

# GRADUATE PROGRAMS IN PHYSICAL & BIOLOGICAL SCIENCES

Astronomy & Astrophysics - Chemistry - Coastal Science & Policy -  
Earth Sciences - Ecology & Evolutionary Biology - Mathematics -  
Microbiology & Environmental Toxicology - Molecular, Cell &  
Developmental Biology - Ocean Sciences - Physics - Program in Biomedical  
Science & Engineering - Science Communication

## **Astronomy & Astrophysics M.S., Ph.D.**

<https://www.astro.ucsc.edu/academics/graduateastrogradinfo@ucsc.edu>

UCSC is a world leader in astrophysics education, providing an intellectually rich, vibrant, and challenging graduate student program. The program emphasizes forefront astrophysics research as the main training tool to prepare and support its students for a range of career options. We currently enroll approximately 40 graduate students working towards the Ph.D. degree. Students benefit from the low student-faculty ratio, extensive research opportunities, and course offerings that cover both theoretical and observational aspects of astronomy. Computational Media at UC Santa Cruz provide knowledge and practical training for students.

Astronomy and Astrophysics graduate students have access to the world-class observational facilities operated by the University of California Observatories (UCO) and to state-of-the-art instrument development and data reduction technology at UCSC. The majority of successful applicants have an undergraduate degree in physics or astrophysics with strong classroom performance. Our goal is to identify enthusiastic students who are well-prepared to thrive in an exciting research environment, and who will make the best use of the particular strengths and opportunities in our department.

We encourage prospective students to visit. Students accepted into the program are invited to a departmental visit in winter quarter. The department will make a best effort to provide 100% support for its students during the normative time to degree.

## **Chemistry M.S., Ph.D.**

<https://www.chemistry.ucsc.edu/academics/graduate>  
(831) 459-2023

The Chemistry and Biochemistry Department offers two graduate degrees: the doctor of philosophy (Ph.D.), and a coursework M.S. The Ph.D. program in Chemistry is designed to help students develop into independent scholars while pursuing the excitement of scientific research in a personal, supportive environment. This program prepares students for careers in academia, industry, government laboratories, and other settings requiring an advanced education in chemistry and related disciplines. The coursework M.S. does not require research and is suited for those

wishing to update or broaden their chemical expertise. Over 100 graduate students are currently enrolled in the graduate program.

Students interested in chemical biology and biophysical chemistry are encouraged to apply to the graduate Program in Biomedical Sciences and Engineering (PBSE) - Chemical Biology,

## **Coastal Science & Policy M.S.**

<https://csp.ucsc.edu/about>  
[csp@ucsc.edu](mailto:csp@ucsc.edu)

The Graduate Program in Coastal Science and Policy prepares future leaders to solve current and emerging challenges to coastal sustainability with coursework that emphasizes interdisciplinary scholarship, project-based study, and developing practical solutions to real-world problems. The intensive academics, real-world experience, and engagement with institutional partners limits the capacity of the Masters program to ten incoming students each year. The program focuses on practical training to provide integrated solutions to social and ecological challenges via four interconnected nodes that leverage UCSC's existing leadership in coastal sustainability:

- Conserving biodiversity, sustaining ecosystem processes, and ensuring human well-being
- Mitigating hazards to nature and society; fostering societal adaptation
- Maintaining security of marine, freshwater, and terrestrial food and energy systems
- Advancing innovative economic and financial models in business and industry

The two-year program is comprised of a year of coursework, a summer internship, and a second year dedicated to a capstone project.

Exceptional investment in CSP students includes: • Need-based financial support for one to two years • Small cohorts to facilitate ample time with mentors and professors • Intensive co-mentoring by program faculty and institutional partners • Career development staff and resources

## **Earth Sciences M.S., Ph.D.**

<https://eps.ucsc.edu/graduate>  
(831) 459-1235

The Earth & Planetary Sciences Department offers both M.S. and Ph.D. programs. Admission is highly competitive, and applicants are strongly encouraged to contact prospective faculty and researcher advisors to learn more about ongoing and planned research activities, and to discuss funding and coursework.

Research areas being actively pursued in Earth Sciences include: seismology, rock and mineral physics, geomorphology, paleomagnetism, geodynamics, paleoclimate and climate change, coastal geology, structural geology, active tectonics, igneous geochemistry and volcanology, geochronology, paleoecology, hydrology and hydrogeology, biogeochemistry, atmospheric science, glaciology, and planetary science.

Ideal applicants will have a strong undergraduate record with a degree in some branch of Earth Science, Planetary Science, Engineering, Chemistry, Biology, Physics, Mathematics, or a related discipline, including considerable quantitative coursework. Applications are evaluated with particular attention to the quality of previous education, statement of purpose, and letters of recommendation. Applicants are required to take the Graduate Record Examination (GRE) General Test; there is no subject test requirement.

Faculty, and researchers make a strong effort to provide financial support to graduate students who are making satisfactory academic progress. Many students are funded throughout their time in graduate school.

## **Ecology & Evolutionary Biology M.A., Ph.D.**

<https://www.eeb.ucsc.edu/academics/graduate>  
[eebgradp@ucsc.edu](mailto:eebgradp@ucsc.edu)

The EEB graduate program encourages strong mentorship between students and faculty in an informal atmosphere advantageous to rapid learning and professional growth. One of the premier EEB programs in the country, our graduate students are particularly fortunate in having varied and easily accessible marine and terrestrial resources for research. In addition to local field sites, students have access to greenhouses, state-of-the-art laboratories, and other facilities in the division. Faculty and their graduate students also participate in field studies throughout the world, especially in Africa, Latin America, the Arctic and Antarctic, and around the Pacific Rim.

Research in EEB's graduate program is comprised of four core tracks: Population and Community Ecology; Evolutionary Biology; Physiology and Behavior; Conservation and Biodiversity.

To learn more about our participating faculty, lecturers, and affiliates, visit our EEB Faculty sites: <https://www.eeb.ucsc.edu/faculty>

THE DIVISION OF GRADUATE STUDIES

<https://gradadmissions.ucsc.edu>



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## Mathematics M.A., Ph.D.

<https://www.math.ucsc.edu/graduate>  
(831) 459-5461

The Mathematics Department at UC Santa Cruz is dynamic with small student-to-faculty ratios, with an ongoing commitment to both research and teaching. The department has leading research programs in several actively developing areas on the frontiers of pure and applied mathematics, interacting strongly with theoretical physics and mechanics. The extraordinary level of National Science Foundation support received by our faculty reflects the high caliber of the research carried out in the department. The department also has ties to nearby industry, and many of the department's graduates are employed by the top IT companies.

In order to be prepared for the master's or Ph.D. program, it is recommended to have a B.A. or B.S. in mathematics. Having taken more than the bare minimum of required upper-division classes in the mathematics major will be most helpful.

The Mathematics Department is strongly committed to the financial support of graduate students who are making good progress toward either the master's or the Ph.D. degree.

## Microbiology & Environmental Toxicology M.S., Ph.D.

<https://www.metx.ucsc.edu/academics/graduate>  
[metxadmn@ucsc.edu](mailto:metxadmn@ucsc.edu)

The Department of Microbiology and Environmental Toxicology prepares students to solve important problems in the field of environmental health by providing stimulating coursework, extensive scientific presentation training, and for the research-oriented Ph.D. and M.S. degrees, in-depth research that culminates in a thesis. There is no other program in the world that educates students to appreciate the interplay between microbes, chemical toxins and health, providing the training students require to work effectively in a complex world.

Key components of our graduate training include: Interdisciplinary core course that teaches critical thinking and how to approach complex problems in environmental health; a core course devoted to grant-writing and scientific-writing skills; personalized class plan for the remaining three courses to fit the student's background and research goals; speaking presentation skills training through coursework and yearly departmental presentations; and scientific writing and literature mastery through the writing of a literature review in the first year.

## Molecular, Cell & Developmental Biology M.S.

<https://mcd.ucsc.edu/academics/graduate>  
(831) 459-2632

The MCD Master's Program is a two year program carried out under the guidance of a faculty advisor. Students interested in a Master's degree should directly contact faculty members with whom they would like to work before applying in order to secure sponsorship.

Students in the Masters Program are normally eligible for Teaching Assistantships and Researchships; although not required, TA-ing is considered a normal part of the Master's Program. The purpose of the Master's Program in MCD Biology is to allow students to extend and complete a senior thesis project, or to allow a student the option of committing to a short program in an area where they may not wish to or need to pursue a Ph.D.

## Ocean Sciences M.S. , Ph.D.

<https://oceansci.ucsc.edu/academics/graduate>  
[osadmin@ucsc.edu](mailto:osadmin@ucsc.edu)

The graduate programs in ocean sciences are designed to prepare students for careers in research, teaching, and other environmentally related endeavors. The fundamental requirement for admission to the program is substantial evidence of superior scholarship and aptitude for original research.

The pathways within the Ocean Sciences Ph.D. program are differentiated from related degrees in the traditional disciplines by their focus on global-scale problems and interactions, a focus on the ocean, and their inherently interdisciplinary approach. Interdisciplinary projects across and between pathways are encouraged, as are interactions with faculty in related departments. The pathways are biological, chemical, geological and physical oceanography.

Whereas the doctoral program has an oceanographic orientation, the Master's program is even broader and has traditionally attracted many students in marine biology and ecology. The Master's program can be entered as course work only or as a thesis based Master's.

As with the doctoral program, students in the thesis based Master's are encouraged to select a course of study and a research program that draws on the expertise of the core ocean sciences faculty and any of the affiliated faculty in other departments. Customized programs of study that combine related disciplines are supported in the Master's program. The degree combines core courses and electives to provide depth and breadth in the ocean sciences.

Graduates from the program are exceptionally prepared to take research or management positions in organizations concerned with the marine environment, to become educators, or to enter doctoral programs in ocean sciences or related fields.

## Physics M.S., Ph.D.

<https://www.physics.ucsc.edu/academic-programs/grads>  
(831)459-4122

The department boasts outstanding research programs in theoretical and experimental particle physics, astrophysics and cosmology, condensed matter physics, and biophysics. Students receive strong grounding in basic physics, as well as exposure to active research areas. Throughout their graduate careers students work closely with faculty and pursue programs that fit their individual needs.

The vast majority of our faculty and graduate students conduct research with the Santa Cruz Institute for Particle Physics (SCIPP) and the Materials Science and Engineering Initiative (MSEI). In addition students have access to a number of research facilities: the University of California Observatories (headquartered at UCSC), Institute of Marine Sciences, and the Institute of Tectonics. There is strong interaction with other disciplines, especially astronomy and astrophysics, biology, chemistry, Earth sciences, electrical engineering, and mathematics.

The Physics Department is committed to providing an excellent education to a diverse population of graduate students and we encourage candidates from all backgrounds to apply. We employ a holistic process to assess candidates' knowledge and passion for physics. Of particular importance is the alignment between the research interests of the candidate and those of the department.

## Program in Biomedical Sciences & Engineering (PBSE)

<https://pbse.ucsc.edu>

The Graduate Program in Biomedical Sciences and Engineering (PBSE) reflects the interdisciplinary and collaborative nature of biomedical research at UCSC. PBSE predoctoral fellows have the opportunity to study biology at the molecular, cellular, and systems levels, and can take advantage of advanced laboratory facilities, computational tools, and a highly collaborative research environment. First-year students can do research rotations with any of the 72 faculty members affiliated with PBSE. *(continued)*

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## ***PBSE Continued:***

Students apply directly to the PBSE, selecting from the following four interdisciplinary training tracks: Biomolecular Engineering and Bioinformatics (BMEB); Chemical Biology, Biochemistry and Biophysics (CB3); Microbial Biology and Pathogenesis (MICRO); Molecular, Cell and Developmental Biology (MCD).

Each training track offers a complete set of core courses, electives, seminars and journal clubs that provide rigorous training in each of the four broad areas. Students may switch training tracks, and we encourage students to take advantage of PBSE's unique opportunities for carrying out interdisciplinary research.

## **Biomolecular Engineering & Bioinformatics (BMEB, PBSE)**

<https://pbse.ucsc.edu/bmeb>

[bsoe-ga@rt.ucsc.edu](mailto:bsoe-ga@rt.ucsc.edu)

The graduate research track in Biomolecular Engineering and Bioinformatics (BMEB) is inter-disciplinary and accepts students from a wide-variety of backgrounds. A typical cohort includes incoming students from molecular biology, genetics, computer science, engineering, and mathematics. The unifying theme of our research training program is using quantitative approaches to addressing fundamental questions in biology and biomedical science. BMEB track coursework is designed to provide the technical skills in programming and other technical skills required for independent and advanced scientific discovery.

The track builds upon UCSC's renowned presence in computational biology and genomics. Graduate students do their thesis training and research in the UC Santa Cruz environment, central hub of collection, aggregation and dissemination of genome-scale data through the UCSC Genome Browser. UC Santa Cruz is also home to unique genome facilities and resources including the UCSC Paleogenomics Lab, the Nanopore Group, the Institute for the Biology of Stem Cells, the Genomics Institute.

Core BMEB faculty are from the Department of Biomolecular Engineering while affiliated faculty are from many other departments. Their research groups are internationally recognized for their discoveries in genome technology, computational biology tool development, stem cell genomics, and computational methods for vaccine development.

Incoming BMEB students undertake rigorous core coursework, conduct laboratory rotations, and are exposed to a rich environment of regular seminars and group meetings. Students interact closely with BMEB faculty members while undertaking their dissertation research, and have first-hand access to state-of-the-art computation tools and lab facilities throughout

their training, including cluster computing and high-throughput sequencing facilities. Students receive financial support throughout their graduate career, contingent upon remaining in good academic standing.

## **Microbial Biology & Pathogenesis (MICRO, PBSE)**

<https://pbse.ucsc.edu/micro>

[metxadmn@ucsc.edu](mailto:metxadmn@ucsc.edu)

The Ph.D. track in Microbial Biology and Pathogenesis (MICRO) prepares students for careers in biological research and teaching. This training program emphasizes the application of diverse approaches, including biochemistry, genetics, genomics, ecology, and imaging to address questions at the forefront of microbial biology.

Interdisciplinary research is encouraged and supported by a diverse group of faculty from the Departments of Microbiology and Environmental Toxicology, Biomolecular Engineering, Ocean Sciences, Molecular Cell and Developmental Biology, Evolutionary and Ecology Biology, and Chemistry and Biochemistry. Their research covers numerous topics related bacteria, viruses and fungi, including bacterial pathogenesis, host-pathogen interactions, the role of microbes in the environment, and basic microbial biology.

MICRO first-year students participate in three seven-week laboratory rotations, while taking rigorous coursework that emphasizes critical evaluation of scientific models and experimental results. At the end of the three rotations, students select a thesis lab for an independent research project that ultimately leads to their dissertation. First year students craft a literature review, to form a sound basis for their thesis research. In the second year, students take oral qualifying exams. Advanced graduate students work under the direct supervision of one of fifteen affiliated faculty members in a highly interactive, collaborative research environment. All students speak every year in the Dept. of Microbiology and Environmental Toxicology seminar series, participate in a variety of seminars, advanced special topics courses, and research group meetings as well.

## **Molecular, Cell & Developmental Biology (MCD, PBSE)**

<https://pbse.ucsc.edu/mcd>

(831) 459-2632

The PBSE graduate training track in Molecular, Cell, and Developmental Biology (MCD) is designed to give students both broad-based knowledge in biology and in-depth skills in the specific area of their dissertation research. MCD emphasizes an interactive and collaborative research environment for graduate training.

Faculty members from six departments participate in the track. Research groups are organized into interdisciplinary clusters of laboratories with shared interests, creating critical masses of researchers that foster mutual support and scientific interaction. These clusters are cell biology, chromosome biology, developmental biology, genomics, microbiology, neurobiology and RNA molecular biology. The MCD training track requires rigorous core coursework and laboratory rotations, while providing students with a rich environment of regular seminars and group meetings. Students interact closely with faculty members throughout their training, and have first-hand access to state-of-the-art laboratory facilities and computational tools while undertaking their research.

Students receive financial support throughout their graduate career, contingent upon remaining in good academic standing.

## **Science Communication M.S.**

<https://scicom.ucsc.edu>

(831) 459-4475

The program consists of nine months of coursework and a final summer internship requires part-time professional internships throughout the academic year. It does not require a thesis, and offers practical training with professional journalists and editors as instructors. Science Communication emphasizes news, long-form writing, and multimedia skills, with an eye toward substantive reporting on research and policy. Small class sizes (10 students) in every course ensure extensive feedback from lecturers, emphasizing original writing and editing for the public, rather than theory and critique. Students receive rigorous editing at the highest standards on their projects, with some peer review by students. Our students practice science writing as a fine art as well as a craft. They emerge from their year in Santa Cruz with dozens of published stories, a broad set of journalistic skills, and distinct voices as writers.

The program is one academic year long, focusing entirely on practical training through rigorous coursework and diverse internships. It's the only graduate science writing program in the U.S. that requires a degree in science and experience in research.

Science writers choose from myriad career options: online or print journalism; staff writing at university news offices, federal agencies, national labs, museums, and zoos; and multimedia work on the Internet and in radio. Our alumni work as reporters and editors at the nation's top science magazines, online news services, research agencies, universities, and medical centers. About half of our graduates freelance, mainly to live where they wish and to cover the science that captivates them.