Committee on Genetics, Genomics, and Systems Biology

Chair, Committee on Genetics, Genomics & Systems Biology (http://ggsb.uchicago.edu)

- Yoav Gilad

Professors

- Graeme Bell, Medicine
- Joy Bergelson, Ecology & Evolution
- Douglas K. Bishop, Radiation & Cellular Oncology
- Sean Crosson, Biochemistry & Molecular Biology
- Anna DiRienzo, Human Genetics
- M. Eileen Dolan, Medicine
- Wei Du, Ben May Department for Cancer Research
- Martin Feder, Organismal Biology & Anatomy
- Richard Fehon, Molecular Genetics & Cell Biology
- Edwin L. Ferguson, Molecular Genetics & Cell Biology
- Yoav Gilad, Human Genetics
- Jack Gilbert, Ecology & Evolution
- T. Conrad Gilliam, Human Genetics
- Benjamin Glick, Molecular Genetics & Cell Biology
- Michael Glotzer, Molecular Genetics & Cell Biology
- Christopher Gomez, Neurology
- Jean Greenberg, Molecular Genetics & Cell Biology
- Robert Grossman, Medicine
- Chuan He, Chemistry
- Robert Ho, Organismal Biology & Anatomy
- David Kovar, Molecular Genetics & Cell Biology
- Martin Kreitman, Ecology & Evolution
- Stephen J. Kron, Molecular Genetics & Cell Biology
- Bruce T. Lahn, Human Genetics
- Michelle M. LeBeau, Medicine
- Manyuan Long, Ecology & Evolution
- Mary Sara McPeek, Statistics
- Laurens Mets, Molecular Genetics & Cell Biology
- Marcelo Nobrega, Human Genetics
- Carole Ober, Human Genetics
- Olufumilayo Olopade, Medicine
- Brian J. Popko, Neurology
- Trevor Price, Ecology & Evolution
- Victoria Prince, Organismal Biology & Anatomy
- Ilaria Rebay, Ben May Department for Cancer Research
- John Reinitz, Statistics
- Marsha Rosner, Ben May Department for Cancer Research
- Lucia Rothman-Denes, Molecular Genetics & Cell Biology
- Andrey Rzhetsky, Medicine
- Jonathan P. Staley, Molecular Genetics & Cell Biology
- Matthew Stephens, Human Genetics
- Joseph W. Thornton, Ecology & Evolution
- Aaron Turkewitz, Molecular Genetics & Cell Biology
- Kevin White, Human Genetics
The Committee on Genetics, Genomics, & Systems Biology  (http://ggsb.uchicago.edu)  (GGSB) is an interdisciplinary degree-granting program that brings together biologists from over a dozen academic departments. The program is aimed at training Ph.D. scholars for careers as independent scientists in basic and applied biomedical research and education. The Genetics, Genomics, & Systems Biology graduate program offers a program of basic study leading to Doctor of Philosophy in genetics. The Ph.D. training program combines a foundation in modern genetic analysis with training in current methods for formulating and addressing biological questions in the context of complex systems. Such systems are studied in physiological, developmental and evolutionary contexts. The presence of both basic and clinical sciences in the Biological Sciences Division (BSD) enhances the committee’s broad based interdisciplinary approach to teaching and research. The committee provides an exciting environment in which to pursue rigorous, high quality training with flexibility in designing programs to meet individual needs. The focus of GGSB is to train students to utilize sophisticated genetic analysis, genomics, modeling and systems level analysis of regulations networks in their own research program. Opportunities are available to study diverse areas of biology and genetics, including bioinformatics, developmental processes, gene structure and regulation, genetic recombination and mutation, chromosome mechanics, evolution, human disease, immunology, and other areas of modern genetics. Students receive broad training in these sub-disciplines, while specializing in one of them for their research career. The committee’s goal is to provide an intellectually stimulating, collegial and supportive environment for students to progress smoothly from research training to research independence.

Curriculum and Timeline - First Year

**Formal Coursework: Choice of Two GGSB Tracks: Empirical Track or Computational Track** (http://compbio.uchicago.edu)

To obtain a Ph.D. in the Division of Biological Sciences, nine graded courses are required as detailed below.
Committee on Genetics, Genomics, and Systems Biology

GGSB has two tracks, one “Empirical Track”, and the other “Computational Biology”. While the two tracks are united by the common goals of using genetic, genomic and systems biology approach to address important biological questions, the training focus is different. Training of the first track is more focused on experimental techniques, especially those quantitative in nature, while the second track builds computational skills of students. The curriculum of the two tracks, as a result, will be different, as outlined below.

**CHOICE #1: GGSB EMPIRICAL TRACK (4 REQUIRED COURSES AND 4 ELECTIVES)**

Suggested “tracks” for students interested in concentrating in the Empirical track have been developed by the CSAC. (Model Systems, Population Genetics, Human Genetics, Developmental Genetics, and Genomics & 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.

A total of four 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.

**Four Required Courses:**
- Genetic Analysis of Model Organisms **AND** Genomics and Systems Biology

**Plus One of the Following Two Courses:**
- Molecular Biology I **OR** Molecular Biology II

**Plus One of the Following Four Courses:**
- Fundamentals of Molecular Evolution **OR** Principles of Population Genetics **I OR** Evolutionary Genomics **OR** Human Variation & Disease

**Empirical Track Course Electives [4 courses]:**
- Must take 4 courses (see list of approved electives).
- Students may petition the CSAC for approval of courses not listed in this handbook as “approved”.
- At least 3 of the 4 electives are to be taken before the Preliminary Exam.
- All 4 electives should be taken before the Qualifying Exam.
- One of the 4 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).

**CHOICE #2: GGSB COMPUTATIONAL TRACK – 3 REQUIRED COURSES AND 3 CORE ELECTIVES AND 2 ADDITIONAL ELECTIVES** (http://compbio.uchicago.edu)

Suggested “tracks” for students interested in concentrating in the Computational Biology Track have been developed by the CSAC. (Population Genetics & Evolution, Statistical Genetics, Computational Genomics, and Computational Cell Biology) A summary of the four suggested tracks is given in Appendix B. Students are required to consult with their assigned mentor prior to registration each quarter.

for additional information please click here (http://compbio.uchicago.edu) to view the Doctoral Training in Computational Genomics (http://compbio.uchicago.edu) website.

**Three Required Courses in Computational Biology and Statistics:**
- Statistical Theory and Methods **I AND** Fundamentals of Computational Biology: Models and Inference **AND** Fundamentals of Computational Biology: Algorithms and Applications

**Plus Three Core Courses Chosen from the Following List:**
- Human Genetics **I OR** Genetic Analysis of Model Organisms **OR** Introductory Statistical Genetics **OR** Principles of Population Genetics **I OR** Evolution of Biological Molecules **OR** Biophysics of Biomolecules **OR** Human Variation and Disease **OR** Genomics and Systems Biology **OR** Quantitative Analysis of Biological Dynamics

**Plus Two [2] Additional Elective Courses Chosen From the Following List:**
- Fundamentals of Cell and Molecular Biology **OR** Applied Linear Statistical Methods **OR** Topics in Statistical Machine Learning **OR** Computational Systems Biology **OR** Mathematical Computation I – Matrix Computation **OR** Introduction to Scientific Computing for Biologists **OR** Fundamentals of Genetics **OR** Statistical Theory and Methods II **OR** Multivariate Statistical Analysis: Applications and Techniques **OR** Theoretical Ecology **OR** Pattern Recognition **OR** Bayesian Analysis and Principles of Statistics **OR** Statistical Genetics **OR** Machine Learning

**Computational Track Course Electives [5 courses]:**
- Students may petition the CSAC for approval of courses not listed in this handbook as “approved”.
- At least 4 of the 5 electives are to be taken before the Preliminary Exam.
- All 5 electives should be taken before the Qualifying Exam.
• One of the 5 elective courses may be taken pass/fail subject to CSAC approval.

**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 Autumn Quarter of the first academic year. Therefore, rotations are performed in the winter or spring and summer quarters. The winter and spring rotations last 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 do so during the second half of Summer Quarter.

**Application**

For information about applying to our graduate program, please visit: https://apply-bsd.uchicago.edu/apply/.

---

**Genetics Courses**

**GENE 31900. Introduction to Research. 100 Units.**
Lectures on current research by departmental faculty and other invited speakers. A required course for all first-year graduate students.
Instructor(s): Staff Terms Offered: Autumn, Winter
Equivalent Course(s): MGCB 31900, BCMB 31900, DVBI 31900, HGEN 31900

**GENE 39900. Readings Genetics. 100 Units.**
A course designed by a student and faculty member. All reading courses must be approved by the Curriculum/Student Affairs Committee prior to registration.
Terms Offered: Autumn, Winter, Spring, Summer

**GENE 40100. Thesis Research: Genetics. 300 Units.**
No description available.
Instructor(s): Gilad Terms Offered: Autumn, Winter, Spring, Summer

**GENE 40200. Non-Thesis Research: Genetics. 300 Units.**
No description available.
Instructor(s): Gilad Terms Offered: Autumn, Winter, Spring, Summer

**GENE 40206. Genetics: Lab Rotation 3. 150 Units.**
No description available.
Terms Offered: Autumn, Winter, Spring, Summer
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Times was used instead of Trajan.

Times was used instead of Palatino.

The editor may contact Leepfrog for a draft with the correct fonts in place.