

THE UNIVERSITY OF CHICAGO

COMMITTEE ON GENETICS,  
GENOMICS & SYSTEMS BIOLOGY  
(GGSB)

Graduate Program Handbook

*Molecular Biosciences Cluster  
Biological Sciences Division*

*2009-2010 Academic Year*

**COMMITTEE ON GENETICS & GENOMICS & SYSTEMS BIOLOGY (GGSB)**  
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## **ACADEMIC CALENDAR**

### **Autumn Quarter 2009**

August 25	Preliminary Exam question distribution
September 9-11	Preliminary Examinations
September 21-25	Orientation week
September 29	Autumn Quarter classes begin
November 6-8	Molecular Biosciences Retreat - Galena, IL
November 18	Approved dissertation deadline for Autumn 2009 graduation
November 26-27	Thanksgiving holiday observance
December 11	Autumn 2009 Convocation
December 11	Autumn Quarter ends

### **Winter Quarter 2010**

January 4	Winter Quarter classes begin
January 18	Martin Luther King, Jr. Day observance
February 1	Spring Quarter rotation decision to Curriculum/Student Affairs
February 24	Approved Dissertation Deadline for Winter 2010 graduation
March 2	Thesis Advisory Committee members due (Second year students)
March 19	Winter 2010 Convocation
March 20	Winter Quarter ends

### **Spring Quarter 2010**

March 29	Spring Quarter classes begin
May 3	Written proposals due for Qualifying Exam (Second year students)
May 3	Summer Quarter rotation decision due (First year students)
May - June	Qualifying Exams held
May 19	Approved dissertation deadline for Spring 2010 graduation
May 31	Memorial Day holiday
June 11-12	Spring 2010 Convocation
June 12	Spring Quarter ends

### **Summer Quarter 2010**

June 24	Summer Quarter classes begin
July 5	Independence Day observance
August 27	Summer 2010 Convocation
August 28	Summer Quarter ends

## **COMMITTEE ON GENETICS, GENOMICS & SYSTEMS BIOLOGY ADMINISTRATION**

### **CHAIR, GGSB**

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### **GGSB GRADUATE PROGRAM ADMINISTRATOR**

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### **EDUCATION AND OUTREACH DIRECTOR**

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### **STUDENT REPRESENTATIVES**

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### **BIOLOGICAL SCIENCES DIVISION**

Everett Vokes, M.D., Interim Dean [evokes@medicine.bsd.uchicago.edu](mailto:evokes@medicine.bsd.uchicago.edu)  
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Graduate Affairs

### **OTHER UNIVERSITY OFFICES**

Main Number - University	702-1234
Main Number - Hospitals	702-1000
Campus Police (Call <b>123</b> from any University phone)	702-8181
University Voice Directory	702-1610

**COMMITTEE ON GENETICS, GENOMICS & SYSTEMS BIOLOGY WEBSITE:** <http://cg.bsd.uchicago.edu>

## **PROGRAM OF STUDY IN BRIEF**

The guidelines in this handbook are official policies of the Committee on Genetics, Genomics & Systems Biology (GGSB). Students and faculty of the Committee are expected to follow these policies. Students with questions not answered by this handbook are encouraged to contact the GGSB Graduate Program Administrator (Sue Levison at [slevison@bsd.uchicago.edu](mailto:slevison@bsd.uchicago.edu), 773/702-2464) or the Chair of the Curriculum/Student Affairs Committee (Dick Hudson [rr-hudson@uchicago.edu](mailto:rr-hudson@uchicago.edu) 773/834-2978).

### **First Year**

The first year of graduate study is spent completing coursework, exploring research opportunities and performing laboratory rotations. Throughout their course of study, all students are registered as full-time during the Autumn, Winter, Spring, and Summer quarters.

Graduate students in the Biological Sciences Division (BSD) are required to take 9 credits of course work for their Ph.D. Most classes are completed within the first year. In addition to the course requirements, students are required to attend the Faculty Research Seminar Series to acquaint them with faculty research programs. This series is also referred to as "AllStars". Students are also required to undertake short research projects in at least two different laboratories before beginning their dissertation research. These rotations are to be performed during the first academic year, usually during the Spring and Summer quarters. Spring rotations are for the duration of the quarter (10 weeks). Summer rotations are for 5 weeks each.

**All students are expected to attend the monthly Genetics Seminar Series starting from the Autumn of their first year and throughout their tenure in the program.**

### **Second Year**

Just prior to the start of the second year, usually in September, students take the Preliminary Examination as a first step towards candidacy for their Ph.D.

At the beginning of the second year, students also choose a Research Advisor. Under unusual circumstances (and with approval of the Curriculum/Student Affairs Committee) students are allowed to carry out a laboratory rotation during the Autumn quarter before choosing an advisor.

Once a Research Advisor is chosen, a Student Doctoral Committee is formed. The Curriculum/Student Affairs Committee (CSAC), in consultation with the student and the student's advisor, appoints its members. The Student Doctoral Committee is comprised of the Research Advisor and three to four other faculty members.

While most or all coursework will be completed in the first year, one course elective may be taken during the second year. If a student is interested in deferring more than one course beyond the first year, that student must petition the CSAC to receive approval.

Most of the second year is spent developing a research project and preparing the student to submit a written proposal for dissertation research. This proposal must be defended in front of the Student Doctoral Committee before the end of Spring quarter (which is known as the Qualifying Examination). Passing the Qualifying Examination permits the student to enter into candidacy for the Ph.D.

**Starting in their second year, students are expected to attend and present at the Genetics Journal Club, where faculty and students review current research papers. Also in the second year, students are expected to attend the Genetics of Model Organisms Club (GMOC), where advanced students and post-doc fellows give presentations.**

## **Advanced Years**

After passing the Qualifying Examination, students work full-time on thesis research while continuing to attend seminars, journal clubs, GMOC's, etc. Students are welcome to audit courses in which they have an interest.

Finally, each graduating student writes a dissertation describing his/her research, presents their work in a public seminar, and defends it before his/her Doctoral Committee members.

The dissertation research period should take approximately 12-16 quarters, with the total duration of coursework and research not to exceed 26 quarters.

## **Evaluation**

The GGSB expects each student throughout his/her term as a graduate student, to have numerous informal conversations with the members of the CSAC, professors in their courses, their Research Advisor and (in later years) members of their Doctoral Committee. This allows students to obtain constructive advice and frequent appraisals of their progress.

Evaluation of each student's progress will take place each academic year. In the first and second years, the evaluation is based on the student's performance in courses, laboratory rotations and the Preliminary Examination. In later years, the Research Advisor and Doctoral Committee report to the CSAC on the student's dissertation research progress after the yearly meetings. If the CSAC is apprised of deficiencies in performance, the student will receive a letter describing those deficiencies along with suggestions as to how these deficiencies might be remedied.

## **Steering Committee**

The Steering Committee makes all decisions regarding administrative policies for the GGSB, and oversees the development of new curriculum. In addition, the Steering Committee makes the final decisions on the granting of

degrees and on the retention of students as degree candidates. The GGSB elected student representatives are invited to present student concerns to the Steering Committee as they arise.

## **Curriculum/Student Affairs Committee**

This faculty committee is responsible for advising all students during their first year of graduate study or until a Research Advisor has been chosen. Each student is assigned a member of the Curriculum/Student Affairs (CSAC) to serve as temporary advisor during this time and to aid in selecting courses and arranging lab rotations. This Committee conducts a quarterly review of each student's course performance and administers the Preliminary Examination. Members of the CSAC meet with first year students after each quarter to discuss any issues concerning the first year curriculum or other topics of concern. The elected GGSB Representatives are invited to present student concerns at the CSAC meetings as they arise.

## **Graduate Program Administrator**

The Graduate Program Administrator, Sue Levison, provides assistance to students on a variety of questions and problems as they arise. The office is located in CLSC 1111. The phone number is 773-702-2464; e-mail address is [slevison@bsd.uchicago.edu](mailto:slevison@bsd.uchicago.edu).

## **REQUIREMENTS FOR THE Ph.D. DEGREE**

A Ph.D. candidate must fulfill certain formal coursework requirements, pass the Preliminary and Qualifying Examinations and present a satisfactory dissertation describing the results of original research.

The Committee expects a knowledge of and proficiency in 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 genetics courses with approval of the CSAC.

## Formal Coursework

To obtain a Ph.D. in the Division of Biological Sciences, nine graded courses are required as detailed below.

Required courses (6 Credits):

MGCB 31400: Genetic Analysis of Model Organisms [1] (Autumn)

MGCB 31500: Genetic Mechanisms [1] (Winter)

HGEN 47300: Genomics and Systems Biology [1] (Spring)

MGCB 31000: Fundamentals of Molecular Biology [1] (Winter)

**OR**

MGCB 31200: Molecular Biology I [1] (Winter)

ECEV 44000: Fundamentals of Molecular Evolution [1] (Autumn)

**OR**

ECEV 35600: Principles of Population Genetics I [1] (Winter)

**OR**

HGEN 46900: Human Variation & Disease [1] (Spring)

GENE 40200: Non-Thesis Research [1/2] (Rotation, Flexible)

GENE 40200: Non-Thesis Research [1/2] (Rotation, Flexible)

Electives [3 credits]:

- Must take 3 courses (see list of approved electives).
- Students may petition the CSAC for approval of courses not listed in this handbook as “approved”.
- At least 2 of the 3 electives are to be taken before the Preliminary Exam.
- All 3 electives should be taken before the Qualifying Exam.
- One of the 3 elective courses may be taken pass/fail subject to CSAC

approval.

- One of the electives may be a graded reading course (see guidelines for reading courses).

Students should note that several courses have prerequisites for enrollment, or require the consent of the instructor. GENE 31400 is a prerequisite for GENE 31500. Students entering the GGSB with advanced coursework at graduate level should inquire whether this coursework can substitute for required electives.

A total of three graded electives must be taken, one of which may be a reading course. The electives can be selected according to the student's interests and the availability of courses.

A student is required to do **two** laboratory rotations **before** selecting an advisor and laboratory to pursue a Ph.D. dissertation.

Suggested “tracks” for students interested in concentrating in difference areas of genetics (Model Systems, Population Genetics, Human Genetics, Developmental Genetics and Genomics and Systems Biology) have been developed by the CSAC. A summary of the five suggested tracks is given in Appendix A. Students are required to consult with their assigned mentor prior to registration each quarter.

Additional questions about the curriculum should be directed to the Graduate Program Administrator or to the Chair of the CSAC.

**Students are expected to maintain a grade average of "B" or higher. Students who fail to do so will be placed on academic probation with continuation in the program dependent upon improved performance. Should a student receive a D or F in any course during any quarter, the student will be immediately placed on academic probation.**

**Students concluding their first year without a “B” average will be terminated from the program after Spring quarter unless otherwise recommended by the CSAC.**

**If a student fails to pass the Preliminary or the Qualifying Examination, the student will be terminated by the end of the respective quarter, unless otherwise recommended by the members of the CSAC.**

### **Introduction to Research**

All first year students are required to participate GENE 31900 - Introduction to Research (also known as "AllStars"), held Autumn and Winter quarters. This course is designed to provide incoming students with information on the variety of faculty research opportunities available and experience with oral presentations. The seminars are held Tuesdays and Thursdays, 12:00 PM-1:20 PM. This course is offered pass/fail. Strict compliance with the attendance policy is required for a passing grade.

### **Scientific Ethics Course**

A course on scientific ethics (BSDG 55000) is offered in Spring Quarter. All first year students are required to register for and attend this course.

### **Prescribed Courses**

In some instances, a student's undergraduate training may not have prepared him/her for a required course. In such cases, the CSAC will prescribe an appropriate course or undergraduate courses if necessary. In such cases, the prescribed course can be counted as a graduate elective. (For example, an introductory course in Biochemistry is prerequisite to the Molecular Biology courses. A student without undergraduate Biochemistry will be advised to take BCMB 20000 in the Autumn quarter.)

### **Reading Courses**

All Reading Courses must be approved by the CSAC prior to registration. Every reading course must conform to the following requirements: 1) it must meet weekly, 2) the instructor must provide a syllabus for the course and an evaluation

of the student's performance, both of which will become part of the student's file and 3) the student must submit a written paper.

### **Laboratory Rotations**

Students undertake short research projects in at least two different laboratories before beginning their dissertation research. The purpose of the rotation is to expose the student to different research environments, broaden his/her acquaintance with useful laboratory techniques, and introduce him/her to the conceptual framework of experimental design.

The distribution of course offerings makes it difficult for students to undertake rotations in the Autumn and Winter quarters of the first academic year. Therefore, rotations are performed in the Spring and Summer quarters. The Spring rotation lasts 10 weeks to coincide with the academic quarter. The Summer rotation lasts 5 weeks, when the student is able to devote full-time to research. Students wishing to do a third rotation may request to do so during the second half of the Summer quarter.

Students arrange their own rotations, in consultation with their academic advisor by contacting potential mentors directly. **After the student and mentor have agreed on the time period for the rotation, the student must complete a Lab Rotation form, signed by the mentor, the Chair of GGSB and the Graduate Program Director, to confirm the arrangement.**

Students should have their Spring quarter rotation arranged by February 1st. The Summer rotation should be in place by May 1st. Should a third rotation be necessary during the Summer quarter, the student must gain approval from the CSAC Chair before their first Summer quarter rotation is completed. All GGSB faculty members are potential rotation mentors. Students who would like to rotate with someone who is not a member of the GGSB faculty should petition the CSAC for approval.

At the end of the rotation, the mentor will provide a written evaluation of the student's performance. The first two required rotations

will be graded. Rotations, Non-Thesis Research, and Thesis Research carried out thereafter will be given a pass/fail. Please notify the Graduate Program Administrator once a Laboratory Advisor has been chosen.

### **Teaching Assistantships**

The ability to teach and to communicate verbally are important skills for a successful research career. All students are required to serve as teaching assistants (TAs) for two quarters. This usually occurs during the second and third years. Students must have the TA requirement fulfilled prior to entering their fourth year. A course designed to train graduate students to be effective TAs can be taken in lieu of one of the two TAs. Responsibilities in this course include leading discussion groups, writing problem sets, and running laboratories.

### **Preliminary/Qualifying Examinations**

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 concerned." In the GGSB, this examination has two parts 1) the Preliminary Exam and 2) the Qualifying Exam. The examination procedures have been designed to ensure that preparing for the exams should be an educational experience for the student. Questions about these examinations that are not answered by the information that follows should be directed to the Graduate Program Administrator.

#### **Preliminary Examination (Part I)**

The objective of the Preliminary Examination (Part I) is to determine the strength of a student's general knowledge of genetics as well as his/her ability to synthesize an overview of research problems of active interest, based on the literature. The exam is typically taken in September following the student's first year.

**Students must have completed the 5**

**required courses and at least three of the four elective courses to sit for the Preliminary Exam. Students also must have a "B" average or permission from the CSAC to take this exam.**

For the Preliminary Exam, students will be given a set of questions in the following areas of genetics: Classical Genetics, Genomics & Systems Biology, Developmental Genetics, Evolutionary/Population Genetics, Human Genetics, and Molecular Genetics. Students are expected to prepare responses to three of the questions. A starting point for references will be included with the Exam. Two weeks after receiving the questions, the student will be asked to present his/her answers orally for the three questions.

The Preliminary Examination lasts for approximately two hours. Students are allowed to use books, reference materials, lecture and seminar notes to answer the questions. Students are also free to discuss the questions among themselves and with faculty. The format of the presentation should be a short lecture (approximately 10 minutes) designed to teach a generally knowledgeable group about the topic. The presentation should concisely review the pertinent background information, state the question being asked, and lay out an experimental plan (if applicable). Potential pitfalls and difficulties should be evaluated. Answers should not be read from a prepared text. However, one 5x8 note card and two transparencies or six PowerPoint slides for each question may be brought to the Exam. There will also be a board to write on. One of the purposes of the Preliminary Exam is to provide practice in oral presentations and discussion. The faculty will question the student further about the general subject of the presentation.

There will be three to four examiners on each Preliminary Examining Committee from the GGSB faculty. The Preliminary Exam committee members are made public one week prior to the Exam.

Based upon the student's performance, the Preliminary Exam Committee **recommends** one of the following options:

A. Pass unconditionally.

- B. Pass conditionally, with written answers to a question(s) required. Answers should be submitted within two weeks. The student will then meet again with the Exam Committee to defend his/her answers.
- C. Pass conditionally, with further course work required in one or two areas.
- D. Fail, with the recommendation that the student retake the exam within the quarter.
- E. Fail, with the recommendation that the student leave the program.

The CSAC then meets to consider this **recommendation**, taking into account the student's overall academic performance as well as his/her performance on the Exam.. If a student who fails the Exam is allowed to retake it, the Committee for the re-take will be selected by the CSAC in consultation with the Chair of the GGSB and will contain at least one member of the first Preliminary Examining Committee and at least one new member.

### **The Qualifying Examination (Part II)**

The Qualifying Examination (Part II) evaluates a student's ability to propose and defend a doctoral thesis research plan. Upon successful completion of this Exam, the Qualifying Examining Committee becomes the student's Doctoral Advisory Committee (i.e. Thesis Committee). A student must have the endorsement of his/her Research Advisor in order to sit for the Qualifying Examination. In the event that a Research Advisor declines to endorse a student for the Qualifying Exam, the Steering Committee will review the student's record to determine if that student will be allowed to seek a new Research Advisor or be asked to leave the program.

Once the student chooses a Research Advisor, the student, in consultation with their Research Advisor, formulates a list of four or five prospective Qualifying Exam Committee members (including the student's advisor) and submits the list to the Graduate Program Administrator who

will forward it on to the CSAC for their review and approval. This review is designed to help ensure that the proposed committee members are qualified and appropriate and, in keeping with the interdisciplinary nature of the program, the expertise of the members is broad-based. It is not uncommon for the CSAC to recommend the addition of a committee member to broaden the overall expertise of the committee. Final decisions on committee membership will be made by agreement between the CSAC, the Research Advisor, and the student.

In addition to approving the initial Doctoral Advisory Committee, the CSAC must also approve replacements when members of a Doctoral Committee resign. In the event that more than one member of a Doctoral Committee resigns, the Steering Committee will meet to consider the circumstances that led to these resignations and decide on an appropriate course of action. Possible courses of action include (but are not limited to) replacement of committee members, formation of a new Doctoral Committee or reconsideration of the student's qualifications for candidacy.

After the Qualifying Exam, the Qualifying Exam Committee members will continue to serve as the Doctoral Advisory Committee throughout the course of the student's doctoral research. This Doctoral Committee will be chaired by a member other than the student's Research Advisor. The function of the Doctoral 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 Doctoral Committee should be based on their knowledge and expertise in the area of the student's research. In the event the student chooses to work with a member of the faculty who does not have an appointment in the GGSB, the student must petition the Committee for approval. At least three members of the Doctoral Committee, including the Chair, must have appointments on the Committee on Genetics, Genomics & Systems Biology.

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. Choose a topic, that is, formulate an important biological question;
2. Propose a coherent set of avenues to answer the question;
3. Summarize critically the current literature on that topic; and
4. Describe a series of experiments taking into account possible pitfalls and therefore alternative approaches.

The written proposal should be modeled after an NIH postdoctoral grant application which should consist of general and specific aims (no more than one page), background and significance (no more than three pages), methods of procedure and a description of your experimental approaches (no more than six pages). This is not a place for trivial experimental details. The recommended length of the proposal, including references and figures, is 10 pages.

Prior to submitting the written proposal to his/her Doctoral Committee, the advisor must approve the proposal for distribution. The written proposal should be submitted to the Graduate Program Administrator by the fifth week of the Spring quarter of the second year (see Calendar of Events for this year's deadline). The student should practice presenting the oral exam prior to the final presentation at the Qualifying Exam. One example would be at the student's lab meetings. The oral exam should be completed by the last week of the Spring quarter. It is the student's responsibility to schedule their Qualifying Exam in a timely manner to ensure that the deadline is met. In the event that circumstances indicate a different schedule, or the student's Doctoral Committee is unable to meet prior to this time, the student must secure permission to postpone the Preliminary Examination from the CSAC. Once the student has fulfilled all course requirements and passed the Qualifying Examination, the student will be admitted

into Candidacy for the degree of Ph.D.

### **Annual Doctoral Committee Meetings**

All students are required to meet at least once a year with their Doctoral Committee and present a brief written report of their research as a basis for discussion. This report must be submitted to all Doctoral Committee members and to the Graduate Program Administrator at least two weeks prior to the meeting. An example of a written report can be found in the GGSB office. After the fourth year, a minimum of two meetings per year are required. At least three members of the Doctoral Committee must be present. These meetings help to ensure that students are making adequate progress toward the completion of their dissertation and to 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 their Research Advisor, providing a stronger basis for future letters of recommendation. When the Doctoral Committee approves it, the student may prepare their dissertation. Following each meeting, the Chair of the Doctoral Committee will prepare a written summary and send it to the student and the student's advisor for their approval and signature. The completed summary will then be given to the Graduate Program Administrator.

### **Penultimate Meeting**

The Doctoral Committee should convene six months before a student expects to receive his/her degree to indicate their agreement that the student is nearing completion of their work and to arrange for subsequent approval

that the student may begin writing their dissertation.

In general, the mentor and other members of the Doctoral Advisory Committee should endeavor to minimize the possibility of an unsuccessful thesis defense via thoughtful and straightforward advice to the candidate. The Penultimate meeting is particularly important in this regard. Permission to write should not be granted if more than one member of the committee lacks confidence

that the thesis will be acceptable. The written report from the penultimate meeting should contain a fairly detailed description of any additional work that needs to be completed prior to submission of the thesis. This list should be limited to a small number of minor items. If, in the judgment of the Doctoral Advisory Committee, substantial work is needed prior to the thesis defense, an additional meeting should be scheduled to review that work before permission to write is granted.

### **Presentation of the Dissertation**

Finally, each graduating student writes a dissertation describing his/her research. Following approval by the student's advisor, the thesis must be delivered to the Doctoral Committee for a two-week reading period. At this stage, the thesis should be in near final form and not in a draft state. The student then presents the work in a public seminar, and defends it in front of their Doctoral Committee.

The University has strict rules concerning the preparation of the dissertation. Detailed information can be obtained from the Dissertation Office located on the first floor of the Regenstein Library, Room 100B, or the Dissertation Office webpage <http://www.lib.uchicago.edu/e/phd>, which has the most current information about upcoming deadlines, required forms, etc.

The Ph.D. dissertation should contain a description of the research performed. In addition, it must contain:

1. An introduction covering the scientific background of the project(s);
2. A discussion of the student's own results and their significance in the field; and
3. A summary of their work.

These should be separate sections of the thesis and written independently by the student. Published manuscripts may be included as chapters in the thesis, but separate Introduction, Discussion and Summary sections covering the entire thesis are still required. In cases where collaborative experiments are included in the thesis, the student must clearly

indicate the specific contributions made by the individuals involved.

The final dissertation, together with a certificate of approval signed by the Committee Chair, must be submitted to the Dissertation Office no later than three weeks before the date of the convocation. The final Exam Committee consists of at least five faculty members, three of whom must be members of the student's Doctoral Committee and at least three of whom are members of the GGSB faculty.

1. Each member of the Thesis Defense Committee must vote "yes" or "no" on the defense form immediately following the defense (i.e. before leaving the room). Thesis Defense Committee members are not allowed to abstain from voting.
2. If more than one member of the Thesis Defense Committee votes "no" the student will be required to revise the thesis according to instructions provided by the Exam Committee and meet any additional conditions set by the CSAC within one week of the defense. The revised thesis must then be defended in a closed session with a committee consisting of at least one member of the original Thesis Defense Committee and at least one new member.
3. If, following the defense of the revised thesis, a candidate receives more than a single "no" vote from a committee member, the candidate will be denied the Ph.D.

### **Master's Degrees**

The Committee on Genetics, Genomics & Systems Biology does not have a specific Master's degree program nor are students admitted as Master's degree candidates. However, a student who decides not to complete his/her Ph.D. candidacy, or who loses Ph.D. candidacy status, but has completed all course requirements with a "B" average and has successfully passed the Preliminary Examination may be eligible for a Terminal Master's degree. The Steering Committee makes final decisions with respect to the granting of Master's degrees.

## GGSB Seminars & Club Meetings

In addition to formal courses, there are many regularly scheduled research seminars that help keep students updated on new developments in genetics and related disciplines.

All students are **expected** to attend the monthly Genetics Seminar Series starting in their second year. Students are also **expected** to attend the bimonthly Genetics Journal Club and the bimonthly Genetics of Model Organisms Club.

The GGSB/IGSB Seminar Series, given by invited speakers, are held the second Tuesday of each month during the academic year at 4:00 p.m in the KCBD Auditorium.

The Genetics Journal Club meets the second and fourth Thursday of every month during the academic year at noon. At each Journal Club meeting, one student or postdoctoral student and one faculty member present for discussion a recently published work in genetics.

The Genetics of Model Organisms Club (GMOC) meets the first and third Thursday of every month during the academic year at noon. The GMOC format is a one-hour meeting, which includes two ~20 minute presentations from advanced students and/or post-docs

from different labs, plus time after each presentation for a discussion. This club includes model organisms such as E. coli, Arabidopsis, nematode, fruit fly, zebra fish, mouse, and yeast.

The Graduate Program Administrator will send emails announcing GGSB seminars. Additional seminar information can be found on the [GGSB website](#), the [Molecular Biosciences website](#) and the [University of Chicago website](#).

## **FINANCIAL SUPPORT**

The GGSB attempts to ensure that all students registered in the Ph.D. program are provided with adequate financial aid. **Financial support is guaranteed to all incoming students for their first four**

**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 GGSB, and the Division of Biological Sciences.

## **Sources of Support**

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

- Training grants
- Departments
- External fellowships
- University fellowships
- Research assistantships

## **Payment of Stipend Checks**

University fellowships and NIH checks are paid in equal quarterly installments at the beginning of each quarter and cover the calendar year. Taxes are owed on, but not deducted, from these stipend checks (see section on "Taxes" below).

Advanced students are often paid from NIH grants under the title "Research Assistant Type-B." RA Type-B students are paid on a monthly basis on the last working day of each month. Taxes will be deducted from the RA Type-B checks.

University fellowships and NIH training grants pay for student health insurance, fees, and tuition without the student having to make separate payments. RA Type-B students are responsible for paying their health insurance and fees from their salary each quarter. However, tuition is paid by the Division.

## **Taxes**

([www.irs.gov/individuals/students/article/0,,id=96674,00.html](http://www.irs.gov/individuals/students/article/0,,id=96674,00.html))

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. IRS form 520 provides information on determining what portion of your stipend is taxable and how and when to pay taxes you owe. These forms are available from the IRS. Regenstein Library also carries tax forms particularly after January 1st).

## **Loans**

For information on the various types of loans that are available to graduate students, consult the Financial Aid Office (970 E. 58th Street, Fourth floor, 773-702-6061). This office can provide short-term loans during temporary financial crises (for example, if a stipend check is delayed or if you are transferring from a fellowship to an assistantship). The office also has up-to-date information on federally-sponsored student loan plans.

Loan applications, for eligible students, are available from the Office of the Dean of Students and are processed through the Graduate Financial Aid Office. See Parag Shah, Associate Dean of Students, Office of Graduate Affairs, for information about eligibility requirements.

## **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 funds for supplies are available on training grants, and are disbursed on an annual pro-rated basis, directly to the laboratories in which trainees are working.

## **Travel to Scientific Meetings**

Attendance at scientific meetings is an important part of the educational process. Should you wish to apply for support, check with the source of your funding, be it an agency, your Research Advisor or training grant. The GGSB is not able to provide financial support to students for scientific meetings. When making your request, please supply the following information: purpose of meeting and relevance to the research; title, place and time of the meeting; title and authors of paper being presented; and amount requested for travel, registration fees, food and lodging.

## **REGISTRATION**

### **General Information**

Approximately one week before the dates designated for registration, the Graduate Program Administrator will contact students via email informing them of the dates and times to register online. If a student does not register for their courses prior to the deadline, they will be charged a late registration fee of \$100.

Special registration procedures have been established for the first year students in the Autumn quarter. During Orientation week, first year students will meet with the GGSB Chair and the Graduate Program Administrator to discuss procedures. The students will then meet individually with their assigned mentor from the CSAC to map out a program of study for the first year. If necessary, second year students also will meet with members of the CSAC to review their progress in the preceding year and to discuss further degree requirements.

### **Residency Status**

All students are in one of three levels of residency, depending on the number of quarters they have been registered at the

University. The three levels and the number of corresponding registration units are:

#### **Scholastic Residence (SR)**

Years 1-4

#### **Advanced Residence (AR)**

Years 5-12

Students in SR and AR are eligible for all benefits associated with full time status at the University, such as the student health plan, university housing, student loans, and loan deferment.

#### **Extended Residency (ER)**

Years 12 and beyond

Students in ER are entitled to use of the library, email accounts, networked access, and faculty contact, but not to other benefits or facilities.

## **Leave of Absence**

During Scholastic and Research Residence a student may, if necessary, apply for a Leave of Absence from the Ph.D. program to be approved by the GGSB Chair and the Curriculum/Student Affairs Committee.

## **Pro-Forma Registration**

Students in Advanced Residence, whose dissertation research requires residence away from Chicago, may register pro-forma. This provides registration as a full-time student without payment of tuition. A fee of \$247 per quarter is assessed. 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.
2. Applications for pro-forma registration must be approved in writing by the GGSB Chair, whose signature means that the student's work away from Chicago is recognized as essential to the dissertation. Normally, students applying for pro-forma status will have been admitted to candidacy and have had dissertation topics approved. For students on the Graduate Residence Track, pro-forma status will normally begin only after completion of Scholastic Residence.
3. An applicant for renewal of pro-forma status must show the GGSB 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 Dean of Students.
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' departments.

6. A copy of the approved application must be filed with the Registrar.
7. The Registrar will certify that a pro-forma student is duly registered at the University to any agency requiring such certification.
8. The fact that a registration is pro-forma will be noted on the student's academic record.
9. 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 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.

## **MISCELLANEOUS INFORMATION**

### **Student Representatives**

GGSB students have two student representatives to represent GGSB student concerns as needed at the quarterly Curriculum/Student Affairs Committee and Steering Committee meetings. At anytime should a student representative have an agenda item for one of these meetings, they should contact the Graduate Program Administrator to add that item to the agenda for the next meeting. Additionally, each year GGSB students nominate a student invited speaker for the GGSB monthly seminar series. The student representatives gather nominations from the GGSB students and decide which speaker to invite. Each representative has a two year term, with one representative new each year, and the other tenured by one year. Each summer, once a representative's two year term has expired, a new representative is elected by their fellow GGSB students.

The GGSB also has student representatives who participate in Molecular Biosciences Cluster events, such as Orientation,

Recruitment and Retreat planning. These representatives are volunteers who are interested in participating and contributing to these events. The Student Representative will ask for volunteers each year. Students interested in becoming a student representative should contact the Graduate Program Administrator.

### **Annual GGSB Symposium**

The Committee on Genetics, Genomics & Systems Biology hosts an annual Symposium at The University of Chicago. Each year a timely new topic is chosen to provide the Genetics community an opportunity to hear a speakers' expertise in a particular area of Genetics. This highly renowned event draws speakers from around the globe as well as a large crowd from the Chicagoland area. The Symposium is typically held on a Friday in April in the Biological Sciences Learning Center. All GGSB students are expected to attend. There is a luncheon prior to the Symposium, where GGSB students are given the rare opportunity to interact one-on-one with the speakers over lunch. A reception follows the afternoon talks, where students are given additional opportunities to interact with the featured speakers.

### **Molecular Biosciences Retreat**

The Molecular Biosciences Retreat provides an opportunity for students, post-docs, and faculty to meet in a pleasant, informal setting to learn about the various research programs of the various research laboratories. The program consists of several sessions of presentations by students and post-docs. Each session is chaired by a faculty member. There is also a poster session. The Retreat is held annually in the Autumn at a resort outside of Chicago.

### **Libraries**

The John Crerar Library (5730 S. Ellis Avenue, 773-702-7715) 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 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 first floor of Crerar contains the major service units. The Circulation Desk (773-702-7409) is located to the left of the entrance atrium. Reserve materials for all science courses except math, computer science, and statistics are held at the Circulation Desk, as well as a permanent reserve collection of current medical textbooks and frequently used science periodicals. The Science Reference Department (773-702-7715) is located to the right of the atrium entrance, together with the science microforms.

The Chemistry Library in Jones 205, (5747 S. Ellis Avenue, 773-702-8775), contains approximately 30,000 volumes. Organic, physical and theoretical chemistry constitutes the greatest part of the collection.

The website for the University of Chicago Libraries is [www.lib.uchicago.edu](http://www.lib.uchicago.edu).

### **Chicago Card, Library & Network Privileges Office**

The Chicago Card, Library & Network Privileges Office is located in the Regenstein Library (773-702-8782). Students can obtain their Student ID from this office. For additional information and hours of operation visit: [www.lib.uchicago.edu/e/using/access/priv](http://www.lib.uchicago.edu/e/using/access/priv)

### **Bursar's Office**

The Bursar's Office, located in the Administration Building, (5801 S. Ellis Avenue, Room 101), is open to the public weekdays from 9:00 a.m. to 3:00 p.m. They accept phone inquiries weekdays from 8:00 a.m. to 4:00 p.m.

Students may contact the following Bursar's Office numbers for information:

Tuition Inquiries & Bursar Restrictions:  
773-702-7086

Check Cashing Privileges:  
773-702-7074

Other Information:  
773-702-8000

### **University Health Insurance**

The university requires that all students carry medical insurance. We strongly encourage students to participate in the university's plan even if they are also enrolled in a parental or an employer plan. Student Accident and Sickness Insurance (SASI), the university insurance plan, offers two levels of coverage: the Basic and Advantage Plans.

Health insurance coverage is mandatory. During the time you are registered at the University, you are required to enroll in either the U-SHIP Basic or Prescription Advantage coverage, or waive enrollment by providing evidence that you have coverage in a health insurance plan that is comparable to U-SHIP.

Waiver Procedure information can be found at: <https://sasi.uchicago.edu>.

Unless you waive U-SHIP enrollment during the enrollment period, you will be automatically enrolled in U-SHIP Basic coverage.

There is an annual insurance premium for the SASI insurance plans. These premiums, along with the Student Health and Wellness Fee, are assessed in quarterly installments during the academic year and are added to your autumn, winter, and spring tuition bills.

You may enroll your spouse, domestic partner, and children under 19 years of age. Information about this option is found on their website at: <https://studentinsurance.uchicago.edu>

Yvette Jones, Admin Room 231  
773-834-4543 (Press #2)

Julie Dunlap, Admin Room 232  
773-834-1554 (Press #2)

Yvette and Julie are employees of United Healthcare/Student Resources. They will receive walk-in visits and phone calls Monday-Friday, 8:30 a.m. - 5 p.m. They will also answer questions directed to the [healthaffairs@uchicago.edu](mailto:healthaffairs@uchicago.edu) e-mail address.

### **University Health Services**

The University Health Service has two components:

1. The Student Care Center (SCC) is located at 860 E. 59<sup>th</sup> Street, R100. SCC hours are 8:00 AM to 5:00 PM, Monday through Friday, in addition a late clinic is offered on Tuesday's beginning Autumn Quarter until 7:00 p.m.

2. The Student Counseling and Resource Service (SCRS), located at 5737 S. University Avenue, is open from 8:30 AM to 5:00 PM, Monday through Friday. The SCRS provides diagnostic evaluation, psychotherapy and services for students who are experiencing difficulties in studying and learning or in managing time commitments, as well as emergency services for all students. For an evaluation, outside referral, or assignment to a therapist call 773-702-9800 to schedule an appointment. Emergency cases are taken immediately during regular hours of 8:30 AM to 5:00 PM. During evenings and weekends, a therapist is available by phone only by calling 773-702-3625 and asking for the therapist-on-call.

### **Computing Facilities**

Networking Services and Information Technologies (NSIT) runs computing facilities in the Regenstein (A Level), Crerar (basement) and Harper (WB 310) Libraries, as well as in the Biological Sciences Learning Center. The facilities provide access to a variety of up-to-date computing equipment. Telephone assistance is available by calling 773-702-7894. Students may apply for personal computing accounts online at <http://cnet.uchicago.edu>. To use these facilities a valid University of Chicago ID card is required.

## **Keys**

The Department of Molecular Genetics and Cell Biology office (CLSC 1106) issues keys needed by students working in the Cummings Life Science Center building. For graduate students, this includes building entrance keys and laboratory keys. There is a \$3.00 deposit for keys.

## **Photocopying**

Photocopying machines are located in the Crerar and Regenstein Libraries. The cost of copying with coins is 15 cents per exposure. Copy cards may be purchased from the automated dispensers located in the Crerar Library on in the first floor north and south copy rooms.

## **Lost and Found**

The Registrar's Office (Administration 103, 773-702-7879) serves as a collection point for items found in the University's academic buildings and quadrangles. For items found in the University Medical Center, the Office of Medical Center Security (Room M-41, 773-702-6262) serves as the collection point.

## **Parking**

You may obtain an assigned parking space on campus by paying a monthly fee. Assignments for campus lots are available at the Campus Parking Office (773-702-8969), located at 5525 S. Ellis Ave, Room 171.

## **Transportation**

For Chicago area public transportation bus routes, maps and schedules (CTA, Metra, Pace, and other transportation options), as well as on-campus parking

information visit The University of Chicago Facilities Services website at: <http://facilities.uchicago.edu/transpparking/index.html>.

## **Chicago Transit Authority (CTA)**

The Chicago Transit Authority (CTA) is the public transportation system for the Chicago area. A copy of the CTA bus

schedules, routes, maps and fare options can be obtained by visiting the CTA website at <http://www.transitchicago.com> or by calling 1-888-YOURCTA. You may also to pick up schedule, route information and purchase CTA transit cards in the Regenstein Library at the Chicago Card, Library & Network Privileges Office JRL 100F.

## **Umbrella Service**

Umbrella Service is not a transportation service, it is an escort service offered by University Security. An individual or group may call Security at 773-702-8181 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. If you are unable to reach a phone, you may contact Security on the [emergency phones](#) scattered throughout campus and Hyde Park.

## **SafeRide Program**

The [SafeRide Program](#) provides the campus community with safe, on-demand transportation during late-night hours within the area patrolled by the University of Chicago Police Department. The hours for this service are Sunday through Wednesday, 5:00 p.m. to 4:00 a.m. and Thursday through Saturday, 5:00 p.m. to 6:00 a.m. This service is on a "first call, first come" basis, so delays may occur. To utilize this service call 773-702-2022 and give your exact pickup address.

## **Recreation On and Near Campus**

There are two main student centers. The Reynolds Club, located at 57th Street and University Avenue, includes the Hutchinson Commons, home of the largest food court on

campus, with a wide variety of fast food restaurants, and the C-Shop, which stocks coffee and pastries; the North Lounge; ATM's; and a variety of recreation rooms. For more information on student life visit <https://studentactivities.uchicago.edu>.

The [Gerald Ratner Athletics Center](#) is a 15,000-square foot, state-of-the-art, athletic and recreational facility. With its fitness center, gymnasiums, dance studios, classrooms, 50-meter swimming pool, 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 Ratner Center is open from 6:00 a.m. to 12:00 midnight on weekdays and Sundays, and from 8:00 a.m. to 9:00 p.m. on Saturdays. For additional information about this facility visit their website:  
<http://athletics.uchicago.edu/facilities/ratnercenter.htm>

Ida Noyes Hall, on 59<sup>th</sup> Street between Woodlawn and Kimbark, was modeled after an English manor house. It houses the Max Palevsky Cinema, a 500-seat theater in which Doc Films screens movies every night of the academic year. For more information about Doc Films visit <http://docfilms.uchicago.edu>. Ida Noyes also contains The Pub, Ida's Café (soups, salads, and hot entrees), the office of Career Advising and Planning Services (CAPS) and the University of Chicago independent student newspaper office, the *Chicago Maroon*.

### **Chicago at Large**

Chicago is a fantastic city for cultural pursuits including museums, music, theatre, and dining out. The Chicago Symphony Orchestra, the Lyric Opera, jazz and blues clubs, The Goodman Theater, and off-loop theatres are all excellent. Both inexpensive ethnic restaurants and expensive special-occasion restaurants abound.

### **Chicago Area Festivals, Exhibits and Special Events Websites**

For information on outdoor concerts, cultural and neighborhood festivals, art fairs and other special events in the Chicagoland area visit the following websites:

The Chicago Convention and Tourism Bureau:  
[www.choosechicago.com](http://www.choosechicago.com)

Chicago Guide:  
[www.uchicago.edu/docs/chicagoguide](http://www.uchicago.edu/docs/chicagoguide)

Special Events Management:  
[www.chicagoevents.com](http://www.chicagoevents.com)

The Chicago Park District  
<http://www.chicagoparkdistrict.com>

The City of Chicago  
<http://egov.cityofchicago.org/city/webportal/home.do>

Metromix:  
<http://metromix.chicagotribune.com>

The Chicago Tribune:  
[www.chicagotribune.com/entertainment](http://www.chicagotribune.com/entertainment)

The Chicago Sun Times:  
<http://www.suntimes.com/index.html>

The Chicago Reader:  
<http://www.chicagoreader.com>

Chicago Magazine:  
<http://www.chicagomag.com>

Chicago Athlete Magazine:  
[www.chicagoaa.com](http://www.chicagoaa.com)

The Chicago Music Guide  
<http://www.chicagomusicguide.com>

Ravinia:  
<http://www.ravinia.org>

The Chicago Symphony Orchestra  
<http://www.cso.org>

The Museum of Science and Industry  
<http://www.msichicago.org>

The Field Museum  
<http://www.fieldmuseum.org>

The Adler Planetarium  
<http://www.adlerplanetarium.org>

John G. Shedd Aquarium  
<http://www.sheddaquarium.org>

The Art Institute  
<http://www.artic.edu>

Kohl's Children Museum  
<http://www.kohlchildrensmuseum.org>

Lincoln Park Zoo  
<http://www.lpzoo.com>

Brookfield Zoo  
<http://www.brookfieldzoo.org>

Navy Pier  
<http://www.navypier.com>

Center Stage  
<http://centerstagechicago.com/events>

Broadway in Chicago  
<http://www.broadwayinchicago.com>

The League of Chicago Theatres  
<http://www.chicagoplays.com>

The Goodman Theatre  
<http://www.goodman-theatre.org>

Steppenwolf Theatre  
<http://www.steppenwolf.org>

The Chicago Botanic Gardens  
<http://www.chicago-botanic.org>

The Morton Arboretum  
<http://www.mortonarb.org>

**COURSES AVAILABLE TO COMMITTEE ON GENETICS,  
GENOMICS & SYSTEMS BIOLOGY STUDENTS**

For detailed information on course time schedules visit:  
<http://timeschedules.uchicago.edu>

**REQUIRED COURSES FIRST YEAR CURRICULUM:**

**FIVE REQUIRED COURSES IN GENETICS:**

**MGCB 31400 Genetics 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 critical reading of original literature. *Autumn.*

**HGEN 47300 Genomics and Systems Biology.** Genomics is a new field that addresses biological questions by combining large scale collection of biological data with rigorous mathematical and statistical design and analysis. This lecture course will explore the technologies that enable 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.*

**MGCB 31500 Genetic Mechanisms.** Advanced coverage of mechanisms involved in promoting genome stability and genome evolution. A variety of experimental systems are explored from bacteriophage to humans. Topics include the genetics of mutagenesis, DNA repair, homologous and site specific recombination, transposition and chromosome segregation. *Winter.*

**Plus one of the following two courses:**

**MGCB 31000 Fundamentals in Molecular Biology.** The course covers nucleic acid structure and DNA topology, recombinant DNA technology, DNA replication, DNA damage, mutagenesis and repair, Transposons and site-specific recombination, prokaryotic and eukaryotic transcription and its regulation, RNA structure, splicing and catalytic RNAs, protein synthesis, and chromatin. *Winter.*

**OR**

**MGCB 31200 Molecular Biology I.** Nucleic acid structure and DNA topology; methodology; nucleic-acid protein interactions; mechanisms and regulation of transcription in eubacteria, and replication in eubacteria and eukaryotes; mechanisms of genome and plasmid segregation in eubacteria. *Winter.*

**Plus one of the following four courses:**

**ECEV 44000 Fundamentals of Molecular Evolution.** Covers major theories that form the foundation for understanding evolutionary forces governing molecular variation and divergence and genome organization. It explores the evolutionary assembly of genes, the origin of novel gene function, the population genetics of repetitive DNA variation, and the evolution of multi-gene families. *Autumn.*

**OR**

**ECEV 35600 Principles of Population Genetics I.** 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.*

**OR**

**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.*

**OR**

**ECEV 35901: Evolutionary Genomics.** This course is a summary and analysis for the investigation of genomic evolution, a rapidly growing area in molecular evolution as a consequence of genomic studies in recent years. We will lecture basic tools and conceptual progresses in the field, including molecular clock, codon usages, new gene evolution and evolution related to sex reproduction and behavior genetics. We will discuss all major issues in the area, adaptive evolution of genomes, gene orders, codon evolution, intron evolutions, gene transfer, transposable elements, and Structure and variation in prokaryotic genomes. One debate will be organized, where students will have opportunity to practice how to express their ideas articulately. *Spring (every other year).*

**TWO GRADED LAB ROTATION TO BE TAKEN IN SPRING & SUMMER QUARTERS:**

**GENE 40200 Non-Thesis Research.** Two laboratory rotations, and all research prior to passing the Qualifying Examination. *Spring and Summer.*

**ADDITIONAL DIVISIONAL REQUIREMENTS:**

**GENE 31900 Introduction to Research.** Lectures on current research by departmental faculty and other invited speakers. A required course for all first-year graduate students. *Autumn, Winter.*

**BSDG 55000 Scientific Ethics Seminar.** Required of all First Year BSD graduate students. *Spring.*

**THREE ELECTIVE COURSES CHOSEN FROM THE FOLLOWING LIST:**

(Students may petition the Curriculum & Student Affairs Committee for approval of courses not listed below)

**Genetics:**

**GENE 39900 Readings in Genetics.** A course designed by a student and faculty member. All reading courses must be approved by the Curriculum/Student Affairs Committee prior to registration. See page 9 for our policy on reading courses. *Autumn, Winter, Spring, Summer.*

## **Biochemistry & Molecular Biology:**

**BCMB 30400 Protein Fundamentals.** The course covers the physico-chemical phenomena that define protein structure and function. Topics include: 1) the interactions/forces that define polypeptide conformation; 2) the principles of protein folding, structure and design; and 3) the concepts of molecular motion, molecular recognition, and enzyme catalysis. PQ: BMB 30100, which may be taken concurrently, or equivalent. *Autumn.*

**BCMB 30600 Nucleic Acid Structure and Function.** The course focuses on the biochemistry of nucleic acids. Topics include nucleic acid structure, folding, and chemistry, protein-nucleic acid interactions, non-coding RNA's and the enzymology of key processes such as DNA repair and recombination. A special emphasis is placed on primary literature. Prerequisite: Courses in biochemistry, molecular biology and organic chemistry. *Autumn.*

## **Developmental Biology:**

**DVBI 35400 Advanced Developmental Biology.** This course provides an overview of the fundamental questions of developmental biology, with particular emphasis on the modern genetic, molecular and cell biological experiments that have been employed to try to reach mechanistic answers to these questions. Topics covered will include mechanisms of primary body axis formation, the role of local signaling interactions in regulating cell fate and proliferation, plant development, and the cellular basis of morphogenesis. Emphasis will be placed on experimental approaches to understanding developmental processes, relevance to human disease, and exposure to the primary literature. *Autumn.*

**DVBI 35500 Developmental Genetics of Non-vertebrate Model Systems.** This course explores the use of genetics in three different model systems, *C. elegans*, *Drosophila melanogaster* and *Arabidopsis thaliana*, to elucidate developmental mechanisms. The class will focus on a series of interrelated topics: for each topic, introductory material presented by the lecturer will be followed by student-led discussions of individual papers. *Winter.*

**DVBI 35600 Vertebrate Developmental Genetics.** This advanced-level course combines lectures and student presentations. It covers major topics in the developmental biology of vertebrate embryos (e.g., formation of the germ line, gastrulation, segmentation, nervous system development, limb patterning, organogenesis). The course makes extensive use of the current primary literature and emphasizes experimental approaches including embryology, genetics, and molecular genetics. *Spring.*

## **Biological Sciences:**

**BIOS 28401 Introduction to Systems Biology II.** Based on the observations presented in this course, students will discuss and learn if there are any general and significant issues of systems biology. There will be discussion about the main classes of gene networks; quantitative description of networks; reconstruction of networks; prediction of gene-gene interaction; and changes of network during evolution. Students will learn necessary skills of network analysis: linear algebra and graphic analysis of interaction data. More importantly, the course will teach students to be critical in evaluation of systems biology, following a great style at Chicago, when the whole world is applauding the rising area. *Spring.*

## **Ecology & Evolution:**

**ECEV 32500 Evolutionary Aspects of Gene Regulation.** This advanced level course focuses on reading and participation. Each meeting period is dedicated to a new Topic, several of which make up a Module. Typical modules are: transcription factors and cis-regulatory elements, functional consequences of regulatory changes and RNAi as an alternative mechanism of gene regulation. Students present and discuss several papers from the primary literature during this course. *Spring.*

**ECEV 35800 Classics of Evolutionary Genetics.** Major classic papers in evolutionary genetics that had great impact on the development of the field are reviewed.

**ECEV 36300 Speciation.** A review of the literature on the origin of species beginning with Darwin and continuing through contemporary work. Both theoretical and empirical studies will be covered, with special emphasis on the genetics of speciation.

**ECEV 37500 Sexual Selection.** A discussion and critical analysis of sexual selection. The course will consist of lectures, reading and discussion.

## **Human Genetics:**

**HGEN 47000 Human Genetics I.** This course covers classical and modern approaches to studying cytogenetic, Mendelian, and complex human diseases. Topics include chromosome biology, human gene discovery for single gene and complex diseases, non-Mendelian inheritance, mouse models of human disease, cancer genetics, and human population genetics. The format includes lectures and student presentations. *Autumn.*

**HGEN 47100 Introductory Statistical Genetics.** This course focuses on genetic models for complex human disorders and quantitative traits. Topics covered also include linkage and linkage disequilibrium mapping genetic models for complex traits, and the explicit and implicit assumptions of such models. *Winter.*

**HGEN 47400 Introduction to Probability and Statistics for Geneticists.** This course is an introduction to basic probability theory and statistical methods useful for people who intend to do research in genetics or a similar scientific field. Topics include random variable and probability distributions, descriptive statistics, hypothesis testing and parameter estimation. Problem sets and tests will include both solving problems analytically and analysis of data using the R statistical computing environment. *Autumn.*

## **Molecular Genetics & Cell Biology:**

**MGCB 31300 Molecular Biology II.** The content of this course will cover 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 lectures and discussions highlight the most significant recent developments, their implications and future directions. *Spring.*

**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.*

**MGCB 31700 Cellular Biology II.** This course will cover cell cycle progression, cell growth, cell death, cytoskeletal polymers and motors, cell motility, and cell polarity. *Winter.*

**MGCB 32900 Plant Development and Molecular Genetics.** Growth, differentiation and development in plants at the organismal, cellular, and molecular level. The regulatory function of environmental factors, hormones and phytochrome on gene expression and the possible evolutionary relationships will be studied. The molecular genetic advances in Arabidopsis and maize are a central feature of the course. *Spring.*

### **Cell Physiology:**

**CPHY 35000 Systems Biology, Self-Assembly & Complexity.** The unifying theme of the course is Systems Biology, Self-Assembly and Complexity, covering a wide range of forward-looking topics where exploiting the approaches of chemistry, physics, computer science, statistics, and mathematics will be necessary to gain key insights into biological mysteries. Topics will be as broad as nucleic acid structure and function at the nano- and meso-scales, determinants of protein-nucleic acid interaction specificity, finding short sequence needles in genome-size haystacks, sequencing and mining genomes and even speculations on the chemical origins of life. *Spring.*

### **Clinical & Translational Science:**

**CCTS 40001 Pharmacogenomics.** Pharmacogenomics is aimed at advancing our knowledge of the genetic basis for variable drug response. One of the great challenges in drug development and therapy is maximizing therapeutic response while avoiding adverse effects. Advances in genetic knowledge gained through sequencing have been applied to both of these areas and identifying heritable genetic variants that predict response and toxicity is an area of great interest to researchers. The ultimate goal is to identify clinically significant variations to predict the right choice and dose of medications for individuals-- "personalizing medicine". This is particularly desirable in the case of anticancer or antiviral agents where the therapeutic index is very narrow and a large proportion of patients do not respond. The study of pharmacogenomics is complicated by the fact that response and toxicity are multigenic traits and are often confounded by nongenetic factors (e.g., age, co-morbidities, drug-drug interactions, environment, diet, etc). Using knowledge of an individual's DNA sequence as an integral determinant of drug therapy has not yet become standard clinical practice; however, several genetics-guided recommendations for physicians have been developed and will be highlighted. As pharmacogenomic advances allow for individualized drug therapies based on genotypic information, the cost of and morbidity from drug toxicity is expected to decrease, and drug efficacy is expected to increase. The ethics and economics of pharmacogenomics will also be discussed. *Spring.*

### **Computer Science:**

**CMSC 37701A Topics in Bioinformatics.** With availability of genomic, expression and structural data, mathematics and computer science is being extensively used for the understanding of biological data at the molecular level. This course will cover some fundamental computational methods for molecular biology. Particularly, this course consists of two major parts. The first part will introduce some fundamental computational approaches to biological sequence analysis including sequence alignment, homology search and sequence motif discovery. The second part will cover some computational approaches to protein structural bioinformatics including protein structure alignment, structural motif discovery and protein

structure prediction. If there is time, other topics will be introduced such as Mass Spectrometry data analysis and protein-protein interaction. *Autumn.*

**CMSC 37701B Topics in Bioinformatics. – I.** This course explores the digital nature of biology at the molecular scale. We focus on the role of the hydrophobic effect in protein/ligand associations. Protein interactions are discrete in nature even though hydrophobic effects are non-specific in general. There is a useful analogy with the duality between the analog and digital nature of computer chips. We refer to this study as the Digital Biology Project. We pursue basic biophysical issues but we also apply our ideas to biomedical problems, e.g., to contribute to the understanding of antibody binding and to drug design. The course will primarily utilize data-mining as a tool both to understand basic biophysics and to explain protein-ligand associations. The course will explore the connections among the following well known but seemingly contradictory facts: proteins are highly specific (and deterministic, or repeatable) in the way that they interact in many of their functions which involve other proteins and other ligands, and yet the hydrophobic effect, which is highly non-specific, is critical in protein-ligand interaction. In the process of explaining this seeming contradiction, we must confront three other facts about biomolecular systems: electrical gradients in proteins are among the strongest in nature, but they get modulated by the dielectric effect of water, the dielectric properties of water are among the strongest in nature, and hydrophobic groups in proteins cause large changes in the dielectric properties of water. These facts make for the strange world in which proteins struggle for survival in an aqueous environment. The course will describe the use of datamining to understand the biophysics of proteins, and we will review the derivation of basic models for dielectrics. We will also discuss some changes at the quantum level caused by the large-scale hydrophobic and electronic environment. Implications for protein folding models will be discussed. No particular background is assumed. All prerequisites are provided in the class. We explore issues in computer science, applied mathematics, physical chemistry and biomedical applications. It is hoped that people from different disciplines will participate. Notes for the course will be distributed and students will read some primary journal articles as well. *Winter.*

**CMSC 37720 Computational Systems Biology.** Introductory concepts of systems biology, computational methods for analysis, reconstruction, visualization, modeling and simulation of complex cellular networks including biochemical pathways for metabolism, regulation and signaling. Students will have the opportunity to explore systems of their own choosing and will participate in developing algorithms and tools for comparative genomic analysis, metabolic pathway construction, stoichiometric analysis, flux analysis, metabolic modeling and cell simulation. A particular focus of the course will be on furthering our understanding of the computer science challenges in the engineering of prokaryotic organisms. The course requires written assignments, programming assignments and a final course project. *Autumn.*

### **Statistics:**

**STAT 22000 Statistic Methods and Applications.** Statistics 22000 provides an introduction to how statisticians think about describing data, data collection and research design, probability and randomness, and inference from a sample to a population. *Autumn, Winter, and Spring.*

**STAT 23400 Statistical Models/Method.** This course presents basic ideas of probability theory and statistics and will provide a broad background in statistical methodology and exposure to probability models and the statistical concepts underlying the methodology. Probability is developed for the purpose of modeling outcome of random phenomena. Random variables and their expectations are studied; including means and variances of linear combinations, and an introduction to conditional expectation. Binomial, Poisson, normal and

other standard probability distributions are considered. Some probability models are studied mathematically and others via simulation on a computer. Sampling distributions and related statistical methods are explored mathematically, studied via simulation and illustrated on data. Statistical methods for describing data and making inferences based on samples from populations are presented. Methods include, but are not limited to, inference for means and variances for one- and two-sample problems, correlation and simple linear regression. Graphical and numerical data descriptions are used for exploration, communication of results, and comparing mathematical consequences of probability models and data. Mathematics is employed to the level of univariate calculus and is less demanding than that required by STAT 24400. *Autumn, Winter.*

**STAT 22600 Analysis of Qualitative Data.** This is an introduction to the theory and applications of statistical methods for investigating the relationships among discrete variables. The course will present methods for analyzing categorical data, standard methods for contingency tables such as odds ratios, tests of independence and various measures of association, generalized linear models for binary data and count data, logistic regression for binomial data, loglinear models for Poisson data. The statistical techniques discussed will be presented by many real examples involving both physical and social science data. PQ: Statistics 22000 or equivalent. It is expected that the students have a good understanding of basic descriptive statistics such as means, variances and expectation, of the inferential notions of estimate, confidence intervals and significance or hypothesis testing. Familiarity with one statistical package, e.g. Stata, Sas, Splus, Spss, Minitab and ability to access Web sites and to download files from the Web are required. *Winter.*

**STAT 24400 Statistical Theory and Methods I.** Principles and techniques of statistics with emphasis on the analysis of experimental data. First quarter: Discrete and continuous probability distributions, transformation of random variables; principles of inference including Bayesian inference, maximum likelihood estimation, hypothesis testing, likelihood-ratio tests, multinomial distributions and chi-square tests. Second quarter: Multivariate normal distributions and transformations, Poisson processes, data analysis, t-tests, confidence intervals, analysis of variance and regression analysis. *Autumn, Winter.*

**STAT 24500 Statistical Theory and Methods II.** Principles and techniques of statistics with emphasis on the analysis of experimental data. First quarter: Discrete and continuous probability distributions, transformation of random variables; principles of inference including Bayesian inference, maximum likelihood estimation, hypothesis testing, likelihood-ratio tests, multinomial distributions and chi-square tests. Second quarter: Multivariate normal distributions and transformations, Poisson processes, data analysis, t-tests, confidence intervals, analysis of variance and regression analysis. *Autumn, Winter.*

**STAT 35500 – Statistical Genetics.** This is an advanced course in statistical genetics. Prerequisites are Human Genetics 47100 and Statistics 24400 and 24500. Students who do not meet the prerequisites may enroll on a P/NP basis with consent of the instructor. Prerequisites are either Human Genetics 47100 or statistics preparation at the level of Statistics 24400 and 24500. This is a discussion course and student presentations will be required. Topics vary and may include, but are not limited to, statistical problems in linkage mapping, association mapping, map construction, and genetic models for complex traits. *Spring.*

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