ph.D. 2005
Mentor: Dr. Neal DeLuca
Modeling Physical Changes In HSV Genomes That Occur During Lytic And Latent Infections: The Role Of ICP0

Jennifer Johnson, Ph.D. 2006
Mentor: Dr. Jean Latimer
Molecular Mechanism of Nucleotide Excision Repair Deficiency in Novel Breast Cancer Cell Lines

Mehwish Khaliq, Ph.D. 2017
Mentor: Dr. Donghun Shin
Elucidating Mechanisms Of Liver Development And Liver Progenitor Cell-Driven Regeneration In Zebrafish

Munil Koppanati, Ph.D. 2010
Mentor: Dr. Paula Clemens
In Utero Gene Delivery Of Aav Vectors For Efficient Treatment Of Muscle Disorders

Mark Langhans, Ph.D. 2015
Mentor: Dr. Rocky Tuan
Wdpcp Affects Skeletogenesis via the Hedgehog Pathway

Olivia Long, Ph.D. 2011
Mentor: Dr. Gary Silverman
Genetic Modifiers that Affect the Accumulation of the Mutant Protein Alpha-1 Antitrypsin-Z

Benjamin Mantell, Ph.D. 2011
Mentor: Dr. Robert O'Doherty
Immune Modulation of Metabolism: The Role of Macrophages, NKT Cells and Dendritic Cells in the Development of the Metabolic Disturbances of Obesity

Ivan Martinez, Ph.D. 2007
Mentor: Dr. Saleem Khan
Identification of Differentially Expressed Genes in HPV Associated Cancers Using Gene Expression, Tissue, and MicroRNA Microarrays

Manasi Mayekar, Ph.D. 2013
Mentor: Dr. Karen Arndt

Uncovering the Mechanism of Chromatin Association of the PAF1 Transcription Elongation Complex

T. Broke McClendon, Ph.D. 2016
Mentor: Dr. Judith Yanowitz
Genetic dissection of factors that promote genome stability in the Caenorhabditis elegans germ line

Lisa McEwen, Ph.D. 2009
Mentor: Dr. Leaf Wang
Interaction of cationic lipid vaccines with cells of the adaptive immune system

Kathleen Morgan, Ph.D. 2008
Mentor: Miguel Estevez
Genetic and Pharmacologic analysis of the Mechanisms of Selenium toxicity in Caenorhabditis elegans

Lolita Nidadavolu, Ph.D. 2013
Mentor: Dr. Saleem Khan
Identification and characterization of senescence-associated microRNAs in a mouse model of the XFE Progeroid Syndrome

Bart Phillips, Ph.D. 2012
Mentor: Dr. Kyle Orwig
GDNF Signaling Regulates YBX1/mRNA Interactions in Mouse Spermatogonia

Jerrod Poe, Ph.D. 2009
Mentor: Dr. Thomas Smithgall
Bimolecular Fluorescence Complementation Reveals that HIV-1 Nef Oligomerization is Essential for CD4 Downregulation and Viral Replication

Eric Rubenstein, Ph.D. 2008
Mentor: Dr. Martin Schmidt
Glucose Sensing and the Regulation of the AMP-Activated Protein Kinase in Yeast

Jonathan Shaffer, Ph.D. 2008
Mentor: Dr. Thomas Smithgall
Investigating the Regulation of c-Fes Non-Receptor Tyrosine Kinase Activation and Gene Expression

Kristen Skvorak, Ph.D. 2008
Mentor: Dr. Greg Houmanics
Investigation of Gene and Cellular Therapies to Cure Maple Syrup Urine Disease (MSUD) in a Genetically Engineered Mouse Model

Joshua Solomon, Ph.D. 2013
Mentor: Dr. Donald DeFranco
Vitamin D receptor activity is differentially affected by the co-regulator Hic-5 in prostate and stromal cells

Nicole Spardy, Ph.D. 2009

Mentor: Dr. Stefan Duensing
The Human Papillomavirus Type 16 E7 (HPV-16 E7) Oncoprotein And The Host Cell DNA Damage Response

Jonathan Steckbeck, Ph.D. 2011
Mentor: Dr. Ronald Montelaro
Experimental Determination of the Topology of the HIV-1 gp41 C-Terminal Tail

Meghan Sullivan, Ph.D. 2019
Mentor: Dr. Kara Bernstein
Functional Insights into RAD51 Regulatory Proteins in Homologous Recombination

Guoming Sun, Ph.D. 2009
Mentor: Dr. Baskaran Rajeskaran
Role Of Ing2 (Inhibitor Of Growth Family Member 2) In Cellular Responses To DNA Damage

Nuri Temiz, Ph.D. 2009
Mentor: Dr. Carlos Camacho
Decoding the protein-DNA recognition rules

Joseph Tran, Ph.D. 2013
Mentor: Dr. Jeffrey Brodsky
A CDC48 cofactor affects ubiquitinated protein levels, endoplasmic reticulum associated degradation and proteasome subtypes

Ronald Trible, Ph.D. 2006
Mentor: Dr. Thomas Smithgall
Selective Activation of Src Family Kinases by the HIV-1 Nef Protein

Marianna Tsvitov, Ph.D. 2006
Mentor: Dr. Joseph Glorioso
Characterization Of Soluble Herpes Simplex Virus Type 1 Glycoprotein D Mediated Infection

Hanna Valli, Ph.D. 2014
Mentor: Dr. Kyle Orwig
Preserving male fertility with spermatogonial stem cells

Lauren Wagner, Ph.D. 2012
Mentor: Dr. Neal DeLuca
HSV-1 ICP4, A Multifaceted RNA PolII Transcription Factor

Jacqueline Starr Welty, Ph.D. 2019
Mentor: Dr. Li Lan
Oxidative Damage and Selective Neuronal Vulnerability in Alzheimer's Disease

Matthew Wilson, Ph.D. 2004
Mentor: Dr. Thomas Smithgall
The Role Of Src Family Tyrosine Kinases In Bcr-Abl Signal Transduction And Chronic Myelogenous Leukemia

Pengrong Yan, Ph.D. 2010

Mentor: Dr. Gutian Xiao
Regulation of HTLV-I oncoprotein Tax by PDLIM2

Chenjie Yang, Ph.D. 2010
Mentor: Dr. Paul Robbins
Characterization of Tumor-Derived Exosomes and Their Role in Immune Regulation

Lee-Wei Yang, Ph.D. 2005
Mentor: Dr. Ivet Bahar
Biomolecular Dynamics Revealed By Elastic Network Models And The Study Of Mechanical Key Sites For Ligand Binding

Mao Ye, M.S. 2008
Mentor: Dr. Martin Schmidt
The role of the Lim1 gene in vertebrate kidney development