THE UNIVERSITY OF CHICAGO

COMMITTEE ON DEVELOPMENT, REGENERATION, AND STEM CELL BIOLOGY

2024-2025

GRADUATE PROGRAM HANDBOOK

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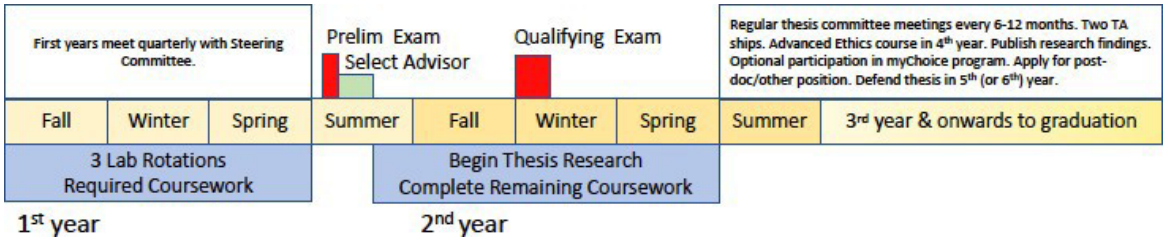
PROGRAM OF STUDY (IN BRIEF)



Quantitative Approaches Bootcamp

Incoming students from all programs in the Biological Sciences Division are strongly encouraged to attend the week-long Quantitative Approaches Bootcamp, held in September each year. DRSB students are expected to attend. The Bootcamp will include workshops, tutorials, seminars, and social activities designed to develop students' computational, statistical, and professional skills and help them get to know their fellow first-year students in the BSD.

First Year

The first year of graduate study is spent in coursework, independent reading, and exploratory research. Students are required to undertake short research projects in at least three different laboratories before beginning their dissertation research. These rotations are performed during the first academic year – one each quarter. Additional rotations and/or later rotations require approval from the Faculty Steering Committee. A written report or oral presentation is required for each rotation. Rotations are graded Pass/Fail. Further information about rotations can be found on pp. 12 of the Handbook.

A seminar course, Introduction to Research (aka "Allstars"), has been organized exclusively for first year students. This course consists of a series of presentations by faculty to introduce their research programs.

There are multiple seminar series within the Biological Sciences Division, including a monthly seminar offered by the Committee and a biweekly Research in Progress/Journal Club series in which DRSB students and postdocs present either their own work or lead discussion of a recent paper of interest. Students are required to attend the DRSB seminars and Research in Progress/Journal Club talks and are encouraged to attend other seminars of interest.

All first-year students enroll in a year-long class called Communicating Developmental Biology Concepts (DVBI 31800). As part of this course, each first-year students will give a Journal Club presentation in the above-mentioned series. In close consultation with the course instructors, the student will select a paper in a field distinct from any of their prior or planned research experiences. In preparing for this Journal Club presentation, the student is expected to read broadly in the chosen field to develop the knowledge base from which ideas for the Preliminary Examination Proposal will emerge.

At the end of June, students take the Preliminary Examination as a first step towards candidacy for the Ph.D. The exam consists of the preparation of a written research proposal in the field of developmental biology and an oral defense of that proposal. Further information about the process and expectations can be found on pp. 13-15 of the handbook.

Second Year

Coursework will continue during the second year as needed to fulfill the requirements. Students choose thesis advisors by July 1 of the Summer Quarter after the first year and begin developing a research project. By early Fall Quarter, each student assembles a thesis committee: it is composed of the student's thesis advisor and three other faculty members. Its members are proposed by the student and the student's thesis advisor and must then be approved by the Faculty Steering Committee. The student then prepares a written proposal for dissertation research and defends this proposal before the thesis committee (the Qualifying Examination) in Winter Quarter, by the end of January. The Faculty Steering Committee must be consulted ahead of time if this deadline cannot be met. Passing the Qualifying Exam permits the student to enter candidacy for the Ph.D. Students must have a subsequent meeting with their thesis committee before the start of the Fall quarter of their third year.

Advanced Years

After the Qualifying Exam, students focus primarily on thesis research. In some cases, students may elect to take one or more additional advanced classes. Students are encouraged to take advantage of the many seminars, Journal Clubs and Research in Progress series that are offered within the division. Regular participation in the DRSB Journal Club is expected.

Students are strongly recommended to attend and present their work at least once at a national/international research conference before graduating, and ideally once a year in their 3rd, 4th and 5th years of study (smaller regional conferences can often provide great opportunities to give talks rather than posters). DRSB has limited funds that can be applied for to help defray the cost of traveling to meetings – only students who are presenting their work are eligible. Finally, each graduating student writes a dissertation describing their research, presents the work in a public seminar, and defends it before a faculty examining committee. As described further below, DRSB students are required to publish a minimum of one first author peer-reviewed paper inorder to graduate.

Evaluation

Throughout their term as graduate students, students are expected to have frequent informal conversations with professors in their courses, with their thesis advisor, and with members of their doctoral committees. In this way, students can obtain frequent appraisals of their progress and constructive advice.

Formal evaluation of each student's progress continues every academic year. In the first year and a half, the evaluation is based on the student's performance in courses, laboratory rotations, the Preliminary Examination, and the Qualifying Examination. In later years, the thesis advisor and doctoral committee oversee the student's dissertation research progress; a report is submitted after each meeting that becomes part of the student's permanent file and is reviewed by the Faculty Steering Committee. If the Committee is apprised of any deficiencies in performance, the student will receive a letter describing those deficiencies and making suggestions about how they might be remedied. Students in their fifth and later years must meet with their doctoral committee every six months.

Faculty Steering Committee

A Faculty Steering Committee (FSC) oversees all aspects of the DRSB graduate program. This includes but is not limited to: setting course requirements; evaluating student progress; organizing, administering and assessing preliminary exams; first year student advising; second year student advising and approval of thesis committee membership; appointing a faculty member to chair the annual admissions and recruitment process; and nominating students for awards. The FSC also oversees the initial steps in academic disciplinary action and in conflict resolution.

The FSC is headed by the DRSB Program Chair and includes a group of advisory faculty (usually 3-4) appointed by the Program Chair. The Program Chair is appointed by the BSD Dean and is responsible for all program-related decisions and policies. The Program Chair has full discretion in appointing FSC members, in enlisting the help and advice of the FSC, and in setting FSC operating procedures.

2023-2024 DRSB Faculty Leadership

Urs Schmidt-Ott, FSC, Chair

Sally Horne-Badovinac, FSC

Ilaria Rebay, FSC

Chip Ferguson, FSC

Paschalis Kratsios, FSC

Cliff Ragsdale, FSC

Ivan Moskowitz, FSC

Victoria Prince, FSC, Co-Chair of DRSB Admissions Committee

Elizabeth Heckscher, Chair of DRSB Admissions Committee

Graduate Program Administrator

The DRSB Graduate Program Administrator, Stephanie Laine, assists students on a variety of questions and problems as they arise. Her office is located in CLSC 1105, and the phone number is 702- 3372.

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE

Requirements for the Terminal Master of Science Degree

Students in the Committee are admitted directly for study towards the Ph.D. degree. In exceptional cases, when students leave the program, they may receive a M.S. degree. This requires completing the six graded courses; students must receive a grade of B or better in one of the two distributional courses and two of the three developmental biology courses and maintain a B average overall in coursework. The Faculty Steering Committee must approve the awarding of the M.S. degree in each case. Students may elect at any time to leave the program without completing the required courses or receiving the M.S. degree.

Requirements for the Transitional Master of Science Degree

Students may apply for a transitional degree of Master of Science. The transitional Master's will only be awarded to candidates who have 1) been matriculated for three quarters or more, 2) successfully completed all course requirements for the Ph.D. and met the requirement for a B average, 3) successfully completed the Preliminary Examination, and 4) are otherwise in good standing at the time of application. To request the transitional Master's degree, students must contact the Graduate Program Administrator

and must submit their degree application online.

REQUIREMENTS FOR THE PH.D. DEGREE

A Ph.D. candidate must fulfill formal coursework requirements, pass the candidacy examinations, and present a satisfactory dissertation describing the results of original research.

The Committee expects a knowledge of and proficiency in contemporary developmental biology as well as in the related fields of molecular biology, cell biology and genetics. This requirement will normally be met by fulfilling the formal coursework listed below, but detailed degree programs are flexible. Courses taken at other institutions, in other departments, or as part of the Medical School curriculum may substitute for required Committee courses with the approval of the Faculty Steering Committee.

Formal Coursework

To obtain a Ph.D. in the Division of Biological Sciences, at least five graded courses are required. The DRSB graduate program requires that six courses have a "quality" letter grade; a grade of "Pass" (or "P") will not fulfill the requirement unless a course only provides pass/fail grading. First-year students are expected to take one or two graded courses and perform a laboratory rotation each quarter. For the graded courses, the Committee requires three in developmental biology (including DVBI 36400 "Developmental Mechanisms"), and one course in each of the following disciplines:

- quantitative analysis
- genetics
- cell biology or molecular biology

Students entering the DRSB program with prior graduate-level coursework can petition the Faculty Steering Committee to waive specific course requirements. Individualized curricular plans should be developed in consultation with the student's first-year advisor prior to petitioning the Faculty Steering Committee for formal approval. All individualized curricular plans must fulfill the Divisional requirement of five graded courses.

In addition to the six graded courses, first- and second-year students are required to take DVBI 31800, "Communicating Developmental Biology Concepts". This is a two-year (six quarter) course that is graded Pass/Fail. Upon completion, the two-year sequence fulfills one Divisional course requirement. First year students are also required to take the seminar course, "Introduction to Research"; this is graded Pass/Fail but is not counted toward the Divisional requirement.

At the start of the academic year, first year students meet as a group and individually with the Faculty Steering Committee to discuss their course plan. First year students also meet with their first-year faculty advisor prior to each quarter's registration deadline. First year students must obtain approval from both their first-year advisor and the Faculty Steering Committee to take fewer than two courses and a rotation in a quarter. A student may not drop a course without the approval of both their first-year advisor and the Faculty Steering Committee.

Rising second year students must also meet with the Faculty Steering Committee at the start of the academic year to discuss their plans to fulfill any remaining course requirements, their progress in their research lab and any other relevant issues.

Training Grant Requirements

Students should be aware that training grants may have additional course requirements that funded students must fulfill. As training grant appointments usually start at the beginning of a student's second year, additional course requirements are fulfilled during the second year. Questions about the specific training grant course requirements should be referred to the appropriate Training Grant Administrator.

After completion of all Divisional, DRSB program, and if relevant, Training Grant requirements, any additional coursework is a matter of discussion between the student, their thesis advisor and their thesis advisory committee.

Courses That Fulfill DRSB Program Requirements

I. Required Courses

DVBI 31800. Communicating Developmental Biology Concepts (REQUIRED for First and Second year students)
This course teaches students a simple set of strategies for conveying scientific information in a spoken format. Each student prepares a journal club presentation from a recent paper in the literature. Through one-on-one sessions with the instructors and a formal practice talk in front of the class, they then receive feedback to improve their presentation skills. The students also gain experience in "peer review" by learning to give and receive constructive comments within the practice talk sessions. Finally, the student presents their polished talk to the community in the DRSB Data Club. Autumn, Winter, Spring Qtrs.

DVBI 31900 Introduction to Research (REQUIRED for First year students)
This broad survey course provides incoming students information about research opportunities and interests across the Molecular Biosciences cluster. Each class features 2-3 short scientific presentations. Autumn & Winter Qtrs.

DVBI 36400. Developmental Mechanisms (REQUIRED for First Year students)
This course provides an overview of the fundamental questions of developmental biology, with particular emphasis on the genetic, molecular and cell biological experiments that have been employed to reach mechanistic answers to these questions. Topics covered will include formation of the primary body axes, the role of local signaling interactions in regulating cell fate and proliferation, the cellular basis of morphogenesis, and stem cells. Winter Qtr.

II. Elective courses

Developmental Biology

DVBI 36400. Developmental Mechanisms
This course provides an overview of the fundamental questions of developmental biology, with particular emphasis on the genetic, molecular and cell biological experiments that have been employed to reach mechanistic answers to these questions. Topics covered will include formation of the primary body axes, the role of local signaling interactions in regulating cell fate and proliferation, the cellular basis of morphogenesis, and stem cells. Winter Qtr.

NURB 32300 Molecular Principles of Nervous System Development
This elective course provides an overview of the fundamental questions in developmental invertebrate animals that advanced our understanding of nervous system development. Topics covered, among others, will include neural stem cells, neuronal specification and terminal

differentiation, and circuit assembly. Dogmas and current debates in developmental neurobiology will be discussed, aiming to promote critical thinking about the field. This advanced-level course is open to upper level undergraduate and graduate students and combines lectures, student presentations, and discussion sections. Winter Qtr.

DVBI 36100. Plant Development and Molecular Genetics
Genetic approaches to central problems in plant development will be discussed. Emphasis will be placed on embryonic pattern formation, meristem structure and function, reproduction, and the role of hormones and environmental signals in development. Lectures will be drawn from the current literature; experimental approaches (genetic, cell biological, biochemical) used to discern developmental mechanisms will be emphasized. Graduate students will present a research proposal in oral and written form; undergraduate students will present and analyze data from the primary literature and will be responsible for a final paper. Spring Qtr.

DVBI 33850. Evolution and Development
The course examines animal evolution from a developmental, genetic, and phylogenomic perspective. Special attention is given to invertebrate phyla. References to vertebrate development will be made when appropriate. Students will be introduced to genomic, genetic, network and systems-based approaches employed in the study of evolutionary developmental biology. Original research papers will be assigned to introduce current debates and approaches. Spring Qtr.

DVBI 36200. Stem Cells and Regeneration
The course focuses on the basic biology of stem cells and regeneration, highlighting biomedicallyrelevant findings that have the potential to translate to the clinic. It covers embryonic and induced pluripotent stem cells, as well as adult stem cells from a variety of systems, both invertebrate and vertebrates. Spring Qtr.

HGEN 47900. Decoding and Engineering Genes and Genomes
The course will provide an in-depth presentation and discussion of the cutting-edge technologies that can be used to identify and characterize the genomic elements (genes, *cis*-regulatory elements, chromatin features) that determine cell functions. Spring Qtr.

HG 47200 Genetic Mechanisms from Variation to Evolution
This course provides a graduate-level introduction to enduring questions regarding the fundamental processes by which genetic information is inherited, regulated, and transformed into organismal phenotypes and how these mechanisms shape and interact with evolutionary processes. We will describe different strategies, including new genome analysis and engineering technologies and statistical/computational principles, that can be used to study the complex, multi-layered organization of genomes, their interactions with varying environments, and ultimately, their evolution. Autum Qtr.

Quantitative Analysis

MGCB 33500 Fundamentals of Biological Data Analysis
The primary goals of this course are to provide first-year trainees in MCB graduate programs with a common grounding in the core tools of modern quantitative data analysis as used in molecular and cellular biology and a shared quantitative mindset and commitment to rigorous reproducible science. Our goal is not to be comprehensive, but to provide students with the conceptual foundations and practical skills they are most likely to need, regardless of research area. The expectation is that they will build upon these foundations through advanced courses, workshops and in-lab training. Winter Qtr.

HGEN 47300 Genomics and Systems Biology
This lecture course explores technologies for high-throughput collection of genomic-scale data, including

sequencing, genotyping, gene expression profiling, and assays of copy number variation, protein expression and protein-protein interaction. In addition, the course will cover study design and statistical analysis of large data sets, as well as how data from different sources can be used to understand regulatory networks, i.e., systems. Statistical tools that will be introduced include linear models, likelihood-based inference, supervised and unsupervised learning techniques, methods for assessing quality of data, hidden Markov models, and controlling for false discovery rates in large data sets. Readings will be drawn from the primary literature. Evaluation will be based primarily on problem sets. Spring Qtr.

CPNS 35600 Statistics and Information Theory
This course begins with an introduction to inference and statistical methods in data analysis. We then cover the two main sections of the course: I) Encoding and II) Decoding in single neurons and neural populations. The encoding section will cover receptive field analysis (STA, STC and non-linear methods such as maximally informative dimensions) and will explore linear-nonlinear- Poisson models of neural encoding as well as generalized linear models alongside newer population coding models. The decoding section will cover basic methods for inferring stimuli or behaviors from spike train data, including both linear and correlational approaches to population decoding. The course will use examples from real data (where appropriate) in the problem sets which students will solve using MATLAB. Spring Qtr.

ECEV 32000 Computing Skills for Biologists
The course will cover basic concepts in computing for an audience of biology graduate students. The students receive basic training in the use of version control systems, databases and regular expressions. They learn how to program in python and R and how to use R to produce publication-grade figures for their manuscripts, and how to typeset scientific manuscripts and theses using LaTeX. All the examples and exercises will be biologically motivated and will make use of real data. The approach will be hands-on, with lecturing followed by exercises in class. Winter Qtr.

Cell Biology

MGCB 31600. Cell Biology I
Eukaryotic protein traffic and related topics, including molecular motors and cytoskeletal dynamics, organelle architecture and biogenesis, protein translocation and sorting, compartmentalization in the secretory pathway, endocytosis and exocytosis, and mechanisms and regulation of membrane fusion. Autumn Qtr.

MGCB 31700. Cell Biology II
This course covers the mechanisms with which cells execute fundamental behaviors. Topics include signal transduction, cell cycle progression, cell growth, cell death, cancer biology, cytoskeletal polymers and motors, cell motility, cytoskeletal diseases, and cell polarity. Each lecture concludes with a dissection of primary literature with input from the students. Students write and present a short research proposal, providing excellent preparation for preliminary exams. Cell Bio I 31600 is not a prerequisite. Winter Qtr.

Molecular Biology

31200. Molecular Biology I
Nucleic acid structure and DNA topology; methodology; nucleic-acid protein interactions; mechanisms and regulation of transcription, replication and genome stability and dynamics. Winter Qtr.

31300. Molecular Biology II
This course covers the mechanisms and regulation of eukaryotic gene expression at the transcriptional and post-transcriptional levels. Our goal is to explore research frontiers and evolving methodologies. Rather than focusing on the elemental aspects of a topic, the course highlights the most significant recent developments, their implications, and future directions, all with a strong emphasis on molecular

mechanisms. Each week the class focuses on one topic that is first explored through two lectures and then debated through an in-depth, student-lead discussion centered on 3-4 complementary and/or contrasting research articles in order to achieve a higher level, synthesis of a specific research topic. For the midterm and final, students prepare short research proposals, with extensive input from the TAs and instructors. Enrollment requires Molecular Biology I (MGCB 31200) or by special permission of an instructor. Spring Qtr.

32200 Biophysics of Biomolecules This course covers the properties of proteins, RNA, and DNA, as well as their interactions. We emphasize the interplay between structure, thermodynamics, folding, and function at the molecular level. Topics will include cooperativity, linked equilibrium, hydrogen exchange, electrostatics diffusion and binding. Spring Qtr.

Genetics

MGCB 31400. Genetic Analysis of Model Organisms
Fundamental principles of genetics discussed in the context of current approaches to mapping and functional characterization of genes. The relative strengths and weaknesses of leading model organisms are emphasized via problem-solving and reading of original literature. Autumn Qtr.

ECEV 35600. Principles of Population Genetics
Examines the basic theoretical principles of population genetics, and their application to the study of variation and evolution in natural populations. Topics include selection, mutation, random genetic drift, quantitative genetics, molecular evolution and variation, the evolution of selfish genetic systems, and human evolution. Winter Qtr.

HGEN 47900. Decoding and Engineering Genes and Genomes
The course will provide an in-depth presentation and discussion of the cutting-edge technologies that can be used to identify and characterize the genomic elements (genes, *cis*-regulatory elements, chromatin features) that determine cell functions. Spring Qtr.

HG 47200 Genetic Mechanisms from Variation to Evolution
This course provides a graduate-level introduction to enduring questions regarding the fundamental processes by which genetic information is inherited, regulated, and transformed into organismal phenotypes and how these mechanisms shape and interact with evolutionary processes. We will describe different strategies, including new genome analysis and engineering technologies and statistical/computational principles, that can be used to study the complex, multi-layered organization of genomes, their interactions with varying environments, and ultimately, their evolution. Autum Qtr.

BCMB 31100 Evolution of Biological Molecules
This course connects evolutionary changes imprinted in genes and genomes with the structure, function and behavior of the encoded protein and RNA molecules. Central themes are the mechanisms and dynamics by which molecular structure and function evolve, how protein/ RNA architecture shapes evolutionary trajectories, and how patterns in present-day sequence can be interpreted to reveal the interplay data of evolutionary history and molecular properties. Core concepts in macromolecule biochemistry (folding and stability of proteins and RNA, structure-function relationships, kinetics, catalysis) and molecular evolution (selection, mutation, drift, epistasis, effective population size, phylogenetics) will be taught, and the interplay between them explored. Winter Qtr.

HGEN 46900. Human Variation and Disease
This course focuses on principles of population and evolutionary genetics and complex trait mapping as they apply to humans. It will include the discussion of genetic variation and disease mapping data. Spring Qtr.

HGEN 36400. Molecular Phylogenetics
While evolution by natural selection is an elegantly simple phenomenon, modern research in evolutionary biology

contains a variety of controversial, and sometimes confusing, topics. In this course, we will explore, as a group, a select list of controversial or confusing topics in evolutionary biology through a mix of student-led presentations and discussion of the primary literature. Each student will also write a review paper about his or her selected topic. Autumn Qtr.

Courses offered at MBL after the first year (not counted towards course requirement)

DVBI 38500. Comparative Delveopmental Biology @ MBL
The Uchicago Embryology Course is an intensive residential research course hosted at the Marine Biological Laboratory in Woods Hole, MA, designed for graduate students in year two or beyond. In this lab-based course students will gain exposure to a combination of well-established and emerging developmental model systems. Students will develop advanced experimental skills—many of which will be transferable across organisms—in the handling and cellular/genetic manipulation of embryos, including CRISPR/Cas mutagenesis, microinjection, lineage tracing, microdissection, in situ hybridization, and high-resolution *in vivo* imaging. Students will also develop an enhanced appreciation of the advantages each different species provides, will learn to think more comparatively / in a phylogenetic context, and will learn how to select the most appropriate species to address specific questions. They will learn about classic, recent, and developing methodologies and techniques, and in evening lectures will be exposed to exciting research using these approaches. Developing and completing a short independent or team-based research project will enhance skills in hypothesis generation and experimental design, with the overall experience helping students to become more effective and critical readers of the broad developmental literature The course is graded Pass/Fail. Alt. Autumn 2024.

MGCB 39500. UChicago Microscopy
The UChicago Microscopy Course is a residential research course to be hosted at the Marine Biological Laboratory in Woods Hole, MA, Oct 1-14, 2023. The course is designed for graduate students in year two or beyond. Travel and lodging costs will be covered in full. In this intensive two-week boot camp course, students will learn both conceptual foundations and practical approaches to modern light microscopy, using a variety of microscopes and specimens. The central goal is to empower students to identify and master imaging strategies that are best suited to address their specific experimental problems of interest, now and into the future. Core topics will include: (a) fundamentals of microscope design, image formation, contrast and resolution; (b) common approaches to transmitted light (e.g. phase contrast, DIC and polarization) and fluorescence microscopy (e.g. laser scanning or spinning disk confocal, light sheet and TIRF), (c) fluorescent probes and multispectral imaging; and (d) cameras and detectors, signal: noise and strategies for optimal sampling in space and time. More advanced topics will include single molecule approaches, super-resolution, and photokinetics (e.g. FRAP, photoactivation and optogenetics). In the first half of the course, daily lectures will introduce basic concepts, followed by intensive hands-on experience with different specimens, microscopes, and imaging modalities. In the second half, students will explore more advanced topics of interest through a set of modular projects. The course is graded Pass/Fail. Alt. Aut 2025.

Reading Courses

DVBI 39800/39900. Reading course in an area of developmental biology, genetics, cell or molecular biology. Every reading course must conform to the following requirements: 1) it must meet weekly; 2) the student must submit a written paper; and 3) at the end of the quarter the instructor must provide a written evaluation of the student's performance and a letter grade. Prior to the registration deadline for the quarter in which the course is planned, the student must submit a written petition to the Faculty Steering Committee explaining the goals and rationale for the course. A copy of the course syllabus and a signed affidavit from the faculty member approving the syllabus and willingness to supervise the course must accompany the petition.

RESEARCH INTERESTS OF COMMITTEE FACULTY

Carrillo: molecules and mechanisms controlling neural wiring specificity.

Chen: stem cell technology, stem cell biology, tissue engineering, and cancer biology

Cunningham: hematopoietic stem cells; transcriptional control of early development.

De Jong: hematopoietic stem cell transplant, cancer, and blood diseases (not accepting students).

Du: retinoblastoma protein function and regulation; cell cycle control.

Echeverri: cell biology, developmental biology, imaging, regeneration.

Fehon: molecular genetic analysis of specialized membrane domains.

Ferguson: cell fate specification and stem cell biology in *Drosophila* (not accepting students).

Gilad: genetic and regulatory differences between humans and other primates.

Gillis: skeletal development, neuroendocrine development, evolutionary developmental biology

Glotzer: molecular mechanisms of cytokinesis in animal cells.

Green: neurotransmitter receptor assembly and expression.

Heckscher: development and function of sensorimotor circuits for locomotion in Drosophila larvae.

Ho: specification of body axes in the zebrafish embryo.

Horne-Badovinac: epithelial morphogenesis and organ shape

Imamoto: mouse models of human syndromes that affect craniofacial development.

Kovar: molecular mechanisms of actin assembly.

Kratsios: molecular mechanisms of motor circuit formation.

Malamy: molecular regulation of plant root systems.

Mitchell: mechanics, dynamics, and patterning in organ morphogenesis

Moskowitz: developmental genetics of cardiac morphogenesis and congenital heart disease.

Munro: computational and developmental analysis of cytoskeletal dynamics and tissue morphogenesis.

Prince: comparative molecular studies of anterior-posterior patterning in zebrafish and other teleosts.

Ragsdale: pattern formation in the vertebrate brain.

Rebay: signaling networks and transcriptional regulatory circuitries in development and disease.

Schmidt-Ott: developmental mechanisms and evolution.

Schwartz: biosynthesis of connective tissue during embryonic development.

Shubin: evolutionary origin of new anatomical features and faunas.

Swartz: Reproduction, reproductive longevity, meiosis, oogenesis, polarity, cell division, development, sea stars

Wu: somatic stem cells in mammalian skin, and their involvement in tissue homeostasis and skin diseases.

Zhang, Xioayang: mechanisms of brain development and disorders.

Zhang, Zhuzhu:

Zhou: Heart development, disease and repair

DETAILED DESCRIPTION OF PROGRAM OF STUDIES

Laboratory Rotations

Students undertake short research projects in at least three different laboratories before beginning their dissertation research. Rotations are performed in fall, winter, and spring, and generally coincide with the ten-week academic quarter. Upon completion of each rotation, the student must provide the Faculty Steering Committee a written 1-2 page report summarizing the rotation's scientific goals and achievements. This report should be signed by both the student and the faculty rotation advisor and submitted prior to beginning the rotation. The faculty member directing the host laboratory will also provide the Faculty Steering Committee an evaluation of the student's performance. These evaluations aid in tailoring the rest of the student's academic program.

What are rotations and what is their purpose? Briefly, the PhD training process centers on the development and successful execution of an independent research project, leading to publication of novel and important results. The purpose of rotations is to help each student identify the laboratory environment that is best suited for their training. Thus, each rotation is a short exploratory venture into a different research lab to see if it's the right "fit". Because the lab you join will have a significant long-term impact on your scientific training and career, rotations are arguably the most important part of the first-year experience. The classes of course equip you with important knowledge and introduce you to new fields and ways of thinking, but the laboratory setting is where you will ultimately gain the vast majority of your PhD training over the next 5-6 years. Rotations provide the entry point to that new learning format.

How does a rotation help you figure out if a particular lab is where you want to do your PhD? First, it is important to remember that the "fit" must be right both from the student's point of view and from the lab's point of view. In other words, the rotation student needs to assess the mentoring and interaction style of the PI, the broad scientific interests and experimental approaches of the lab, and the overall lab

atmosphere or culture and decide if it's a good match. In turn, the lab has to assess the rotation student's scientific interests, motivation and ability to learn, experimental skills and personality, and decide if it's a good match.

To facilitate interactions during the rotation so that both the student and the lab can assess "fit", each rotation student is given a small independent project – the project may focus on learning a new technique, getting a feel for the model organism, taking on a small experimental off-shoot of a more established project, or helping with a larger longer-term experiment. Rotation projects need not be entry points into a dissertation project, although sometimes they are. Rotation projects do not have the expectation of generating a lot of data or leading to a publication, although sometimes they do. It is a good idea to discuss rotation expectations and goals at the start of the rotation with both the PI and the lab member who will be working most closely with you, and then to revise them as needed throughout. Bottom line - a good rotation project is one that motivates you to spend enough time in the lab thinking about the science and interacting with other lab members that you are then able to make a confident decision about whether it is or is not an environment where you would want to do your PhD training.

Remember that doing good science requires sustained effort, enthusiasm and support, and so having a lab atmosphere that you enjoy and that stimulates you intellectually, a PI that you find easy to talk to, and lab-mates whose projects interest you can make all the difference in putting you on the path toward a successful and positive PhD experience. So, when you rotate, don't just bury yourself in your experiments. Make sure you talk to everyone, multiple times and about lots of different things. Ask questions about science and about mentoring/training styles and about life in general. Speak up in lab meetings.

Finally, when assessing fit and deciding which lab is best for you, never underestimate the importance and impact that the personal interactions and overall atmosphere of the lab will have on your training. Even if you love the science, if you and the PI just don't match personality-wise, it is very unlikely that you will enjoy the lab long-term. If you don't enjoy your lab environment you are much less likely to be motivated, productive and successful. Trust your instincts and use your student and faculty advisors, and other student and faculty colleagues, as sounding boards to explore your thinking as you make these decisions.

How to start thinking about the fall rotation: To start, please go to the DRSB website and click on "People" and then "Faculty". Please be aware that some lab websites may be out of date even though the lab is currently an active and vibrant research environment. PubMed and bioRxiv are good ways to assess this, although keep in mind that you will only learn about new projects or research directions that haven't yet reached the publication stage by talking to the PI and lab members. You are also free to explore faculty outside the DRSB program and will find all the necessary links to do that from the DRSB site.

It is relatively easy to figure out whether the scientific focus of a lab interests you. So, this is the first step toward making a short list of labs where you might be interested in rotating. Because you have 3 rotations to work with, you will likely have to whittle down the list – talking with your student and faculty advisors, talking with the lab PIs and with other lab members are all important as you narrow the list. Once in a lab rotation, you will keep assessing "fit" by spending time in the lab doing experiments, by spending time in the lab chatting with all the other lab members and the PI, and by spending time reading and learning about the science and experimental approaches.

In addition to sifting through websites and papers on your own, we strongly encourage you to get feedback and additional suggestions from both your student and faculty advisors, from the DRSB Faculty Steering Committee, and from other students or faculty you met while interviewing. Basically, the more

you think about and discuss your interests, the better choices you will make in selecting your rotation lab.

How to line up a rotation? Once you have a short list, please contact individual faculty directly (email is usually best) to discuss the possibility of doing a rotation in their lab. It may be quite helpful to spend a little time looking at some recent papers from their labs (or more broadly in their field) before you contact them, as this will help you explain better why you are interested in their research area. You don't need to go crazy with this, but first impressions are important, and a thoughtful email describing your scientific interests and why you think their lab might be a good match can go a long way toward opening doors. Obviously if you already had a great interaction when you interviewed, then the initial email contact should be quite easy. It is also important that you identify more than one lab in which you might want to rotate this fall - sometimes a faculty member's schedule won't leave time to accommodate a fall rotation, or the lab might be full, so don't be discouraged if you get a few No's along the way. Overall, you will find most faculty will be delighted to hear from you and eager to have you rotate.

Once you've opened up an email conversation, you should then arrange a time to meet with them to discuss research interests, possible projects etc. in more detail. This should happen before orientation. You will meet with the entire Faculty Steering committee again during orientation week, and so if you haven't yet settled on a rotation at that point, we can offer more help and advice.

In selecting their rotations, students are encouraged to seek advice and input from their first-year advisor and from the whole Faculty Steering Committee. It is expected that a student's interests will evolve and change considerably as they gain exposure to new areas of science through their coursework and other interactions. For this reason, students are encouraged not to plan all three rotations in advance at the start of the academic year. And even if a student "commits" in advance to a specific rotation, such agreements are non-binding, and the student may revise their plans up until the start of the quarter in which the rotation is planned. Students are responsible for all logistics of contacting faculty of interest and setting up their rotations. The course "Introduction to Research" (aka Allstars) facilitates the process of making initial contacts with faculty. Students are encouraged to meet with multiple faculty members to discuss further their lab's research, and the possibility of a rotation. Rotations may be performed in labs outside of the DRSB program.

Rotation Grading Guidelines

Rotations are graded on a Pass/Fail basis. Although rotations do not count toward a student's Divisional Course Requirements, the grade and the written evaluation from the faculty advisor will be part of the student's academic performance record. The following guidelines will be provided to the faculty regarding rotation grades:

Passing (P) grade: This grade denotes a performance that ranges from acceptable to outstanding. The grade of P should be awarded when the student has regularly attended the lab and put solid effort into both experimental and intellectual aspects of the project.

Failing (F) grade: This grade denotes inadequate performance. Significant deficits in any of the following areas may lead the faculty rotation advisor to assign an F grade: attendance, intellectual engagement, or focus on either experimental or academic goals of the project.

Teaching Assistantships

Teaching and verbal communication are important skills for a successful research career. All students are required to serve as teaching assistants (TAs) for two quarters; DRSB students are expected to

perform one TAship in the third year and one in the fourth year. If a student wishes to TA in their second year, they must submit a written request to the Faculty Steering Committee, signed by their thesis advisor, that explains how/why an early TAship is needed to advance their own dissertation research. Students must register for BSDG 50100, complete the TA compact, and submit the electronic TA requirement form by the end of the first week of classes to receive credit. Standard TA responsibilities include leading discussion groups, writing problem sets, holding office hours, grading exams and other assignments and assisting in laboratory exercises. The instructor will evaluate the TA's performance, and these evaluations will become a part of the student's record.

Any student at risk academically or who is behind in meeting program requirements must request permission from the Faculty Steering Committee prior to undertaking a Teaching Assistantship. Under such circumstances, permission to TA would normally be granted only of it were deemed that TAing a particular course would be beneficial in terms of the student's academic progress.

Students interested in performing additional TAships should consult with both their thesis advisor and with the chair of their thesis advisory committee prior to making a commitment

Vacations

Graduate students who are fully registered and receiving a full stipend for four academic quarters are required to be on campus, in residence, and engaged in study or research during all four quarters, including the summer quarter. During their first year in the graduate program, vacations generally coincide with the University's academic calendar. Please note that the Fall rotation continues until roughly one week after the end of final exams. International students who need to travel to their home country for visa renewal may request permission from the Faculty Steering Committee and from their rotation advisor to end the rotation on the last day of Fall quarter. Prior to joining a laboratory, first year students who wish to take a vacation at other times, including during summer quarter, must obtain the approval of the Faculty Steering Committee. After joining a laboratory, the amount and the timing of vacation must be agreed upon by a student and their thesis advisor.

Grading Policy and Academic Standing

DRSB students must demonstrate proficiency in their core academic coursework. For the discussion below a "core course" is defined as any course taken to fulfill the developmental biology requirement, any course taken to fulfill the distributional requirements in genetics, cell or molecular biology, and quantitative analysis. Elective courses are excluded.

To maintain good academic standing, a student must maintain at least at least a B average (3.0) in their core courses in any given quarter. Failure to do so will result in an academic warning. The Faculty Steering Committee will advise the student of what must be achieved to restore good academic standing. Failure to achieve the agreed upon milestones by the end of the next quarter will result in the student being placed on academic probation.

A student who receives a C+ or below in any core course, regardless of their overall grade point average, will be placed on academic probation. The Faculty Steering Committee will inform the student in writing that they are at risk of being dismissed from the program, and what they must achieve to restore good academic standing.

If a student receives a second grade of C+ or below in any core course, continuation in the program is no longer automatic. This is regardless of their overall grade average, and regardless of whether they had been restored to good academic standing after the first C+ or below. The student may petition the Faculty

Steering Committee to remain in the program. If the petition is granted, the Faculty Steering Committee will inform the student in writing of what must be achieved to restore good academic standing. If the student is unable or unwilling to meet the necessary milestones, the student will be dismissed from the program.

The Candidacy Examination

The Biological Sciences Division requires that "a general oral or written qualifying examination, separate from course examinations, must be passed by the student upon the major subject offered and such subordinate subjects as may be required by the Department or Committee concerned." In the Committee on Development, Regeneration, and Stem Cell Biology, this examination is administered in two parts. Part I, the Preliminary Examination, takes place at the end of the first year. It is administered by a committee of three faculty, including one member of the Faculty Steering Committee who serves as chair. Members of the examining committee are selected by the Faculty Steering Committee, with prior advisors and rotation mentors generally excluded. Part II, the Qualifying Examination, takes place at the start of winter quarter in the second year. It is administered by the student's thesis committee, which is comprised of the thesis advisor and a minimum of three additional faculty suitable to the field chosen by the student in consultation with their thesis advisor. The composition of the thesis committee must be approved by the Faculty Steering Committee and must conform to the following guidelines: 1) at least two members of the thesis committee must have appointments in the Committee on Development, Regeneration, and Stem Cell Biology; 2) the chair of the thesis committee must be someone other than the thesis advisor and must have an appointment in DRSB. If the Faculty Steering Committee feels there might be a conflict of interest between the thesis advisor and any of the other three faculty on the committee, an additional faculty member must be added to the committee.

Part I: The Preliminary Examination

Students take their Preliminary Examination at the end of June of their first year. The purpose of this exam is two-fold. First, it is designed to assess each student's readiness to start working independently on their doctoral research. Second, it is designed to help all students gain experience in crafting a research proposal, a skill essential to scientific research. The exam presupposes general knowledge in the field of developmental biology, and of how genetic, cellular, molecular and quantitative approaches are employed within the field. It will test the students' ability to use this knowledge to identify an interesting question from the current literature, to pose a testable hypothesis and to design an experimental plan to advance understanding in the chosen area. Course work during the first year, attendance at seminars, and reading the current literature should be good preparation for the exam.

The format for the exam is a two-hour oral defense of a 5-page written research proposal on a topic chosen by each student. To encourage creativity and independent thinking, the topic should not be closely related to the student's doctoral project or to projects on which they have previously worked, including undergraduate projects and rotation projects. Additional inappropriate projects include those closely related to projects ongoing in rotation labs. Students must identify an important general area in which research is needed, frame an interesting specific research question in that area, design a set of experiments to test one or more explicit hypotheses, and discuss how the potential results will be interpreted. A critical aspect of the exam is understanding the limitations of different approaches and defining alternative, complementary approaches. The winter quarter Journal Club presentation in DVBI 31800 "Communicating Developmental Biology Concepts" is designed to help students select their general area of interest and develop a sufficient knowledge base well in advance of preparing the actual proposal.

Approximate timeline and deadlines:

- **Winter Quarter** - Journal Club Presentation of a recent paper in the chosen field of interest.
- **Late Winter Quarter** - Students meet as a group with the Faculty Steering Committee to discuss the preliminary examination process.
- **Friday, April 4, 2025** - Students submit the Specific Aims for their proposal to the Faculty Steering Committee. Students are strongly encouraged to discuss their ideas with faculty not limited to those on the Faculty Steering Committee, in advance of this initial submission deadline.
- **Monday, April 7, 2025:** Students will be advised of their exam date, time, and location and of the composition of their examining committee. If a student feels there is a conflict with a faculty member assigned to their examining committee, they may ask to replace that faculty.
- **Friday, April 11, 2025** students will be notified that the proposal topic is approved or that revision is necessary. It is expected that revision will be required. It is common for the first round of revision to be extensive, sometimes requiring complete reworking of both the proposal topic itself and the planned experimental approach.
  Assuming revisions are required, students should discuss their revision plan with faculty on their examining committee, and as helpful, with other faculty who may be experts in the field, with other members of the Faculty Steering Committee and with more senior student or post-doctoral colleagues.
- **Friday, April 18, 2025.** Initial revision of Specific Aims due. Students will be notified assoon as possible that their proposal topic is approved, or that additional revision is required. It is expected that revision will be required.
- **Friday, May 2, 2025.** Final revision of proposal Abstract and Specific Aims due. Students will be notified as soon as possible that their proposal topic is approved. In the event approval is not granted, and additional revision is required, the revised Specific Aims must be approved by **May 19, 2025**. If this deadline cannot be met, then the student will resume work on the Specific Aims after the end of spring quarter and the Preliminary Exam will be postponed by about a month.
- Deadline for submitting the full research proposal to faculty on the examination committee will be about a week in advance of the oral examination dates, which will be scheduled in late June.

Guidelines for Preparation of the Preliminary Exam Written Proposal:

Specific Aims Page

After discussing their ideas with relevant faculty, students should prepare a Specific Aims page for their proposal. This document should be one page in length and should include the following items:

- An opening section formulating the overall question that is to be to be addressed.
- A summary of essential background information and identification of a specific knowledge gap that together motivate the question the proposal will address and explain its importance.
- A clear and logical "set-up" of the experimental hypotheses to be addressed.
- The proposed specific aims. For each aim, state the hypothesis that will be tested. The maximum number of specific aims permitted is two; however, since it can be difficult to discuss multiple aims in sufficient depth, students may propose only one specific aim.
- Brief summary of the general experimental strategies for each aim.

References should be included and are not within the 1-page limit. When submitting the Specific Aim page, students must include a recent and relevant review article and a copy of the primary research paper on which the proposal is most clearly based.

Full Proposal

The written proposal should include the student's name and a title and be five single-spaced pages in length, including figures (please follow the NIH format of Arial eleven-point font and half-inch margins). This limit does not include references, for which there is no page limit. The scope of the experiments proposed should be roughly what a graduate student might achieve in four years of doctoral research. The proposal should be organized as follows:

- Specific Aims (one page).
- Background (about a page). Give a brief introduction, providing only essential background on the topic and elaborate on the significance of and interest in the question and the impact the proposal would have on the field, if successful.
- Experimental Design. Describe the approaches to be used to address the experimental hypotheses. It is important to develop a clear rationale for the experimental design; the minute details of the experiments are less important. However, it is critical that the proposed experiments are feasible given the resources and techniques currently available. Possible outcomes, pitfalls, alternative approaches, and implications of the results must be discussed. Such discussions can be either integrated with the Experimental Design section or presented separately.

The student will submit the final proposal by email and, if requested, in hard copy to the examining committee and to the Graduate Program Administrator before the exam. To assist the examiners, the student should also provide a copy of the most useful published review of the field and a copy of the primary research paper on which the proposal is most closely based.

Oral Exam

The oral exam lasts for approximately 120 minutes. Students should prepare ~30 minutes of material. They should briefly present the proposal objectives and the motivation for these objectives. Two PowerPoint slides are allowed although working on a whiteboard often works best. The faculty examiners question the students about the foundation for the question, the potential impact of the question, the experimental hypothesis in each aim, the rationale and feasibility of the experiments, possible interpretations of the experimental results, and alternative approaches that might be important. Because part of the purpose of the exam is to test a student's general knowledge in the area of developmental biology, faculty may also ask general questions to probe the student's knowledge.

The examining committee will evaluate the written document together with the oral presentation, using the following criteria:

1. Knowledge of fundamental ideas and paradigms in developmental biology
a. Does the student have sufficient depth of knowledge of the chosen area of their proposal to enable them to understand the current status of knowledge in the field and identify an important question?
b. Does the student have knowledge of sufficient breadth to enable them to draw from related fields in the analysis of a given problem?

2. Quality of research strategy posed
a. Is the logical structure of the strategy sound?
b. Have the possible experimental outcomes been considered and their interpretations relative to the original hypothesis been carefully evaluated?

An important goal of the exam is to provide an opportunity for students to improve their writing skills, and students should not be surprised if they are asked to revise the written document after the exam. To help improve writing skills, all students are advised to take advantage of writing workshops and courses offered by the division and the university. For more information, go to https://writing-program.uchicago.edu/grads

Based upon the student's performance, the examination committee recommends one of the following:
A. Pass unconditionally
B. Pass conditionally, with revision of written proposal required. The revised proposal should be submitted within two weeks by email and, if requested, in hard copy to the examining committee and to the Graduate Program Administrator. All members of the examining committee will evaluate the revised proposal. The student will be informed of the final decision one week after submitting the revision.
C. Pass conditionally, with further course work required in one or twoareas.
D. Unsatisfactory, with the recommendation that the student retake the exam within the quarter.

The Faculty Steering Committee then meets to consider this recommendation, taking into consideration the student's overall academic performance as well as their performance on the examination. Students who perform unsatisfactorily on the exam and are permitted to retake it must do so by the end of the Summer Quarter. During the interim, students will continue to receive stipend support. The examining committee for the retaken exam will be selected by the Faculty Steering Committee Chair and will contain at least one member of the first examining committee and at least one new member. If the exam is retaken and the student does not pass, the student will be asked to leave the program.

Choosing an Advisor and Forming a Thesis Committee

At the end of the Spring Quarter of the first year of graduate study, the student will choose a thesis advisor. In the event the student chooses to work with a faculty member who does not have an appointment inthe Committee on Development, Regeneration, and Stem Cell Biology, the student must petition the Faculty Steering Committee for approval.

In consultation with the thesis advisor, the student should formulate a list of four prospective thesis committee members (including the student's thesis advisor) and submit this to the Faculty Steering Committee for approval. The function of the thesis committee is to monitor the student's progress and to assist the student in the development of their dissertation research. For this reason, the choice of the members of the thesis committee should be based on their knowledge and expertise in the area of the student's research. At least two members of the thesis committee must have appointments in the Committee on Development, Regeneration, and Stem Cell Biology. The thesis committee will be chaired by a member of the Committee on Development, Regeneration, and Stem Cell Biology other than the thesis advisor. The Faculty Steering Committee will require a fifth member to be added if it believes there are potential conflicts of interest between the thesis advisor and any of the other three faculty; in this case, the faculty member with the perceived potential conflict of interest cannot be appointed chair of the thesis committee. Once a thesis committee is constituted, its composition can be changed only by petitioning the Faculty Steering Committee. Such changes may be necessitated by differing circumstances, including a shift in the student’s experimental focus or unavailability of a faculty member.
Divisional requirements:
1. BSD requires that all students who have been admitted to candidacy have an annual thesis committee meeting; more frequent meetings are recommended for senior students.
2. BSD requires that students supply their committee with a brief written update on progress ahead of each committee meeting.
3. BSD requires that after each meeting the chair of the thesis committee will provide a written report on progress that is approved by all committee members, signed by faculty mentor and chair, placed on file with the program, and shared with the student.

4. BSD requires that the thesis committee chair be a faculty member who is not the student's primary mentor.

Part II: The Qualifying Examination

For the Qualifying Examination, the candidate will prepare a research proposal on the topic planned for their thesis research. It is important to note that the Qualifying Exam is not a thesis defense. It does not require preliminary results although, if available, they can be used. The exam tests the student's ability to:

1. Propose a coherent set of avenues to answer the question (SPECIFIC AIMS).
2. Summarize critically the current literature on that topic (BACKGROUND).
3. Describe a series of experiments taking into account possible pitfalls and offer alternative approaches (EXPERIMENTAL METHODOLOGY).
4. Provide references.

The written proposal should be modeled after an NIH grant application. It should consist of specific aims (1 page), background and significance/impact (2-3 pages), and a description of experimental approaches that includes discussion and interpretation of possible outcomes, consideration of limitations of particular approaches, and suggestions of alternative strategies (6-7 pages). These page numbers are guidelines, not strict rules, but the entire proposal must be no more than 10 pages (single spaced, Arial 11 font, 0.5-inch margins). Figures must be included in the body of the proposal, not as additional pages at the end, and count toward the 10- page limit. Figures must be large enough to be legible on a printed page, without additional magnification. References should be placed at the end, and do not count toward the 10-page limit. Examples of past proposals will be available in the Graduate Program Administrator's office.

Students are expected and encouraged to work closely with their thesis advisor as they develop, write, and revise their proposal. Assuming a student has been conscientious about reading broadly in their field since joining the lab, a successful proposal will generally require ~ 4-6 weeks of intensive preparation; this effort can of course be spread out over a longer time period to suit individual preferences and/or experimental research obligations.

The oral exam should be scheduled to take place by the end of January. It is the responsibility of the student to take care of the scheduling. The written proposal should be submitted to the members of the thesis committee and to the Graduate Program Administrator no later than one week before the oral exam. If circumstances dictate a different schedule and/or the student's thesis committee is unable to meet prior to this time, the student must secure permission to postpone the exam from the Faculty Steering Committee. **All members of the student's thesis committee must be present for the Qualifying Examination**

Meetings with the Thesis Committee

Students are required to meet with their thesis committee six-nine months after the Qualifying Examination to assess their initial progress. In their third and fourth years, students must meet at least annually with their committee; starting in their fifth year, meetings should be held every six months to prepare the student for graduation. It is the responsibility of the student to schedule their meetings at the appropriate intervals determined by the DRSB program and their thesis committee. These meetings help to ensure that students are making adequate progress toward completing their dissertation and provide the student with a broader base of expertise on which to draw for help and advice. They also strengthen the student's acquaintance with faculty other than the thesis advisor.

At all meetings, a minimum of three members of the committee must be present, including the student's thesis advisor and the committee chair. If a meeting is to be held in the absence of one or more faculty members, the student should attempt to meet informally with such faculty in order to discuss their progress.

Students may change the composition of their thesis committee as warranted by changes in their research focus, or other reasons. Students must inform the Faculty Steering Committee of such changes and get approval.

In these meetings, which are expected to last 90 minutes, the student should give a formal oral presentation that both summarizes their experimental accomplishments since the previous meeting and outlines planned future directions. These oral presentations should be 20-30 minutes long to allow ample time for questions and discussion. The intent of these presentations is not to show the committee the result of every experiment the student has performed since the last meeting, but rather to highlight recent findings of particular significance to the project and to seek advice, both technical and intellectual, when stumbling blocks have been encountered in the project. It is critical that the planned presentation allow ample time for a thorough discussion. The student is strongly encouraged to consult with their thesis advisor in advance of these meetings to come up with a plan that will maximize the benefit of the meeting to the student's research progress.

One week prior to the meeting, the student should submit to committee members and to the Graduate Program Administrator an updated vitae and a written report of experimental progress since the last meeting as well as future objectives; the report should be two to four pages in length. The report should include the original aims and a discussion of how the original aims have been modified, if applicable. The report should also contain descriptions of experiments focused on these aims and, in particular, the data to be discussed at the meeting. Students are also encouraged to define in a summary statement the issues that would most benefit from the committee's input. For all meetings in the fourth year of study, and beyond, the student must also submit a separate one-page document that outlines their publication plans. For each planned publication, the student should provide a title and a list of projected figures, indicating which data are in hand and which experiments still need to be completed. These outlines are intended to help the student organize their research efforts and to start thinking about publication plans early on in their project. A copy of all written documents should also be submitted to the Graduate Program Administrator.

Students in year 3 or more are required to use a specific format for their thesis advisory committee meetings. The document can be found here https://biosciences.uchicago.edu/current-students/policies/uchicago/bsd and selecting BSD Progress and Plans Documents.

At the beginning of each committee meeting, the mentor provides a review of the student's progress. The student is not present for this review. At the conclusion of the meeting, the committee will briefly discuss specific recommendations and will then relay these to the student.

Following the meeting, the chair of the committee will provide a brief written report summarizing the discussion. At the very end of the meeting, the thesis advisor will be asked to leave the room, and the student will be offered the opportunity to speak with the committee in the absence of their thesis advisor.

Fifth Year Meeting with Thesis Advisor

All graduate students in the Biological Sciences Division are strongly encouraged to conclude their doctoral research within six years. The fifth-year meeting is designed to help students and thesis advisors realize this goal. At the beginning of the student's fifth year in the graduate program, prior to their thesis committee meeting, students will meet with their thesis advisors to develop a plan for completing the dissertation. The plan will include intended completion dates for experiments to be performed and proposed manuscripts to be written. The plan will be submitted to the student's thesis committee for approval at the committee meeting. Members of the thesis committee must approve the proposed plan or an appropriately amended version, as realistic and suitable. The final, approved plan will be submitted together with the standard thesis committee report after the annual meeting, and will be included in the student's permanent file.

Publication Requirement

To receive a Ph.D., DRSB students are required to publish a minimum of one first author peer- reviewed paper. Equal co-first authorships can also meet this requirement. This requirement formalizes the expectation that every DRSB doctoral student will make an original contribution to the scholarship in their field. Additionally, the requirement ensures training in fundamental aspects of our discipline: preparing a manuscript for submission to a journal, replying to reviewer comments, and finalizing the manuscript for publication.

At the penultimate meeting, the student's thesis committee will assess whether the student's publication record is sufficient to meet this requirement, prior to their granting approval for the student to write their thesis. Students may request an exception to the publication requirement by petitioning the Faculty Steering Committee. Letters from both the thesis advisor and the chair of the thesis committee supporting and explaining the reason for the exception must be included with the petition. If either the thesis advisor and/or the thesis committee chair are members of the Faculty Steering Committee, additional DRSB faculty member(s) will be recruited on an ad hoc basis to consider the case.

Penultimate Meeting with the Thesis Committee

After completing a significant body of experimental work, the student should seek permission from the thesis committee to write and defend their dissertation. One week prior to this meeting, the student should submit to the committee members an outline of their proposed dissertation. This outline should be as detailed as the student can make it and should include a list of ongoing experiments to be completed before the defense, a list of the chapters and the topics to be covered within each chapter, and a list of figures and tables for each chapter. All committee members must be present for this meeting, without exception. If this condition cannot be met, the student must consult the Faculty Steering Committee to determine alternative procedures. At the meeting, the mentor should review the student's overall progress in the program. The student is not present for this review. This is followed by a presentation from the student that reviews finished or published work and details ongoing experiments to be completed for the dissertation. After a discussion with the committee members, the chair of the thesis committee should prepare a written recommendation providing approval to the candidate to write and defend the dissertation. The recommendation may include specific guidelines for unfinished experiments as well as for the structure and content of the dissertation. This report must be signed by all committee members as well as the faculty mentor. Approval to write and defend the dissertation does not constitute its acceptance.

Presentation of the Dissertation

Each graduating student must write a dissertation describing their research, present the work in a public seminar, and defend it in front of a faculty examining committee.

The dissertation must be distributed to the thesis committee at least **two weeks** before the final examination. Announcement of the thesis defense will be posted one week before the defense date. The final exam committee consists of at least four faculty members, three of whom must be members of the student's doctoral committee and at least two of whom are members of the faculty of the Committee on Development, Regeneration, and Stem Cell Biology. A dissertation is not accepted if more than one member of the examining committee abstains or votes against acceptance. In such a case, the examining committee will advise the student and the Chair of the Committee of the additional work that must be completed.

The University has strict rules concerning the preparation of the dissertation. Detailed information is provided on the Dissertation Office website https://www.lib.uchicago.edu/research/scholar/phd/. The final dissertation must be submitted to the Dissertation Office no later than three weeks before the date of the

convocation. Once the dissertation has been submitted, the Chair of the graduate program must approve the thesis and the departmental approval form must be submitted to the Dissertation Office.

BSD guidance on the dissertation document:
All UChicago dissertations must adhere to the detailed instructions provided in the document University-Wide Requirements for the Ph.D. Dissertation (https://www.lib.uchicago.edu/documents/447/booklet2011.pdf). In addition, we strongly recommend that all BSD students plan to attend workshops offered by the Dissertation Office expert staff in advance of the quarter in which they defend. In addition:

1. Every BSD thesis must include an abstract (to the whole dissertation) of up to 500 words (a length determined by Proquest).
2. The overarching organization of the thesis should typically be:
   Table of Contents
   List of Figures
   Acknowledgments
   Abstract
   Introduction
   Data Chapters
   Discussion, which includes overarching conclusions in a broad framework – i.e. how the thesis work has altered and fits into the broader field – and future directions.
   Bibliography
   Appendices (as appropriate).
   Detailed Methods may usefully be gathered in a separate chapter but may alternatively be components of the **Data Chapters**
3. Chapters that are collaborative works must include an attributions section, within the opening abstract/summary of the chapter, which clearly delineates the contributions of other individuals to the work. This should have enough detail that a reader will fully understand which aspects of the research were performed by the author of the dissertation. We note that in many cases these chapters will take the form of published or submitted co-authored works.
4. BSD's position is that there is no expectation of rewriting published or submitted works, although sufficient framing should be provided to ensure they integrate appropriately into the thesis. The necessary framing may be provided in an extended summary or abstract, included within the body of the chapter text, or both. The previously published work must be fully cited. Most journals do not have restrictions on allowing parts (or all of) previously published works to appear within a thesis that will be placed on Proquest. However, we strongly recommend that all BSD students refer to the detailed information available from the University of Chicago dissertation office (https://www.lib.uchicago.edu/research/scholar/phd/) and urge all students to submit sample pages for draft review by the dissertation office staff. The quarterly draft review period is limited to the early weeks of each quarter; see https://www.lib.uchicago.edu/research/scholar/phd/services/drafts/

Final Quarter Funding Plan

The final quarter funding plan is to confirm a student's plans regarding participation in the research lab, in consultation with the thesis advisory committee, and to confirm expectations for fellowship support. This document is to be finalized at the last thesis committee meeting before scheduling the dissertation defense.

Student Grievances

The DRSB graduate program follows the Biological Sciences Division policies on resolving graduate students' concerns about academic matters. Academic matters include but are not limited to such matters as course grades, teaching assignments, publication rights, timely feedback on academic work, timeliness of letters of recommendation, and application of policies and practices.

Briefly, students who encounter problems with their research project, their thesis advisor, or the responses of their thesis committee to their work should approach the chair of their thesis committee to discuss how to handle and resolve the situation. If they feel uncomfortable approaching the chair, then they should contact the chair of the Faculty Steering Committee and/or the chair of the graduate program for advice – such conversations will always be regarded as confidential. If a student disagrees with the report on their committee meeting, they should immediately contact the chair of the Faculty Steering Committee. Students should always feel free to contact the DRSB Faculty Steering Committee to discuss any difficulties, scientific or personal; such communications are always confidential. Similarly, the Dean in the BSD Office of Graduate Affairs is available to help resolve academic problems and can help direct students to appropriate academic and non-academic support services provided by the Division and University.

The text below is taken from the Statement of BSD policy on "Procedures to Resolve BSD Graduate Students Concerns about Academic Matters". The full document and other relevant information can be found at: https://biosciences.uchicago.edu/current-students/policies (access requires cnet ID and password).

Questions About Academic Matters

Students with a question about a grade received in a course should consult with the instructor first. Other questions about academic matters may be brought to the academic advisor, the procedural chair of the student's thesis committee, the chair of the student's graduate program, the head of the program's Faculty Steering committee, or the dean for graduate students. These people will also be able to help guide students in determining who is the best person to answer their question.

Grievance Resolution Process

Students with a grievance should bring the grievance to the attention of an appropriate faculty member, who may be the academic advisor, the procedural chair of the student's thesis committee, the chair of the student's graduate program, the head of the program's Faculty Steering committee, the department chair of the faculty mentor, or in rare cases where none of these individuals are appropriate, the dean for graduate students. In cases where there is a perceived ethical issue, rather than, or in addition to, an academic issue, students should bring their grievance directly to the dean for graduate students. The person to whom the student brings their grievance will act as the facilitator of the resolution process, or alternatively will assist the student in finding a more appropriate facilitator. Grievances should be described in a concise and formal written document and brought forward as soon as possible, at the latest within one quarter.

Should the matter remain unresolved, the student may bring the grievance to the attention of the dean for graduate students. The student should submit their grievance, the written response to the grievance, and an articulation of why the matter is still unresolved in writing to the dean for graduate students. The dean for graduate students will review the written materials, may ask the student for clarification, may consult with the facilitator, and together with the BSD standing faculty grievance committee will

make a final determination. The dean for graduate students will discuss the outcome of the review in person with the student and follow up in writing.

Students with questions about any of these procedures may contact the dean for graduate students. Students may also avail themselves of the Office of the Student Ombudsperson (http://ombudsperson.uchicago.edu/) to assist in providing impartial advice and assistance with navigating the grievance procedures or related matters. The Ombudsperson can also help where the existing channels of communication or dispute resolution have proven unsatisfactory.

Other Complaints

Complaints about sexual harassment or discrimination and harassment on the basis of race, color, religion, sex, sexual orientation, gender identity, national or ethnic origin, age, disability, veteran status, genetic information, or other protected classes under the law are addressed under the University's unlawful discrimination and harassment policy. For more information, please see http://studentmanual.uchicago.edu/university/index.shtml#unlawful.

Complaints about student conduct involving possible violation of University policies and regulations and other breaches of standards of expected behavior of University students should be brought promptly to the attention of the Dean of Students of the academic area of the student in question."

REGISTRATION

General Information

About one week before the dates designated for registration, the Graduate Program Administrator will inform all students of the days and times to register online. Special registration procedures have been established for the first-year students in the Fall quarter. During Orientation Week, members of the Faculty Steering Committee and the Graduate Program Administrator will discuss program procedures with entering first year students. The students will then meet with members of the Faculty Steering Committee to map out a program of study for the first year. Second year students will also meet with members of the Faculty Steering Committee at the start of the academic year to review their progress in the preceding year and to discuss further degree requirements.

Leave of Absence

A student may, if necessary, apply for a Leave of Absence from the Ph.D. program to be approved by the Faculty Steering Committee and the Departmental Chair. Only students who are in good academic standing will be granted a Leave of Absence.

Pro-Forma Registration

Students whose dissertation research requires residence away from Chicago may register pro-forma. Pro-forma status establishes a good faith relationship between the student and the University. The following regulations apply:

1. Pro-forma registration is approved for only one academic year at a time, and the maximum pro- forma enrollment allowed is eight quarters.
2. Applications for pro-forma registration must be approved in writing by the Chair of the Committee, whose signature means that the student's work away from Chicago is recognized as essential to the

dissertation, and by the Office of Graduate and Postdoctoral Affairs.
Normally, students applying for pro-forma status will have been admitted to candidacy and have had dissertation topics approved.

3. An applicant for renewal of pro-forma status must show the Committee Chair that good use has been made of the time already spent "on location" and that additional time is essential to completing the original task. Renewals of pro-forma status must be approved by the Office of Graduate and Postdoctoral Affairs.
4. A student on pro-forma status may not be gainfully employed for more than 19 hours a week.
5. Pro-forma students may not use the facilities of the University or the time of its faculty, except for progress reports that may be required by the students' program.
6. The Registrar will certify that a pro-forma student is duly registered at the University to any agency requiring such certification.
7. The fact that a registration is pro-forma will be noted on the student's academic record.
8. Pro-forma registrations do not count toward satisfying a student's residence requirements toward a degree.

Visiting Non-Degree Students

Students who have moved to the University with their thesis advisor but who are still registered at their home institution are given the status of Visiting Non-Degree Students. This gives them access to the libraries and to athletic facilities while they are completing their degrees.

FINANCIAL SUPPORT

The Committee on Development, Regeneration, and Stem Cell Biology attempts to ensure that all DRSB students are provided with adequate financial aid. Financial aid is guaranteed to all incoming students for their first five years, subject to satisfactory academic performance.
Support for subsequent years of study is subject to the student's satisfactory research progress, as determined by the faculty sponsor, the program, and the Division of Biological Sciences.

Through their sixth year in the program, students will automatically receive any divisionally approved increase in stipend amount. Students in their seventh year and beyond will not receive these stipend increases.

Sources of Support

Students receive tuition plus a stipend. The various sources of support are:

- divisional funding
- training grants
- external fellowships
- research assistantships

Payment of Stipend Checks

All Ph.D. students are supported on divisional funds, training or research grants. All graduate student stipends are paid via direct deposit on the last business day of each month while tuition and fees are paid directly to the student’s account. Stipends paid to Research assistants supported by the research sponsor on a research grant are subject to monthly tax withholdings. Stipends supported by a training grant, NSF, or F award will not have taxes withheld monthly and students are required to make quarterly estimated tax payments to the IRS and State of Illinois.

Training grant support, for those appointed, usually begins in year two and lasts about two years, after which the student is supported by the research sponsor on a research grant or other approved awards.

Above and beyond the stipend, some students may work as a Teaching Assistant or Study Group Facilitator. Such added work is subject to approval by the student's research advisor and the departmental chair.

Taxes

Graduate student stipends are taxable by Illinois and the Federal government. Students on fellowships and NIH training grant support must calculate and pay estimated taxes several times a year. The following IRS forms provide information on determining what portion of your stipend is taxable andhow and when to pay taxes you owe:
Tax Benefits for Education, PUB 970
US Tax Guide for Aliens, PUB 519
US Tax Treaties, PUB 901
These forms are available from the IRS. Regenstein Library also carries tax forms, particularly after January 1st. For more information, please refer to the Internal Revenue website: Taxable income for students (http://www.irs.gov/Individuals/Students).

Supplies and Research Expenses

In general, costs of research supplies and equipment are covered by grants or contracts held by the faculty member in whose laboratory you are working. Limited supply funds are available on training grants, and are disbursed on an annual pro-rated basis, directly to the laboratories in which trainees are working. Students supported on training grants have small annual allowances for supplies. Students must usually be in their second year of support to receive an allowance. Requests for supplies are handled by the training grant administrator.

Travel to Scientific Meetings

Attendance at scientific meetings is an important part of the educational process. Limited travel funds are available on training grants and are distributed by the training grant administrator to students who request them, with preference given to students who have passed the Preliminary Exam. Additionally, DRSB may provide partial support for students who wish to give a talk or present poster at national or international meetings. Informal inquiries about the availability of funds and other questions should be directed to the program administrator, Stephanie Laine slainenazaire@uchicago.edu.

Should you decide to apply for a DRSB Mini Grant, you should submit a formal request (with your advisor's approval) in writing to the program administrator, supplying the following information:

1. Purpose of meeting and relevance to the research.
2. Title, place, and time of the meeting.
3. Meeting deadlines for registration and abstract submission.
4. Title and authors of the presentation.
5. Amount requested for travel, registration fees, food, and/or lodging.

Selection process: All DRSB students in good standing are eligible. Requests for support (e.g., $500 to defray travel costs to a conference) will be reviewed by members of the DRSB Steering Committee on a rolling basis based on merit, the availability of funds, and the availability or alternative funding mechanisms. The level of support may vary depending on recommendations of the Steering Committee.

Students may apply up to one time per year. In exceptional cases, retroactive support may be granted.

MISCELLANEOUS INFORMATION

DRSB Student Representatives

Students who have finished their first year of study are eligible to serve as student representatives. They help to organize a variety of student activities under program auspices, such as student recruitment events and the annual Retreat. Representatives typically serve for two years.

Scientific Ethics Course

A course on scientific ethics, "Responsible, rigorous and reproducible conduct of research," is offered in Winter Quarter. All first-year students must register for and attend the course.

Senior Ethics Course

All students in their fourth year and beyond are required to register for and attend a course on scientific ethics for senior students. The course is offered in Spring Quarter every other year.

Seminars

In addition to formal courses and seminars, there are many regularly scheduled research seminars that will help to keep students up to date on new developments in molecular genetics, cell biology, and related disciplines.

One seminar in particular deserves special note: on Fridays at 5:00 p.m. in CLSC 101, students and postdocs gather for an informal seminar, Graduate Student Seminar (GSS). Beer, soda, and foodare provided. The format is for a student to give a one-hour presentation on theirresearch.

Seminars sponsored by the Molecular Biosciences cluster are usually held on Tuesdays at 5:00 p.m., except for Human Genetics, which holds its seminars on Wednesdays. The schedule is as follows:
GGSB, 1st Tuesday, CLSC 101
BMB, 2nd Tuesday, GCIS 301
DRSB, 3rd Tuesday, CLSC 101
CMB, 4th Tuesday, CLSC 101
Human Genetics, one or two Wednesdays each month, KCBD 1103
Other seminar series of interest include: Cancer Biology
Various Fridays, 12:00 noon, KCBD 1103Ecology and Evolution
Mondays, 3:30 p.m., KCBD 1103 http://pondside.uchicago.edu/ee
Darwin's Weekly, Tuesdays, 12:00 noon, Erman 200 http://pondside.uchicago.edu/ee
Immunology, Mondays, 4:00 p.m., BSLC 115
Committee on Neurobiology and Committee on Computational Neuroscience Seminar Series: Thursday 11:00 noon, BSLC 001, http://neuroscience.uchicago.edu/events/
Chemistry, Mondays, 4:00 p.m., Kent 120
Evolutionary Morphology, Thursdays, 7:30 p.m., Hinds 176 http://evbio.uchicago.edu
Contact: Marcy Hochberg, mhochberg@bsd.uchicago.edu
Microbiology, Wednesdays, 12:30, CLSC 119

The Biological Sciences Learning Center and Jules F. Knapp Medical Research Building

This complex is located at the northern end of the Science Quadrangle. The Learning Center provides classrooms, laboratories, and research facilities for undergraduate, graduate, and medical programs. The Knapp Building houses faculty members in the areas of molecular cardiology, immunology, oncology, and neurobiology. In addition, the Office of Graduate and Postdoctoral Affairs for the Division of Biological Sciences is located in the Learning Center.

The Gordon Center for Integrative Science

The Center, a $200 million, state-of-the-art interdisciplinary research facility uniting scientists in the Biological Sciences Division and the Physical Sciences Division, is located at the northwestern end of the Science Quadrangle. This is the largest research facility on the campus, housing 700 investigators and students under one roof.

Knapp Center for Biomedical Discovery

Located adjacent to the Learning Center, the KCBD houses laboratories and office space for principal investigators, postdoctoral students, and graduate students in the departments of medicine and pediatrics, as well as the Cancer Research Center.

Libraries

The John Crerar Library (5730 South Ellis Avenue) combines the University collections in biological sciences, medicine, and the physical sciences. Users with valid University of Chicago ID's or Library cards have access to all floors and stack areas during all library hours. The library is adjacent to the Cummings Life Science Center and is connected by tunnel to Cummings, the Kovler Viral Oncology building, the Gordon Center for Integrative Science, and the Medical Center.

The lower level of Crerar contains the major service units: the Circulation Desk, Scan and Deliver, search requests, and course reserves. The website for the University of Chicago Libraries is www.lib.uchicago.edu.

Bursar's Office

The Bursar's Office, located at 6030 S. Ellis Ave, 2nd floor, is open from 9:00 a.m. to 4:00 p.m., Monday through Friday. For additional information, Students may call 702-8000. For the website, go to: http://bursar.uchicago.edu

Student Health Services

Student Health Services provides health care to all registered students in the University. It is funded by a mandatory quarterly student health fee. Payment of this fee allows the student access to the University's student health services. Some specialized and emergency care is not covered, nor does the fee include the cost of outside referrals, laboratory tests, and hospitalizations.

In addition to participation in Student Health Services, all students are REQUIRED to carry a health insurance plan (either university student health insurance or comparable insurance) to cover the costs of hospitalization, outpatient diagnostic and surgical procedures, laboratory tests and catastrophic illness. Charges for university insurance are assessed for each of three quarters (Fall, Spring, Winter); there is no charge for coverage for the Summer Quarter. More information about health services and the university insurance can be found on the web, http://wellness.uchicago.edu/ and

https://wellness.uchicago.edu/student-insurance/u-ship/

Students with comparable group insurance coverage through a parent's, spouse's, or their own policy may request that participation in the university program be waived. However, they must cover the cost of alternative health insurance out of their own pocket.

The Student Wellness Center is located at 840 E. 59th St. Hours are 8:00 a.m. to 6:00 p.m., Monday-Thursday, and 8:00 a.m. to 5:00 p.m. on Friday. To make an appointment, call 834-WELL.If you need emergency medical advice after SHS business hours, or if you need emergency medical advice during business hours or want to review an acute medical problem, call 702-4156
and follow the prompts to connect with a nurse. The nurse can provide time-saving advice and assistance and help you to determine if you need immediate medical treatment. For other services
and phone numbers, please visit the SHS website at http://wellness.uchicago.edu/.

The Student Counseling Service is located at 840 East 59th Street and is open from 8:30 a.m. to 5:00 p.m., Monday through Friday. It specializes in diagnostic evaluation, psychotherapy and emergency services for all students, as well as services for students who are experiencing difficulties in studying and learning and difficulty in managing time commitments. For an evaluation, outside referral, or assignment to a therapist call 834-WELL to schedule an appointment. Emergencies are taken immediately during regular hours. During evenings and weekends, a therapist is available by calling 702-3625. For all services and phone numbers, please go to the SCS at http://wellness.uchicago.edu/

Computing Facilities

Information Technology Services (IT Services) is UChicago's central provider for IT infrastructure, technology, and related service and support. Students may get information and apply for personal computing accounts online at http://its.uchicago.edu/get-started-students/. Also, the TECHB@R, located on the first floor of the Joseph Regenstein Library, provides convenient walk-up technology support.

Email accounts

All students must establish UChicago email accounts and check their accounts regularly. Email accounts can be set up online at http://its.uchicago.edu/get-started-students

Keys

The MGCB Department Office (CLSC 1106) issues keys needed by those working in the Cummings building. Graduate students may obtain laboratory keys from the receptionist.

Mail

The Cummings Mailroom is located in CLSC 108. First year students share mailbox number 60 and may also receive mail at their rotation lab; advanced students receive mail in their appropriate lab boxes.

Copying, Printing and Scanning

Copy, print, and scan stations are located in the Crerar and Regenstein libraries. The cost varies and a UChicago Card or campus card is required; no machine takes cash. For more information, see https://printing.uchicago.edu.

MGCB has a photocopying/scanning machine in CLSC 1106. You must set up an access account through the Departmental Office.

Lost and Found

Most University buildings have their own lost and found location. For the libraries, go to www.lib.uchicago.edu/thelibrary/lost-found/. For the Reynolds Club at 57th and University, call 2-8787. For the Medical Center at 58th and Maryland, call 2-6262; for Admissions at 58th and University, call 2-8650.

Parking

You may obtain an assigned parking space on campus by paying a monthly fee. Information about current fees and how to apply for a parking assignment is available at http://safety-security.uchicago.edu/transportation

For space in the multi-level parking garage at 5840 S. Maryland Ave., you must apply to the Hospital Parking Office located in the garage, 702-4381.

Transportation

Campus Bus

The Chicago Transit Authority (CTA) provides bus service for Hyde Park and Kenwood. The routes are as follows:

#171 U. of Chicago/Hyde Park: Services Lake Shore Drive/54th Street and the 55th-56th-57th Street Metra station. This route travels to campus on 55th Street and Ellis Avenue and then circles campus. This route operates weekdays from 7:32 a.m. to 6:32 p.m.; weekends from 8:02 a.m. to 6:32 p.m. After Summer Convocation, a reduced service schedule goes into effect.

#172 U. of Chicago/Kenwood: Services Lake Shore Drive/50th Street and the Hyde Park-53rd Street Metra station. This route travels to campus on Hyde Park Boulevard and Ellis Avenue and then circles around campus. This route operates weekdays from 7:30 a.m. to 6:37 p.m.; weekends from 8 a.m. to 6:37 p.m. After Summer Convocation, a reduced service schedule goes into effect.

#192 U. of Chicago Hospitals Express: Provides express service to/from downtown to Harper Court, campus, and the medical center. Southbound service is from 6:30 a.m. to 9 a.m., northbound service is from 3:45 p.m. to 7 p.m.

For more information, see http://safety-security.uchicago.edu/cta_buses

Students ride the # 171 and 172 free with a UCID; regular CTA fares apply for the #192 (full fare, $2.25).

The University also operates a free evening bus service, Nightride, consisting of four routes that cover the Hyde Park-Kenwood neighborhood. The buses operate on 15-30-minute schedules between 5 p.m. until about 4 a.m. Sunday through Wednesday, and until 6 a.m. Thursday through Saturday. They depart from the Ellis Parking Garage or University Avenue across the street from the Reynolds Club. During University breaks and Summer Quarter, the service runs until 1 a.m. For more information, see https://safety-security.uchicago.edu/services/ugo_nightride_shuttles

Safety Escort Program

The Safety Escort Program is not a transportation service - it is an escort service offered by University Security. An individual or group may call Security at 702-8181, and request a patrol car to accompany them from their place of departure to their destination anywhere within Hyde Park. This service is extremely useful late at night and/or if buses have stopped running. You may contact Security on emergency phones throughout the campus and Hyde Park. However, Security prefers that people only use these phones when absolutely necessary. Students consider this to be an excellent service. It's really a good idea to utilize it so that it continues to be offered.

RECREATION ON AND NEAR CAMPUS

There are two main student centers. The Reynolds Club, at 57th and University, includes Hutchinson Commons, home of the largest cafeteria on campus; two coffee shops; the North Lounge; automatic teller machines (in the basement area); and a variety of recreation rooms. For more information, visit https://leadership.uchicago.edu/

The Gerald Ratner Athletic Center is a 15,000-square-foot, state-of-the-art athletic and recreational facility. With its fitness center, gymnasiums, dance room, classrooms, 50-meter swimming pool, ball courts and more, it is designed to support the university's various sports teams as well as the fitness needs of other users. Graduate students receive membership for free. During the academic year, the center is open from 6 a.m. to midnight on Monday to Thursday, 6 a.m. to midnight., on Friday, 6 a.m. to 9 p.m., and 8 a.m. to 9 p.m. on Saturday and Sunday. For additional information about this facility, visit their website: http://athletics.uchicago.edu/landing/index

Ida Noyes Hall, on 59th Street between Woodlawn and Kimbark, was modeled after an English manor house. It houses the Max Palevsky Cinema, a 500-seat theater, home of Doc Films. For more information, visit http://docfilms.uchicago.edu . Ida Noyes also contains The Pub, the office of Career Advancement, and the *Maroon* office.

COMMITTEE ON DEVELOPMENT, REGENERATION, AND STEM CELL BIOLOGY

ADDRESS LIST

BSD

Name	Location	Phone
Anderson, Mark E., Dean of the Biological Sciences Division and Pritzker School of Medicine, Executive Vice President for Medical Affairs	AMB S106	2-9000
Bruckner, Halina, Dean for Medical Education	BSLC 104	4-2138
Kovar, David, Dean and Director, Office of Graduate and Postdoctoral Affairs	BSLC 104	5-9890

GRADUATE EDUCATION ADMINISTRATOR

Laine, Stephanie	CLSC 1105	2-3372

COMMITTEE

Albertin, Carrie	MBL	
Carrillo, Robert	CLSC 925B	4-4192
Chen, Joyce	CLSC 1003D	
Du, Wei	GCIS W336	
Echeverri, Karen	MBL	2-1205
Fehon, Richard	CLSC 901F	4-1949
Ferguson, Edwin	CLSC 921A	4-6751
Gilad, Yoav	CLSC 325C	2-5694
Gillis, Andrew	MBL	
Glotzer, Michael	CLSC 901	
Green, William	JFK 220	2-8507
Heckscher, Ellie	CLSC 915	4-7394
Ho, Robert	CH 305	2-1763
Horne-Badovinac, Sally	CLSC 921B	4-1376
Imamoto, Akira	GCIS W322	4-8423
Kovar, David	CLSC 212	4-1471
Kratsios, Paschalis	Ab 412	4-1258
Malamy, Jocelyn	GCIS W524A	4-2810
Mitchell, Noah	CLSC 921A	
Morgan, Jennifer	MBL	
Moskowitz, Ivan	KCBD 5102	2-7442
Munro, Ed	CLSC 218B	2-4651
Prince, Victoria	CH 205	
Ragsdale, Cliff	Ab 216	2-6221
Rebay, Ilaria	GCIS W340	4-2100
Schmidt-Ott, Urs	A 309	2-9609
Schwartz, Nancy	WCH C519A	2-5753
Shubin, Neil	CH 106	4-9798
Swartz, Zachary	MBL	2-6426

Wu, Xiaoyang	GCIS W408B	
Zhang, Xiaochang	CLSC 507A	4-2948
Zhang, Zhuzhu	CLSC 423	
Zhou, Bin		4-7472

Main Number – University	702-1234
Main Number – Hospitals	702-1000
Campus Police	702-8181
(Call **123** from any University phone)	

THE UNIVERSITY OF CHICAGO
DIVISION OF BIOLOGICAL SCIENCES

	PLEASE CHECK BELOW
Rotation 1	
Rotation 2	
Rotation 3	

LABORATORY ROTATION FORM

PART I: Student and Rotation information. To be completed for all rotations.

First Name	Last Name	UC ID #
Rotation Start Date	Rotation End Date	Quarter/ Year
Faculty name	Program	Contact

Project Goals: **Briefly** outline the goals of this laboratory rotation below. Outline the work to be performed.

- Summarize academic and technical goals - such as gaining familiarity with a specific literature and/or techniques.
- Describe opportunities for presenting (eg. lab meeting presentations or similar) and expectations for written reports (eg. lab notebooks, a summary report etc)

1. I am allowing this student to rotate in my laboratory. However, the student and I have agreed that this rotation is NOT intended to lead to subsequent Ph.D. research training in my group.	**Student** **Faculty**	_____ _____
2. I am allowing this student to rotate in my laboratory with the understanding that he/she may seek to carry out Ph.D. research training with me. **I am aware of the funding obligations associated with accepting this student to conduct dissertation research under my guidance. I agree to actively attempt to maintain, renew or obtain sufficient funding to support the student during the period that he/she pursues doctoral research in my laboratory (*Please be sure to clarify any uncertainties with the Program Head before signing).***	**Student** **Faculty**	_____ _____

Signature of Student

Signature of rotation faculty

THE UNIVERSITY OF CHICAGO
DIVISION OF BIOLOGICAL SCIENCES

PART II: To be completed if rotation is for course credit. Register for BSDG 40100, section for program

Student Name	Program	Quarter/Year
Faculty Name	Program	Phone

PART III: Representative of Degree-Granting Unit

Will this rotation will be graded and count towards the student's Divisional Course requirement?

Yes or No

Note that rotations to meet Divisional Course requirements must be for a full quarter, with the exception of summer rotations, which must be for at least 5 weeks..

Registered for BSDG 40100, section ____

_____

Signature of Academic Advisor

_____

NOTES:

Final quarter funding plan

Students must be in full-time registration in the quarter of receiving the PhD. However, students sometimes are not in Chicago for the full length of that final quarter. Please confirm your plans below so your graduate program and faculty advisor can make plans about the details of your support.

Name: Date of defense:

Program: Genetics, Genomics a Procedural chair:

Final quarter funding:

☐ I plan to remain on campus and active in the lab after I defend my dissertation until graduation
Remaining/Continuing lab responsibilities:

Fellowship support will continue as previously arranged

☐ I plan to leave campus after my defense

and my last day in the lab will be _____

New position:

The University of Chicago will assess the full cost of quarterly tuition and fees, regardless of the date of the final stipend payment within the graduation quarter. Your administrator can help with any special circumstances.

Student signature: _____ Advisor signature: _____

Please return this form to Stephanie Laine-Nazaire, CLSC 1105B