GENETICS (TETRAD) (PHD)

Visit program website. (https://tetrad.ucsf.edu/)

Degree Offered: PhD in Genetics
Program Leadership:
Natalia Jura, PhD, Director
David Toczyski, PhD, Co-Director
Admissions Inquiries:
Toni Hurley, Program Coordinator
Danny Dam, Student Affairs Coordinator

Program Description

The Tetrad graduate program prepares students to pose and address fundamental research problems in modern biology. The program highly values curiosity-driven research that investigates challenging questions in life sciences conducted in a collegial and scientifically rigorous manner. The program places special emphasis on modern approaches within three core and interrelated areas listed below. The research conducted under the Tetrad umbrella encompasses a wide range of structural, molecular, cellular, physiological, and pathophysiological questions.

The Tetrad program was among the first graduate programs nationwide to break down barriers between disciplines; emphasis on interdisciplinary research remains a guiding principle of the program. Hand-in-hand with promoting interdisciplinary research is the program's emphasis on fostering a strong sense of community and interactions among students and the program's cadre of internationally recognized scientists. Program activities include an annual retreat held in Lake Tahoe, a weekly seminar program featuring top scientists from around the world, and multiple other activities that provide student-faculty interactions in both formal and informal settings.

All Tetrad graduate students go through the same admission process, take the same classes, and have the same requirements. Depending on the specific aspects of their thesis work, their PhD degree will be in one of the indicated areas below.

Faculty

Over 120 faculty members are associated with the Tetrad program, representing all of the basic science departments of UCSF, numerous research centers such as the Helen Diller Family Comprehensive Cancer Center, the Cardiovascular Research Institute at UCSF, and the Institute for Neurodegenerative Diseases, and numerous clinical departments.

Tetrad is a member of the Program in Biological Sciences (PIBS) at UCSF.

Sub-disciplines

- Biochemistry and Molecular Biology
- Cell Biology
- Genetics

The Tetrad program office is located at the Mission Bay campus, though some classes and labs affiliated with the program are at the Parnassus campus as well.

The Tetrad program is offered by the UCSF Division of Graduate Education and Postdoctoral Affairs, administered by the UCSF Department of Biochemistry and Biophysics, and delivered by faculty members in the UCSF schools of dentistry, medicine, and pharmacy.

Admission Requirements

Because of the interdisciplinary nature of the Tetrad Graduate Program, we expect that entering graduate students will have diverse undergraduate preparation. Students with backgrounds in anatomy, biochemistry, biology, chemistry, physics and related fields are welcome to apply, providing they have demonstrated a high level of academic proficiency (generally a grade point average of 3.0 or higher in relevant science courses). Evidence of exposure to scientific research, generally as participation in a research project during at least one year (preferably two or more years), is regarded as an important attribute of the successful applicant.

Learning Outcomes

1. *Establish a foundation of knowledge in the fundamental principles underlying biological processes, from molecules to organisms*. This objective is enabled by 1st year coursework that emphasizes basic concepts, methods of discovery, and lifelong learning, followed in later years by individual thesis projects that are motivated by addressing fundamental questions of cellular or organismal function in mechanistic depth.
2. *Learn to critically evaluate the literature and assess the significance of a given biological question.* This objective is enabled by in-depth paper discussions and proposal writing within courses in the 1st year, journal clubs and qualifying exam in the 2nd year, and literature study throughout the thesis project.
3. *Learn to independently make original research contributions through rigorous experimental design, data analysis and interpretation.* This objective is enabled through activities such as solving problem sets and formulation of research proposals on new questions in the 1st year, the NSF proposal writing workshop and qualifying exam in the 2nd year, and mentorship by thesis mentor and thesis committee during the thesis project.
4. *Learn to work across disciplines to leverage the strengths of collaborators from different scientific backgrounds.* This objective is enabled by the multi-disciplinary nature of the first-year course work, peer-peer learning that leverages the diversity of scientific backgrounds within each class, the multidisciplinary nature of the research programs of most faculty members, the presence of students from different graduate programs in a given thesis lab and a strong ethos of collaboration amongst the different laboratories at UCSF.
5. *Learn how to promote and support an inclusive scientific environment*. This objective is enabled through training activities that include diversity workshops for 1st year students, collaboration with faculty who participate in diversity and inclusion-promoting campus organizations, opportunities to mentor summer research students from under-represented backgrounds, and participation in outreach events.
6. *Establish values that drive the responsible and ethical practice of science*. This fundamental objective is enabled through examples of best scientific practices threaded throughout the 1st year courses, two focused courses in the Responsible Conduct of Research in the 1st and 5th years, journal clubs, seminar series, day-to-day mentor-mentee interactions and thesis committee meetings.
7. *Develop skills for effective oral and written communication of complex scientific ideas and findings*. This objective is enabled through the writing and oral defense of research proposals in two 1st year courses, journal club presentations, writing and oral defense of a qualifying exam proposal, writing an NSF proposal, presentations

in lab meetings and thesis committee meetings, presentations at scientific meetings within and outside UCSF, and the program requirement for thesis completion of writing at least one manuscript on original work for publication in a peer-reviewed journal.

Additional Information

Program Faculty

- *Find a* program faculty list *(*https://tetrad.ucsf.edu/faculty*) on the program website.*

Career Outcomes

- *Find* career outcomes and other data on PhD programs *(*https://graduate.ucsf.edu/program-statistics#career*) on the Graduate Education and Postdoctoral Affairs website.*

Degree Requirements

Doctoral

- All core courses and required activities taken and passed
- Six quarters in residence including a minimum of three registered quarters after advancement to candidacy
- Pass qualifying examination
- Complete and submit the dissertation based on the current Tetrad guidelines
- For additional details, please see: graduate.ucsf.edu/phd-degree (https://graduate.ucsf.edu/phd-degree)

Core Courses

Course	Title	Units
Year 1		
BIOCHEM 200A	Structure of Macromolecules	3
BIOCHEM 201A	Biological Regulatory Mechanisms	4
BIOCHEM 220	Biochemistry Basic Science Seminar Series	1
BIOCHEM 215	Laboratory Rotation (Taken all terms)	9
BIOCHEM 225	Research in Progress Seminar	1
CELL BIOL 245	Cell & Developmental Biology	4
GENETICS 200A	Principles of Genetics	3
GRAD 202	Racism in Science	3
Various: 2-3 minicourses		2-3
GRAD 214	Responsible Conduct of Research and Rigor & Reproducibility [1]	0-1.5
	Units	**30-32.5**
Year 2		
BIOCHEM 225	Research in Progress Seminar	1
GENETICS 250	Research (Taken all terms)	24
Any approved electives		
	Units	**25**
Year 3 and Beyond		
GENETICS 250	Research (Taken all terms)	24
BIOCHEM 225	Research in Progress Seminar	1
Any approved electives		
	Units	**25**
	Total Units	**80-82.5**

[1] GRAD 214 is taken across three quarters during the first year.
- Fall and Winter enrollment should equal 0 units
- Spring enrollment should equal 1.5 units

Approved Electives

Code	Title	Units
BIOCHEM 210	Special Topics	3
BIOCHEM 241	Startup 101	3
BIOMED SCI 270	Special Topics in Biomedical Sciences	3
BIO MD INF 219	Special Topics in Bioinformatics	3
BIOPHYSICS 219	Special Topics in Biophysics	3
CHEMISTRY 219	Special Topics in Basic and Translational Chemical Biology	3
GRAD 210	Justice, Equity, Diversity and Inclusion Academic Leadership (with approval from the Graduate Division)	4
GRAD 213	Motivating INformed Decisions (MIND) Catalytic Course	2
DEV STMCEL 270	Special Topics in Developmental & Stem Cell Biology	3
GRAD 286	GSICE Curricular Practicum	1
GRAD 219A	Special topics in racism and social justice in science	3
GRAD 219B	Special topics in racism and social justice in science	3
GRAD 219C	Special topics in racism and social justice in science	3
NEUROSCI 219	Special Topics in Basic and Translational Neuroscience	3

Other electives may be approved by program on a case-by-case basis

Non-course Core Requirements

1. Attendance and participation in introductory bootcamp:
   We realize that our incoming students come from a wide variety of experimental backgrounds, so the first year begins with a series of intensive hands-on workshops on cutting-edge concepts and experimental techniques that will be useful in a modern biomedical research lab.
2. Passing qualifying exam
3. Teaching Assistantship in year 2
4. Submission/publication of first-author research paper
5. Presentation of thesis talk