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Resources for Learning and Research

[2014–15 General Catalog](#)

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University Library

The handsome Science and Engineering and recently renovated McHenry libraries house the impressive holdings of UCSC's University Library—the largest library collection between Santa Barbara and San José. In nearly five decades, the collection has grown from a few shelves of books and a substantial dependence on the libraries of UC Berkeley to more than 2.2 million volumes, over 56,000 periodical titles (including online journals), in excess of 39,000 microforms, and more than 406,000 non-print items including films, slides, and audio and video recordings.

As part of the statewide University of California library system, the University Library also serves as a gateway to millions of other books and periodicals. The library's efficient Interlibrary Loan service is heavily used, facilitated by the online request service of the systemwide Melvyl® Catalog.

The University Library collection is divided into two parts. Resources in the humanities, arts, and social sciences are contained in McHenry Library at the heart of the campus, while the engineering, mathematics, and natural sciences collections are housed in the award-winning Science and Engineering Library, conveniently located on "Science Hill."

Collections librarians manage the growth and development of UCSC's collection and provide in-depth research assistance.

Most of the holdings of the University Library are shelved in open stacks. Students and faculty are encouraged to help themselves, using information found via the local Cruzcat online library catalog, the Melvyl Catalog, and the library web site. The library home page provides a convenient gateway to the Cruzcat and Melvyl catalogs, the California Digital Library, and a host of other electronic information resources, such as article databases and online journals. The library staff is also eager to offer its assistance at any of several service points.

At the McHenry Library reference desk as well as by e-mail and appointment, librarians and reference specialists give individual guidance: general orientation for the newcomer and specialized help for the researcher. They assist in the use of a wide range of resources—in

print and online—including more than 200 online article databases to which the library subscribes. Librarians also offer specialized group instruction, upon request, to classes in all disciplines.

The Reserve service, located at the respective circulation desks, lends copies of assigned class readings on a short-term basis and provides protection for vulnerable circulating materials and heavily used periodicals.

Special Collections at McHenry Library contains rare, valuable, and often fragile materials that do not circulate. Holdings focus on local and campus history, and 20th-century literature and book arts. Special Collections also houses the official campus archive, as well as the archives of George Barati, Gregory Bateson, Thomas Carlyle, the Grateful Dead, Lou Harrison, Robert Heinlein, Kenneth Patchen, Brett Weston, and the Shameless Hussy, Trianon, and Turtle Island presses.

Other important collections and services include:

- [The Digital Collections web site](#), containing a growing treasury of digitized photographs, maps, artwork, oral history transcripts, and sound recordings, as well as “born digital” materials, focusing on the most rare and unique.
- Government Publications, a selective depository for documents published by U.S., California, and Santa Cruz government agencies
- The Media Center, which provides access to audio and video in all formats; CD-ROMs; support for music study, including music scores and music course reserves via iTunes; and language-related audio and video recordings
- The Map Collection, with maps and aerial photographs of Santa Cruz and adjoining counties, and topographic, nautical, and aeronautical maps from all over the world
- The Mary Lea Shane Archives of the Lick Observatory, a national resource for the history of astronomy
- The Regional History Project’s documentation of Central California history

For more information, see the [library’s home page](#).

Computing Facilities and Technology Services

Information Technology Services (ITS)

[Information Technology Services \(ITS\)](#) at UCSC provides a broad spectrum of IT-related resources, services, and support to students, faculty, and staff in the areas of computing, network, telephones, media services, information systems security, web, e-mail, and instructional technology.

ITS operates [the campus network](#), which interconnects computers, workstations, instructional computing labs, and computer-equipped classrooms with each other and the Internet. In addition, wireless access is available across campus.

ITS also provides the campus with technical services and computer support through [the ITS Support Center](#).

Purchasing a Computer?

If you are planning on buying a new computer, UCSC recommends purchasing a laptop with both wired and wireless network capability. The campus supports both PC and Mac computers. An excellent source for purchasing computers and computer products is the campus [Bay Tree Bookstore](#), (831) 459-2082. Through university-negotiated contracts, the bookstore offers a full line of Apple and Dell computers, as well as software and peripheral equipment. Pricing is almost always below outside market prices. The bookstore works closely with ITS to be certain the equipment you buy will meet campus specifications, both wired and wireless.

Computer Standards

The campus supports both PC and Mac computers. For general campus support standards, see [Standard Desktop Support](#) at ITS.

UCSC Account (CruzID) and E-mail

All students, faculty, and staff have a UCSC account called CruzID and a UCSC e-mail account, for example cruzid@ucsc.edu.

In addition to e-mail, CruzID gives individuals access to many campus systems and applications. Every UCSC student is preassigned a CruzID account upon enrollment. Students can activate and change their initial password through [MyUCSC](#).

All official UC and UCSC communication is e-mailed to the @ucsc.edu address. More information is available at [UCSC Email Services](#).

Computing Policies

Policies define how ITS will approach security, how faculty, staff, and students are to approach security, and how certain situations will be handled. Individuals using UCSC computing services must comply with the [University of California state and federal policies and laws](#).

Security Awareness

There are many cyber security threats out there, but it is important to remember that most of them are avoidable. To help protect against common cyber security threats, information is available at [the IT Security page](#).

Residential Network

ITS provides in-room Internet access (called ResNet) to students living on campus. Network services are available to undergraduate and graduate students living in university housing (except for the Camper Park). For assistance with network connections, contact ResNet at resnet@ucsc.edu or call (831) 459-HELP (4357).

Computing Labs for Drop-in Use and Academic Classes

ITS manages 12 computer labs throughout the campus. These labs have more than 300 computers available for students to use that include PC, Mac, and Sun workstations. Wireless access is available in all labs.

The computing labs are used like classrooms; they can be reserved by faculty or teaching assistants for instruction. When not reserved for instruction, the labs are available to students on a walk-in basis. Even if faculty are not teaching in the labs, they may request specific academic software to be installed in the labs so that students may complete homework assignments. More extensive lab information, including hardware and software specifications and hours of operation, is available at [the Computer Labs page](#).

Equipment Checkout

With faculty authorization, students may reserve and check out media equipment for instructional purposes from the ITS checkout pool located in Kerr Hall 149. UCSC Identification with a current quarter sticker is required to check out any equipment. Reservations for equipment are strongly encouraged. All equipment is available on a first come, first served basis and can be borrowed for up to three working days. Equipment may be reserved by calling 459-2117. Detailed information can be found at [the Audio-Visual Checkout page](#).

Academic Course Materials on the Web

[eCommons](#) is the campus online course-management system used to create sophisticated web-based course materials to supplement, but not replace, classroom instruction. eCommons uses a web browser as the interface for the course.

Faculty using eCommons can incorporate a wide variety of tools in their course site, such as a course calendar, student conferencing system, electronic mail, group projects with student-created web pages, and quizzes. Faculty can use eCommons to see what materials students have viewed before they arrive in class. When faculty administer pre-class quizzes on eCommons, they can see what concepts students understand before class and then tailor the lecture accordingly.

Outside of class time, students can use eCommons to view course materials, participate in web-based class discussions, collaborate on student group projects, and take quizzes.

Disability Accommodations for Instruction

If you have a disability and require adaptive or assistive technology to use lab computers, library facilities, or other campus services, please contact the Disability Resource Center (DRC) right away so that they can coordinate services for you.

Computing labs have common adaptive technologies—such as enlarged type for students with low vision and Dvorak keyboards for students with repetitive strain injuries. If you need accommodations, please call the DRC at (831) 459-2089 (voice), or (831) 459-4806 (TTY).

ITS Support Center for Technical and Computer Help

The ITS Support Center is open to all students, staff, and faculty and provides general computer help, assistance with CruzID accounts and e-mail, and other technical-support needs. The Support Center is located at 54 Kerr Hall and is open Monday through Friday from 8 a.m. to 5 p.m.

Get help:

- Online: <http://itrequest.ucsc.edu>
- Phone: 459-4357 (459-HELP)
- E-mail: help@ucsc.edu
- Walk-in: Kerr Hall, Rm. 54

Natural Reserve System (NRS)

The purpose of the NRS is to establish and maintain, for teaching and research, a system of natural areas that encompass diverse and undisturbed examples of California's terrain, both aquatic and terrestrial. The reserves are open to all qualified individuals and institutions for scholarly work concerned with the natural environment. Such work usually deals with ecological topics or experimental studies in a natural setting. At UCSC, the reserves play an important role in supporting experiential learning (course support, internships, and research support) for undergraduate students interested in ecology and environmental sciences in general.

The University of California administers 38 natural reserves throughout the state. Santa Cruz has responsibility for four—the Landels-Hill Big Creek Reserve, Fort Ord Natural Reserve, Año Nuevo Island, and Younger Lagoon Natural Reserve—in addition to the campus's own Natural Reserve. Information about the system's holdings and management is available from the director, [NRS, University of California](#), 1111 Franklin Street, Oakland, CA 94607-5200, (510) 987-0150. You may also contact [the UCSC natural reserve](#) director, c/o Environmental Studies Department, 467 Natural Sciences 2 Building, (831) 459-4971, ghdayton@ucsc.edu.

Campus Natural Reserve

Approximately 400 acres of campus wildlands were designated by the Regents in the 1988 Long-Range Development Plan as a [Campus Natural Reserve](#). This reserve contains redwood forest, springs, a stream, vernal pools, secondary madrone/Douglas fir forest, chaparral, and many soil types and geological formations and structures. The reserve is used for research and teaching and is overseen by the UCSC natural reserve director, c/o Environmental Studies Department, 467 Natural Sciences 2 Building, (831) 459-4971, asjones@ucsc.edu. Students interested in internships and volunteer opportunities should contact Alex Jones asjones@ucsc.edu.

Año Nuevo Island Reserve

This 25-acre island, part of the 4,000-acre [Año Nuevo State Reserve](#) 20 miles north of Santa Cruz, is a university research reserve of the NRS. Northern elephant seals, California sea lions, northern sea lions, and harbor seals breed and haul out in different seasons. The reserve's breeding colony of elephant seals has been the subject of a remarkable 40-year study by UCSC scientists. More than 300 species of land, shore, and sea birds reside in or

migrate through the area, which also has a diversity of fish and intertidal organisms. Access to the island is restricted, and UCSC's research use is managed by the UCSC Natural Reserves. An annual use agreement with California State Parks allows research and field work throughout Año Nuevo State Reserve. A small research facility is located on the island, and a day-use facility is available in the state reserve. For further information, or to use the reserve, contact Patrick Robinson,, e-mail patrick.robinson@ucsc.edu.

Fort Ord Natural Reserve

The [Fort Ort Natural Reserve](#) is a 600-acre reserve was added to the system in 1996. It contains Monterey Bay maritime chaparral, an endemic plant community, and coast live oak woodland, grassland, and coastal scrub, including nine species of plants and animals that are listed as endangered, threatened, or of special status. The reserve was part of the former Fort Ord army base and its habitats are relatively intact. The reserve specializes in studies of plant ecology and rare species conservation. It is a 45-minute drive from campus. For information, contact the UCSC natural reserve director, c/o Environmental Studies Department, 467 Natural Sciences 2 Building, (831) 459-4971, ghdayton@ucsc.edu. Students interested in internships and volunteer opportunities should contact Gage Dayton ghdayton@ucsc.edu.

Landels-Hill Big Creek Reserve

The [Landels-Hill Big Creek Reserve](#) is a 4,000-acre reserve is located in the Santa Lucia Mountains on the Big Sur coast, about two hours by car from the campus. The reserve includes the lower portions of an undisturbed and protected watershed containing numerous terrestrial and aquatic habitats and several geological formations and associated fault systems. The upper watershed is protected by the Ventana Wilderness of the Los Padres National Forest. The reserve's four miles of rocky coastline, located within the California Sea Otter Refuge area and the Monterey Bay National Marine Sanctuary, is now a California Department of Fish and Game Marine Protected Area and provides opportunities for marine research. There are campsites for researchers, a modest field-laboratory facility, a cabin for long-term researchers, and a small storage facility. The Big Creek Reserve is managed by the onsite reserve director. Access is controlled, and applications for use should be made to the resident reserve manager, Big Creek Reserve, Big Sur, CA 93920, (831) 667-2543, readdie@biology.ucsc.edu.

Younger Lagoon Reserve

The [Younger Lagoon Reserve](#) is a 26-acre coastal lagoon and beach next to UCSC's Long Marine Laboratory is part of the NRS. Its waters are a haven for many species of migratory birds, and many small mammals, birds, reptiles, and invertebrates live in its marsh and bank vegetation. A 20-year restoration effort has been initiated. The site provides opportunities for student projects and hands-on involvement in restoration and monitoring. Younger Lagoon is managed by the UCSC natural reserve director and field manager, c/o Environmental Studies Department, 467 Natural Sciences 2 Building, (831) 459-4971, eahoward@ucsc.edu. Students interested in internships and volunteer opportunities should contact Beth Howard eahoward@ucsc.edu.

Research Programs and Facilities

Research at UC Santa Cruz is thriving, facilities are excellent, and the amount of external funding received for research continues to grow. In addition to their individual research projects, faculty are involved in organized research on various scales, from small focused activities within academic divisions, to large research units, some with campuswide scope and others with wider connections to the whole 10-campus University of California system.

Research programs and facilities are described below by academic division: [Arts Division](#); [Baskin School of Engineering](#); [Humanities Division](#); [Physical and Biological Sciences Division](#); and [Social Sciences Division](#).

Specialized research facilities in addition to those listed below are described in the [Programs and Courses](#) section.

Arts Division Research Centers and Institutes

Arts Research Institute (ARI)

[The Arts Research Institute \(ARI\)](#) funds and facilitates the research and creative work of individual Arts Division faculty, as well as collaborative research, symposia and other creative activities and events. Grants and awards from the ARI have helped to support performances, exhibitions, software design, manuscript preparation, digital recordings, international field research, collaborative colloquia, on-site installations, operas, and electronic productions. These and other innovative projects in arts practice and theory are among the research areas and interests supported by the institute.

Center for Documentary Arts and Research

[The Center for Documentary Arts and Research \(CDAR\)](#) supports interdisciplinary explorations of the documentary and nonfiction arts, broadly conceived. CDAR serves as a locus for experimentation and investigation of the social, aesthetic, historical, political, and pedagogical capacities of documentary and nonfiction film and media forms and practices. In addition to staging screenings, talks, and symposia, CDAR fosters exhibition, discussion, investigation, and collaboration in areas of documentary and nonfiction media history, theory, and practice that bridge the gap between academic settings of documentary research and the broader public sphere.

Center for Force Majeure Studies

The mission of the interdisciplinary [Center for Force Majeure Studies](#) is to generate long-term research projects that address the emerging stresses on the Earth's largest ecosystems. The center connects the processes of art-making and the sciences within the unique perspective pioneered by Helen Mayer Harrison and Newton Harrison. The center is reaching out to cultural and educational institutions to execute on-the-ground projects that engage scientists, artists, lawmakers, and the public; enrich public discourse concerning ecology; and inform policy development.

Innovation and Design Lab (IDL)

[The Innovation and Design Lab \(IDL\)](#) is devoted to creating and publishing new knowledge in the health and wellness industries. The IDL takes a holistic approach to innovation and design research that generates products, tools, services, and solutions to improve health outcomes. The IDL is currently focused on a large collaborative program "The Hospital of the Future: The Living Laboratory" at the Johns Hopkins Medical Institutions (JHMI) Children's Center in Baltimore, Maryland. This work is in collaboration with the Department of Pediatrics at JHMI and with corporate research and corporate sponsor partners.

OpenLab Network

[The OpenLab Network](#) is an interdisciplinary initiative that promotes collaborations among art and science researchers. The goal of the OpenLab Network is to help change the current status quo by providing shared research facilities and creating a network for discourse fueled by academic communities, arts and science communities, and industry. The OpenLab Network is pursuing the physical development of new collaborative laboratories on the UCSC campus to foster this research and is establishing an online social networking system for faculty and students to create projects.

Social Practice Arts Research Center (SPARC)

[The Social Practice Arts Research Center \(SPARC\)](#) fosters knowledge exchange and project building between artists, scientists, the public, and others to promote active social and environmental change. The mission of SPARC is to increase the flow of ideas and art actions in real social contexts; position art-making and the creative process as research; and foster creative exchange, critical dialog, and social consciousness in art, education, and life. Working across disciplines, SPARC aims to engender and support collaborations and projects that have a local, national, or international impact.

Arts Division Teaching, Research, and Performance Facilities

Arts Information Technology Services (ITS) Labs

ITS has [two labs](#) that primarily serve the Arts Division: the [Porter Arts Mac Lab](#) (Porter D 240) and the [Music Lab](#) (Music 249). The Porter Arts Mac Lab is equipped with arts-specific software, including high-end video-editing, graphics, web-development, and sound-

editing software. The Music Lab includes hardware and software for music editing, notation and working with MIDI. These ITS labs are open to all UCSC students. In addition, several of the departments in the Arts Division manage computer labs with specialized equipment and software for the exclusive use of students taking classes in Art, Film and Digital Media, Theater Arts, Social Documentation, Music, and Digital Arts and New Media (DANM).

Baskin Visual Arts Center

The [Baskin Visual Arts Center](#) provides excellent [studio facilities](#) for drawing, painting, installation, photography, sculptural construction, printmaking, and digital and traditional printmaking and photography. The nearby bronze foundry is the only such facility within the UC system.

Digital Arts Research Center

Opened in 2010, the 25,000-square-foot [Digital Arts Research Center \(DARC\)](#) houses UCSC's MFA Program in Digital Arts and New Media (DANM) and parts of the departments of Art and Music. This state-of-the-art, three-story facility includes several DANM labs for graduate student use, an outstanding undergraduate photo lab and classroom, as well as an expansive drawing studio and faculty research studios.

Music Center

[UCSC's Music Center](#) offers several performance venues as well as classrooms and teaching studios outfitted with advanced audiovisual technology and with state-of-the-art digital audio, video, and recording systems. Facilities include the 386-seat Recital Hall; studios for Indonesian gamelan, percussion, and electronic music; a 60-seat performance studio; 20 practice rooms; and a music library.

Theater Arts Center

[The Theater Arts Center](#) contains a 500-seat thrust stage, a state-of-the-art experimental theater, and a 200-seat proscenium theater. It also offers acting, directing, and dance studios; costume, scene, and properties shops; a sound recording room; and a computer lab. Elsewhere on campus are additional dance studios, the open-air Quarry Amphitheater seating 3,000, the Sinsheimer-Stanley Festival Glen, and the 150-seat Barn Theater.

Baskin School of Engineering (BSOE) Research Centers and Institutes

Center for Games and Playable Media

[The Center for Games and Playable Media](#) focuses on research in computer games, interactive fiction, and playable media, broadly construed. The center houses the school's five games-related research labs: Expressive Intelligence Studio, Computational Cinematics Studio, Natural Language and Dialog Systems, Augmented Design Laboratory, and Software Introspection Laboratory. There is a great diversity in the faculty's topics of research. Projects range from work on artificial intelligence and interactive storytelling, to natural language dialogue systems, cinematic communication, procedural content generation, human computer interaction, rehabilitation games, computational photography, and level design. Members of the group have published in some of the most respected journals in the fields of game studies, game AI, and game culture.

Center for Maximizing Abilities Through Technology, Education and Research (MATTER)

[The MATTER Center](#) (Maximizing Abilities Through Technology, Education and Research) is formed by an eclectic combination of faculty members in engineering, psychology, nursing, and rehabilitation from UC Santa Cruz, UC San Francisco, and UC Davis. The center covers a broad spectrum of research areas, under the common denominator of technologies to help persons with special needs in their activities of daily living.

Center for Research in Intelligent Storage (CRIS)

The Center for Research in Intelligent Storage (CRIS) is a partnership between universities and industry, featuring high quality, industrially relevant fundamental research, strong industrial support of collaboration in research and education, and direct transfer of university developed ideas, research results, and technology to U.S. industry to improve its

competitive posture in world markets. Through innovative education of talented graduate and undergraduate students, CRIS is providing the next generation of scientists and engineers with a broad, industrially oriented perspective on engineering research and practice. Web: <http://cris.cs.umn.edu/>

Center for Stock Assessment Research (CSTAR)

The [Center for Stock Assessment Research \(CSTAR\)](#) is a collaboration between the Fisheries Ecology Division, NOAA Fisheries (FED), Santa Cruz, and UCSC to provide training in for undergraduate and graduate students and postdoctoral colleagues in the quantitative population biology needed to improve the sustainability of fisheries. CSTAR members work closely with FED staff, and participate in stock assessments, cruises, data workshops, and other management-oriented activities. Members of CSTAR have gone on to positions at NOAA Fisheries across the country, to academia, and to other kinds of non-academic positions including the Malaria Atlas and high-tech companies. A CSTAR alumna founded FishWise, which trains point-of-sale individuals about the sustainability of fisheries and includes Safeway and Target as customers.

Center for Sustainable Energy and Power Systems (CenSEPS)

The [Center for Sustainable Energy and Power Systems \(CenSEPS\)](#) is poised to become a major hub for innovation in emerging clean energy technologies and for tackling the challenges of energy sustainability. The center explores the societal implications of new renewable energy technologies and prepares a new generation of 21st century engineers and scientists to address the problem of more efficient energy use with a minimal carbon footprint. We promote and integrate the use of renewable energy technology to create sustainable communities and renewable energy districts. The center partners with other energy research institutes, both within the United States and abroad, to develop an international approach to solving the critical problems that delay deployment of renewable energy resources.

Information Technologies Institute (ITI)

The [Information Technologies Institute \(ITI\)](#) is a focused research activity (FRA) founded in 2001 and housed at the Baskin School of Engineering. ITI's objective is to provide an environment in which its members can attract large-scale projects that bridge technology research from concept to prototype and solve problems in social and commercial sectors nationally.

In ITI, advanced Internet applications provide the impetus and focus that bring together the components of research related to the rapidly expanding world of networks, distributed computing, "smart" sensors, and Internet appliances. As electronics and packaging developments lead to powerful low-cost sensors, resulting in a broad array of instruments, these become Internet devices, bringing a significant increase in the data captured, transmitted, stored, managed, and displayed.

Through its research centers, ITI focuses on interrelated areas in computer science, computer engineering, and electrical engineering as well as physics, chemistry, and applied mathematics. Areas of emphasis include:

- Design and development of complex networked systems and software technologies
- Storage systems and databases
- Assistive technologies
- Sensors, sensor systems and Internet appliances
- Multimedia systems and applications in education and business management
- Communications
- VLSI design, packaging, and testing
- Visualization and computer graphics
- Knowledge management/data mining
- Decision support tools

Directed by Professor of Computer Engineering Patrick Mantey, ITI has faculty throughout the School of Engineering and manages the participation of other research partnerships—including the activities in the Center for Information Technology Research in the Interest of Society (CITRIS)—with UC Berkeley, UC Davis, and UC Merced. ITI also has participation from the Division of Physical and Biological Sciences, the Division of Social Sciences, and the Arts.

Institute for Scalable Scientific Data Management (ISSDM)

The [Institute for Scalable Scientific Data Management \(ISSDM\)](#) is a collaboration between Los Alamos National Laboratory (LANL) and UC Santa Cruz. The ISSDM promotes and sponsors LANL/UCSC research collaborations and fosters long-term relationships with collaborators at LANL and UCSC. The current focus of these collaborations is on research in storage systems, data and knowledge management, human computation, and visual exploration and analysis of cosmology.

Storage Systems Research Center (SSRC)

The [Storage Systems Research Center \(SSRC\)](#) is composed of faculty from the Computer Science, Computer Engineering, and Electrical Engineering departments and the Technology and Information Management Program. It is funded by the NSF, the Department of Energy, and companies such as NetApp, Symantec, HP, LSI, Data Domain, and Agami. Current research topics include long-term archival storage, scalable indexing and metadata, petabyte-scale storage systems, and file systems for next-generation storage technologies such as non-volatile memories and probe-based storage. Issues of particular concern include performance and scalability, reliability, and security. The SSRC's resources include several computing clusters, the largest with more than 80 processor-disk nodes, as well as over 10 terabytes of dedicated storage. In addition, there are several hardware-software testbeds for projects such as self-managing archival storage and large-scale distributed file systems. The SSRC also maintains a PlanetLab site at UC Santa Cruz, allowing researchers to run experiments on the PlanetLab global-scale distributed testbed.

W. M. Keck Center for Adaptive Optical Microscopy

The [W. M. Keck Center for Adaptive Optical Microscopy](#) is an interdisciplinary center's objectives are to develop enabling adaptive optical technologies and critical procedures to overcome longstanding barriers and vastly improve in vivo deep tissue biological imaging. The approach is inspired by the highly successful use of adaptive optics in the W. M. Keck Telescopes, which allows astronomers to see much more clearly and deeply into space. This center was made possible through the generous support of the W.M. Keck Foundation.

W. M. Keck Center for Nanoscale Optofluidics

The mission of the multidisciplinary [W. M. Keck Center for Nanoscale Optofluidics](#) is the development of optofluidic devices and their application to single-particle studies in molecular biology and biomedical diagnostics. Facilities include a dedicated nanofabrication facility housing a FEI Quanta 3D FEG dual beam SEM/FIB nanofabrication instrument for fabrication, imaging, and characterization of nanoscale devices.

UCSC Genome Technology Center

The [UCSC Genome Technology Center](#) features state-of-the-art equipment including the GS FLX Titanium Series sequencing platform from 454 Life Sciences and the SOLiD sequencing platform from Applied Biosystems. Applications include whole-genome and targeted sequencing; resequencing; RNA sequencing; micro-RNA and small-RNA sequencing; chromatin immunoprecipitation (ChIP) sequencing (to identify binding sites of DNA-associated proteins); and metagenomics (also called environmental genomics, involving the analysis of genetic material recovered directly from environmental samples)

Baskin School of Engineering (BSOE) Facilities

The [Baskin School of Engineering \(BSOE\)](#) occupies principally the Jack Baskin Engineering and Engineering 2 buildings. Some laboratories and offices are also in the new Biomedical Sciences and Engineering Building (completed in 2012), the Physical and Biological Sciences Building, and the Sinsheimer Laboratory Building. On the west side of Santa Cruz, outside the main campus, BSOE has a set of advanced material sciences laboratories at 2300 Delaware Ave. (formally a Texas Instruments semiconductor fabrication plant). Several BSOE

faculty also work closely with colleagues at the adjacent UCSC Long Marine Laboratory and Marine Sciences Campus.

“Over the hill,” BSOE has created a strong presence at the UCSC Silicon Valley Campus (SVC) located at 2505 Augustine Drive in Santa Clara across the 101 Freeway from Intel, and has joint laboratory facilities at NASA Ames Research Center in Mountain View, California. Many BSOE faculty members maintain offices and teach classes at the SVC and have joint research agreements with NASA through its [University Affiliated Research Center \(UARC\)](#) and with a large number of companies. Many BSOE faculty are also members of the joint [NASA/UCSC Advanced Studies Laboratories \(ASL\)](#), which is located at NASA Ames Research Center.

BSOE is working to develop additional locations off the main campus often in interdisciplinary partnerships.

BSOE Computing Infrastructure

For the most current details regarding BSOE computing infrastructure, see the BSOE page [How To Get Computer Support](#).

BSOE operates a computing network of several hundred Unix, Windows, and Macintosh computers and several computer laboratories. These labs support research and graduate instruction in applied mathematics and statistics, biomolecular engineering, computer engineering, computer science, electrical engineering and technology and information management. Undergraduate computing is supported by a combination of BSOE Undergraduate Laboratories (also known as the BELS Labs) and the campus’s Instructional Computing Laboratories (IC Labs).

For graduate and research computing, the ITS/BSOE computing support team operates a high-speed 100/1000 megabit-per-second network with 1/10 gigabit-per-second fiber optic backbones and redundant core routers and paths. Most areas of BSOE buildings are covered by wireless networking of various types (802.11g/n). The BSOE computing network has redundant connections to the main campus network.

UCSC and BSOE have connections to the [Corporation for Education Network Initiatives in California \(CENIC\)](#) via CENIC-managed “dark-fiber,” which provides direct connections to the CENIC High Performance Research Network, to activities at NASA Ames, and to the BSOE research labs located at 2300 Delaware Ave.

BSOE Computing also operates four separate Tier 1+ data centers, all with UPS and air-conditioning support. Two of the data centers have backup power generation and the other two use a campus cogeneration facility for backup power. In addition, BSOE uses the main UCSC data center (Tier 2) for some redundancy and for web sites and copies and/or mirrors data to distant Universities (such as the San Diego Supercomputer Center). For graduate and research computing, BSOE supports the following:

- Central file servers for core services such as mail, name service, file sharing, and backup
- Several general-access Unix systems
- Multiple compute servers
- Research computing clusters
- Several general-use research computing clusters, in addition to the clusters used by individual research groups. These clusters are available to all faculty and graduate students for general-purpose computations:
- Several graduate student computer labs with a mix of Windows, Linux, and Apple workstations and network printers
- A variety of software purchased in cooperation with UCSC central computing, BSOE computing, and individual faculty members
- A variety of computer-aided-design software, including Altera, Agilent Advanced Design System, AutoCAD, Cadence, Maple, Matlab, Mentor Graphics, National Instruments Labview, Qualnet, Synopsys, and Xilinx.

Baskin Engineering Wireless Networking. BSOE has an installed wireless computer (Wi-Fi)

network that covers nearly all interior building spaces of the Baskin Engineering, Engineering 2, Physical Sciences Building, and Biomedical Sciences Building. The Wi-Fi network uses “eduroam,” a wireless authentication system that allows members of other confederated universities to use the UCSC wireless network; BSOE personnel are also able to use Wi-Fi networks at other universities that participate in eduroam.

Undergraduate Engineering Laboratories (Baskin Engineering Lab Support–BELS). BSOE operates the following special instructional laboratories for the exclusive use of engineering students. These laboratories are typically open 24 hours a day, seven days a week, during instructional quarters. The instructional labs available in 2012 are listed below. Please check the web site for updates as new instructional laboratories are being added:

- Digital Logic Design Laboratory
- Controls, Signals, and Instrumentation Laboratory
- Analog Circuits Laboratory
- Electrical Engineering Senior Projects Laboratory
- Optics and Laser Laboratory
- Computer Engineering Projects Laboratory
- Electromagnetic and Radio Frequency Laboratory
- Physical Electronics Laboratory
- Computer Networking Laboratory
- Computer Game Design Laboratory
- Tau Beta Pi, Engineering Honor Society Hardware Laboratory
- Biomolecular Engineering Instructional Laboratory
- Fabrication Laboratory
- Flexible Instructional Laboratory

A number of [additional laboratory spaces](#) are set up for three-quarter-sequence senior projects in electrical engineering, computer engineering, and computer science. These labs are often used by project groups sponsored by various industry partners, many of which have headquarters or operations in Silicon Valley and the Monterey Bay Area.

UCSC Instructional Computing Laboratories. In addition to the facilities provided by the Jack Baskin School of Engineering, students have access to the computing facilities of the UCSC Instructional Computing (IC) Labs. These include several labs located around the campus consisting of Unix, Mac, and Windows workstations. There are two large IC Labs located in the Baskin Engineering Building. Check the [UCSC Instructional Computing web site](#) for details on these labs and hours of operation.

Research Laboratories

BSOE operates and supports the following [research laboratories](#). Current information about BSOE research labs. see the [BSOE laboratories web site](#).

Applied and Nano-Optics. [The Applied and Nano-optics group](#) covers a wide range of optical research with an emphasis on experimental nanoscale optics. New methods and devices are developed for optical studies of single particles such as molecules, photons, or nanomagnets. A variety of optical and nanoscale characterization techniques such as time-correlated single-photon counting, ultrafast laser spectroscopy, or scanning-probe microscopy are used and investigated. Applications include integrated biomedical sensors, high-density magnetic memory, single-photon light sources and detectors.

Biomolecular Engineering Research Facilities. BSOE supports a broad range of biomolecular-engineering (BME) research activities through the use of more than seven state-of-the-art research labs in the department. Areas of research include systems biology, comparative genomics, HIV vaccine development, stem-cell research, nano-device fabrication and DNA-

sequencing–device development. BME departmental laboratory facilities include a variety of equipment used for molecular biology, cell biology, protein chemistry, immunology, virology and computational biology. Specific equipment includes high– and low–speed centrifuges, PCR machines, CO2 incubators, bacterial shakers, microtiter plate readers, microtiter plate washers, microscopes (inverted, upright, fluorescence), spectrophotometers, protein–chromatography equipment, a variety of gel electrophoresis equipment including power supplies, gel dryers, gel–imaging equipment, vacuum concentrators, and cryopreservation equipment. Recently acquired and planned equipment purchases to be shared with other investigators include a Fluorescence Activated Cell Sorter (FACS), and next–generation DNA sequencing devices. Shared equipment rooms contain a variety of common equipment including freezers, glass–washing equipment, autoclaves, and refrigerators. Most labs are supplied with basic utilities such as air, gas, vacuum and reverse–osmosis de–ionized (RODI) water. The BME research groups have several computer clusters, one with more than 1,000 CPUs. There is additional access to BSOE laboratories and facilities within other departments. Many of the BME research groups cooperate closely with the Electrical Engineering Department, which operates a clean room, a scanning electron microscope and semiconductor fabrication facilities. Collaborative research with faculty from the Physical and Biological Sciences Division is frequent with routine access to a wide range of biology and chemistry laboratory facilities. Web: www.soe.ucsc.edu/research/labs/

Clean Room. The Electrical Engineering Department operates a shared [Class 1,000 clean room](#) for use by researchers in Electrical Engineering. The Biomolecular Engineering Department also uses this facility.

Computer Communication Research Group (CCRG). [The Computer Communication Research Group \(CCRG\)](#) is dedicated to basic and applied research in computer communication. CCRG research focuses on new algorithms, protocols, and architectures for wireless networks based on packet switching (packet–radio networks), Internetworking, multipoint communication, and the control of resources by multiple administrative authorities.

Design and Verification Laboratory. [The Design and Verification Laboratory](#) facilitates research in software and system design methods, embedded software design, software and system verification, game theory, formal methods.

Geospatial Visualization Laboratory. [The Geospatial Visualization Laboratory](#) creates a consistent four–dimensional space–time visualization of geospatial data and intelligence associated with the environment. This task requires intelligent collection of data using various sensors, including a variety of cameras, LIDAR data, and multispectral imagery in all kinds of frequency bands. The spatiotemporal GIS (geographic information systems) visualization will bring together several layers of information including terrain data, street maps, buildings, environment data, aerial images, and mobile–objects data.

High–Speed Network Laboratory. Members of this lab explore and expand the field of high–speed computer networking and communication. Current areas of research include high–speed switching, traffic–scheduling algorithms for providing quality–of–service (QoS) guarantees in packet networks, ATM congestion control, and optical networks. Projects are funded by NSF, ARPA, and private industry.

Image Processing and Multimedia Laboratory (IPMML). This lab is the central venue for ongoing research into topics in image processing and multimedia. Areas of interest include wireless digital video; virtual scene and panorama generation; natural and machine–generated image compression; video capture, processing, and editing techniques; color printing technology; image libraries; and combinations of the above.

Information Retrieval and Knowledge Management Lab (IRKM). This lab conducts basic and applied research in information retrieval and data mining. Projects include developing a proactive personalized information–retrieval system (funded by NSF), adaptive information filtering (funded by AFOSR), and collaborative personalized search, recommendation and advertising (with industry funding from Yahoo, Microsoft, Google, NEC, Nokia, Bosch).

Internetworking Research Group (i–NRG). [The Internetworking Research Group \(i–NRG\)](#) conducts research in the design, experimental evaluation, and implementation of network protocols for both wired and wireless internetworks. Research activities include a number of areas in computer networks and distributed systems.

Materials Synthesis and Characterization Research Lab. This laboratory has recently been commissioned at our 2300 Delaware Ave. location. Formally a Texas Instruments semiconductor fabrication plant, the building has infrastructure to support very large clean rooms. At present, synthesis capability exists in metal-organic chemical vapor deposition (MOCVD) and rf-magnetron sputtering. The Materials Synthesis and Characterization Research Lab capability includes semiconductor test equipment, bulk magneto-thermal properties, and atomic force microscopy. Much of the work involves properties of materials at very low temperatures, nearly 0 degrees Kelvin. At these temperatures, materials behave very differently than at room temperature, a notable example being superconductors. Web: www.soe.ucsc.edu/research/labs

Micro-Architecture at Santa Cruz (MASC). MASC's focus is on computer-architecture research, with emphasis on energy/performance trade-offs, thread-level speculation, simulation tools, FPGAs, and design complexity. Web: masc.soe.ucsc.edu

Multidimensional Signal Processing Research Group (MDSP). This group's interests are in the area of inverse problems in imaging, statistical detection and estimation, and associated numerical methods. Current projects include image-resolution enhancement and superresolution, computationally efficient image-motion estimation, shape reconstruction from local and global geometric data, multiscale modeling and analysis of signals and images, radon transform-based algorithms for deformation analysis and dynamic imaging, image processing and inverse problems in remote sensing, and automatic target detection and recognition. The group is also associated with the Image Processing and Multimedia Lab. Web: www.users.soe.ucsc.edu/%7emilanfar/

Network Management and Operations Lab. BSOE, in partnership with Cisco Systems, has established this lab to serve as a "network-systems teaching hospital" where real-world problems and projects are addressed by students and faculty. Projects range from the routine (e.g., quality-assurance and release testing of new products) to the advanced (e.g., research into new architectures for network systems). Students employed as interns work with faculty researchers on these projects in BSOE facilities equipped for the specific needs of the projects. Web: nmo.soe.ucsc.edu

Santa Cruz Laboratory for Visualization and Graphics. Recent research at this lab includes animal modeling and animation, environmental visualization, isosurfaces, d.v.r., hierarchies, irregular grids, massively parallel volume rendering through the net, uncertainty visualization, virtual reality in scientific visualization, nomadic collaborative visualization, tensor visualization, and flow visualization. Web: <http://www.soe.ucsc.edu/research>

Thin Films Research Lab. This laboratory is located at our 2300 Delaware Ave. location. Formally a Texas Instruments semiconductor fabrication plant, the building has infrastructure to support very large clean rooms. The Thin Films laboratory operates several advanced metal organic chemical vapor deposition (MOCVD) systems to fabricate and study thin film semiconductors. Applications include advanced solar cells, memory systems, and biosensors. The Thin Films laboratory in April 2010 received an in-kind donation from Phillips LumiLEDs of Santa Clara of an AIXTRON Nitride MOCVD Reactor (AIX 200RF).

UCSC Broadband Communications Research Group. The members of this group investigate the fundamental limits and performance analysis of protocols in wireless ad hoc networks, space-time signal processing, and development of signal processing and coding techniques for wireless communication systems. Web: <http://users.soe.ucsc.edu/~hamid/ucbc/index2.html>.

UCSC Scientific Visualization Laboratory. This lab provides the means for creating visualizations from scientific data. Projects include a simulation of an "extensive air shower" striking the Milagro detector at Los Alamos National Lab, representing a subsonic flow over a delta-wing aircraft, a demonstration of direct volume rendering on a multiple-gridded space-shuttle launch vehicle, an N-body simulation of large-scale structure in the universe, and a representation of a diving whale based on location data from a Monterey Bay tagging experiment. Web: www.soe.ucsc.edu/research/labs/

UCSC Visual Computing Laboratory. This lab explores visual tracking, stereo and sparse IBR, facial modeling and analysis, and image and video processing. Web: soe.ucsc.edu/research/labs

For additional information regarding BSOE, please check the web site: www.soe.ucsc.edu.

Humanities Division Research Programs—The Institute for Humanities Research (IHR)

The Institute for Humanities Research (IHR) at UC Santa Cruz is a laboratory for theorizing and implementing new visions of the humanities via faculty research projects, graduate and undergraduate education, and public programs. Established in 1999, the IHR has grown dramatically since its inception and now serves as an umbrella for a multitude of research centers, research clusters, and multi-campus research projects.

With these and other initiatives, the IHR serves as an incubator for new ideas and provides crucial support to faculty, graduate students, and undergraduate students at every stage of the research process. One of our key functions is to identify promising students and help them become productive researchers through mentorship programs, fellowships, and internship opportunities.

As the designated humanities center of UC Santa Cruz, the IHR is part of the University of California system-wide Humanities Network and is able to leverage the human and intellectual resources of the finest public university system in the world.

In addition, the IHR administers a variety of research centers, including the Center for Cultural Studies, Center for Jewish Studies, Center for Labor Studies, Center for Mediterranean Studies, Center for the Study of Pacific War Memories, and Center for World History. It also houses new research initiatives in ancient studies, Sikh and Punjabi studies, and critical race and ethnic studies. Supported activities include research clusters, conferences, seminars, visiting scholars, publications, film series, and NEH summer seminars for university and high school teachers.

For more information, please visit us at ihr.ucsc.edu or e-mail us at ihr@ucsc.edu.

Center for Cultural Studies

The Center for Cultural Studies at UC Santa Cruz was founded in the spring of 1988 as a part of the University of California's President's Humanities Initiative. The Center encourages a broad range of research in the rapidly evolving field of cultural studies and hosts a hugely popular weekly colloquium series

The international field of cultural studies emerged from the challenges posed to traditional humanistic and social scientific agendas by new research strategies in visual studies; anthropology, ethnography and folklore; feminist studies; comparative sociology and politics; semiotics; social, cultural, literary, and political theory; science studies; colonial discourse analysis; ethnic studies; and the histories of sexualities. These challenges, and the areas of scholarly activity they stimulate, compose the heart of cultural studies at UC Santa Cruz. Thus, the Center for Cultural Studies' concern is to foster research across divisional and disciplinary boundaries.

While based in the humanities, the Center engages with the "interpretive" or "historical" social sciences, science studies, and theoretically informed work in the arts. The membership of the Center's Advisory Board and faculty/graduate student participation in its events clearly reflect this cross-divisional agenda. Visit us at culturalstudies.ucsc.edu.

Center for Jewish Studies

Jewish Studies is one of the most intellectually compelling and broadly relevant fields in the university. We design research projects and host public events that conceptually redraw the boundaries of Jewish studies, while encouraging people who may have previously been uninvolved in Jewish studies to engage with it.

Our primary constituents are the thousands of students at UC Santa Cruz, including the 1,200 who take Jewish Studies courses every year, making it one of the most popular programs in the entire university. We are also committed to creating programs that attract faculty and staff members as well as people from the broader Santa Cruz community. The content of our programming organically integrates the contemporary issues that are most important to our constituents, with a range of perspectives and methods unique to Jewish Studies. In so doing, we place Jewish Studies squarely at the center of the intellectual and

cultural life of the campus and illuminate the central role that Jewish creativity has played in helping to shape human civilization for over three thousand years. Visit us at cjs.ucsc.edu.

Center for Labor Studies

The Center for Labor Studies, founded in 2007, is dedicated to the study of working people, the labor movement, and the challenge of the broader global economy as it impacts the working people of California and beyond. Through conferences, workshops, public lectures, and a range of guest speakers, we focus, in particular, on the relationship between the labor movement (broadly defined), social movements, and democratic practices; on gender, race, and ethnic dynamics; and on labor activism in international context. We also address a wide spectrum of questions related to the nature of work, employment, and working people's lives in the U.S. and beyond. Our goal is to serve UCSC students, staff, and faculty while reaching out to the broader community of the Central Coast of California and beyond. Visit us at ihr.ucsc.edu.

Center for Mediterranean Studies

The Center for Mediterranean Studies is dedicated to the study of the nature of premodern Mediterranean societies and cultures and their role in world history and the history of "the West." Located at the intersection of three continents, the premodern Mediterranean was a shared environment characterized by tremendous ethnic and religious diversity and by the particular intensity of its cultural, economic, and political exchange. Among Africans, Asians and Europeans, Christians, Muslims, and Jews, and others, both conflict and peaceful communication encouraged acculturation and spurred innovations that transformed the societies of the Mediterranean and their continental neighbors. It is affiliated with the independent scholarly forum the Mediterranean Seminar.

Because of the dominance of modern national paradigms, the weight of teleological historical traditions, and assumptions about the rigidity of ecumenical divisions, the premodern Mediterranean is frequently regarded as an anomaly. Sponsoring a diverse range of scholarly activities, including a reading group, colloquia, seminars, and publications, the Mediterranean Seminar provides a forum for scholarly exchange and dialogue across the humanities and social sciences. Our aim is to facilitate investigation into the premodern Mediterranean and to promote the incorporation of Mediterranean studies into university curricula. Visit us at mediterraneanseminar.org.

Center for the Study of Pacific War Memories

The Center for the Study of Pacific War Memories was established in the fall of 2006 to promote transnational, collaborative teaching and research projects across the Asia-Pacific region related to memories of the Pacific theater of World War II (1937-1945). Memories of the war are articulated and sustained in a wide range of media and practices at individual and collective levels. At the same time, memory changes over time, with changing contexts and changing agents of memory. Finally, while memory is at the core of identity-formation, memory-making in the modern world always operates at a global level. Thus, memories of the past in one place do not exist in isolation within single national or ethnic boundaries, but are always in formation through engagement with other memories from other places and other groups.

The foundational project of the center is the construction of a web site for a multilingual and multinational research community built around a user-generated digital archive called *Eternal Flames: Living Memories of the Asia Pacific War*. The site will enable the formation of collaborative research projects among both students and researchers from countries throughout the Pacific region, particularly promoting translingual work. Other center projects include a documentary film about a former Japanese soldier now living in California, an exhibit of photographs of Okinawa taken by an American serviceman in the early 1950s, and a data-rich virtual re-creation of a massive memorial complex in Okinawa. Visit us at cspwm.ucsc.edu.

Center for World History (CWH)

As a part of a collective effort at imagining the development of world history as a research field, the CWH sponsors occasional lectures and conferences, including periodic conferences of the all-UC Multi-Campus Research Group, the World History Workshop.

CWH is also active in encouraging the development of world history as a teaching field. To this end, it develops world history teaching materials available online. The Center has hosted multiple NEH Summer Seminars for classroom teachers on the theme "Production and Consumption in World History." Visit us at cwh.ucsc.edu.

Dickens Project

Through a regular program of conferences, courses, and scholarly gatherings, the Dickens Project coordinates research and instruction in the work, times, influence, and achievement of Charles Dickens. Twice a year, faculty members and graduate students from the 10 campuses of the University of California, joined by colleagues from other universities, present their research findings to conference participants, interested undergraduate and graduate students, and members of the general public. They meet on the Santa Cruz campus each summer and at another university each winter. Each year, the conference is available as a regular Summer Session undergraduate course. The project also publishes its own newsletter and curricular materials and cosponsors international conferences. Visit us at dickens.ucsc.edu.

Linguistics Research Center (LRC)

LRC at UC Santa Cruz facilitates research and education in the areas of theoretical linguistics—syntax, phonetics, phonology, morphology, and semantics. The members of the linguistics community at UCSC (faculty, students, and visiting scholars) work together under the auspices of the LRC to conduct and disseminate the results of their research to the larger linguistics community. An increasingly important aspect of LRC's mission is to coordinate and administer the LRC Labs (SynLab, PhonLab and SemLab).

In addition, LRC serves as a liaison between researchers at other institutions and researchers at UC Santa Cruz. Among other efforts, the LRC hosts visiting scholars from other institutions interested in conducting research in the UCSC linguistics community, organizes workshops featuring participants from other U.S. and international institutions, engages in online publication of research conducted at UCSC, coordinates the logistics of externally funded research projects, and in general works to enhance the environment for linguistic research at UCSC.

A collection of books and journals in linguistics, including working papers from many other linguistics departments, is maintained in the LRC Library, which is available for use by any LRC affiliate. The LRC sponsors visiting scholars for an entire academic year (or for shorter periods) through the Research Associate Program. Visit us at lrc.ucsc.edu.

Ray Film and Study Center

The Satyajit Ray Film and Study Center (Ray FASC) is a research activity concentrating on the films and other artistic works of Satyajit Ray, one of the world's greatest filmmakers. Ray FASC maintains, in addition to 35-mm films and videocassettes of Satyajit Ray's films, a collection of the Ray papers: books, articles, letters, screenplays, sketchbooks, costume designs, music tapes/recordings, posters, stills, illustrations, and other examples of Ray's multifaceted genius. Ray FASC has received the Lethbridge Collection of some 1,500 volumes/items of works on Ray and by Ray in some 10 world languages. The gift has come from Mr. and Mrs. Cuthbert Lethbridge of Melbourne, Australia.

With major grants Ray FASC has prepared an inventory, catalog, and database of the materials in the archive. Ray FASC hosts lectures, film screenings, seminars, and exhibitions. It helped organize several Ray retrospectives nationally and internationally. Student internships and research projects in the archives are welcome. Please visit <http://satyajitray.ucsc.edu>.

Physical and Biological Sciences Division Research Programs and Centers

Center for Adaptive Optics (CfAO)

CfAO is a cross-disciplinary center funded by the University of California. It is headquartered at UC Santa Cruz, with members from other UC campuses and with many academic and industrial affiliates. Adaptive optics (AO) is an enabling technology that sharpens images by removing optical aberrations. This technology is transformative for

ground-based astronomical telescopes because it removes blurring due to turbulence in the Earth's atmosphere. An exciting application closer to home is the use of AO for imaging the living human retina. The mission of the CfAO is to develop, apply, and disseminate adaptive optics science and technology in service to scientific research, healthcare, industry, and education. To accomplish these goals, the CfAO connects the UC campus communities, fosters research collaborations across campuses and disciplines, and works to develop the next generation of graduate students and young leaders in this burgeoning field. Web: cfao.ucolick.org and lao.ucolick.org

Center for Molecular Biology of RNA

The Center brings together an interdisciplinary group of researchers from the Departments of Molecular, Cell and Developmental Biology; Chemistry and Biochemistry; and Biomolecular Engineering, whose common interest is to understand the structure, function, and biological roles of DNA's more versatile cousin, RNA. The Center promotes interaction between structural biologists, molecular geneticists, biochemists, and computational biologists. Unlike DNA, RNA has the ability to fold into complex and unusual three-dimensional structures that confer its biological functions. RNA, like protein, can possess enzymatic activity to catalyze biochemical reactions. It is believed that RNA preceded both protein and DNA in the early molecular evolution of living systems. Today, its importance is underscored by the finding that, while only a small fraction of the human genome codes for protein, the majority of human DNA is transcribed into RNA. Many new classes of functional RNAs continue to be discovered, including those that regulate development of higher organisms; however, the roles of most non-coding RNAs remain to be discovered.

New insights into the fundamental properties of RNA benefit medical research in such areas as the study of RNA viruses (which include HIV, influenza, polio and the common cold) and in development of new antibiotics based on the molecular structure of the bacterial ribosome. Among the areas currently under investigation in the Center are RNA genomics, RNA splicing, protein synthesis, ribonucleoprotein assembly, RNA-protein recognition, molecular structures of RNA and RNA-protein complexes, mechanisms of action of catalytic RNAs and micro-RNAs, and in vitro evolution of novel catalytic and other functional RNAs. Researchers in the Center employ diverse experimental methods, including cryo-EM reconstruction, x-ray crystallography, DNA microarrays, high-throughput DNA and RNA sequencing, single-molecule FRET and optical tweezer techniques and state-of-the-art computational approaches. The Center provides research training for postdoctoral scientists and doctoral students in graduate programs offered by the Department of Molecular, Cell, and Developmental Biology, the Department of Chemistry and Biochemistry, and the Department of Biomolecular Engineering. Web: rna.ucsc.edu/rnacenter

Center for Origin, Dynamics, and Evolution of Planets (CODEP)

CODEP brings together faculty from the Departments of Astronomy and Astrophysics, Applied Mathematics and Statistics, Earth and Planetary Sciences, and Physics. The interests of CODEP researchers include Earth's internal dynamics, the formation of planets, how planetary systems evolve, and the discovery of new planets outside the solar system. This is a joint effort to understand as much as possible about planets in general, both in our own solar system and around other stars. The center encourages Earth scientists and astronomers to bring their different perspectives to bear on planetary issues. Web: <http://codep.ucsc.edu/>

Center for the Study of Imaging and Dynamics of the Earth (CSIDE)

This center coordinates research in seismology, geodynamics, geomagnetism, hydrology, geomorphology, active tectonics, and mineral physics addressing structure and dynamics of the Earth's interior. Thermal, chemical, and dynamic processes are studied in six affiliated research laboratories. CSIDE hosts a major industrial consortium focused on development of new seismic-imaging technologies. Web: <http://cside.ucsc.edu/>

Center for Remote Sensing (CRS)

CRS coordinates research efforts of faculty in the Departments of Earth and Planetary Sciences, Ocean Sciences, Ecology and Evolutionary Biology, Electrical Engineering, and Computer Engineering for the use of satellite and airborne remote sensing in studying processes occurring on the surfaces of Earth and other planets. Specific interests include

astrogeology; plant ecology; coral reef health; volcanic, geothermal, and earthquake processes; climate change; submarine and coastal geology; ocean surface processes and marine habitats; and engineering development. Web: <http://crs.ucsc.edu/>

Institute of Marine Sciences (IMS)

With the dynamic combination of university marine scientists, state-of-the-art facilities and analytical equipment, collaborative research, and an overriding commitment to quality, UC Santa Cruz is at the forefront of marine sciences research, education, and outreach. Set in the biologically rich environment of Monterey Bay and the nation's largest national marine sanctuary, the campus provides students and scientists who seek to study the ocean and its life a unique opportunity to pursue their dreams.

Established in 1972, IMS is composed of 39 affiliated faculty; 175 professional researchers, project scientists, specialists, postdoctoral researchers, and research associates; and 25 support staff. Marine scientists from the departments of Ocean Sciences, Ecology and Evolutionary Biology, Earth and Planetary Sciences, Microbiology and Environmental Toxicology, Chemistry and Biochemistry, Environmental Studies, and Applied Mathematics and Statistics conduct their research within the shared focus of the institute. The institute provides facilities and administrative and technical support for faculty, researchers, visiting scientists, graduate students, and undergraduates. Faculty and researchers work independently and collaboratively within eight clusters:

- Coastal biology
- Environmental toxicology
- Fisheries and fishery management
- Marine and coastal geology
- Marine and coastal policy
- Marine vertebrate biology
- Oceanography and ocean processes
- Paleooceanography, paleoclimatology, and global change

An undergraduate major leading to a B.S. in marine biology is described [here](#); a two-year graduate program leading to an M.S. in ocean sciences is described [here](#). Doctoral students pursue marine research through the Ph.D. programs in the Departments of Ecology and Evolutionary Biology, Earth and Planetary Sciences, Microbiology and Environmental Toxicology, or Ocean Sciences.

Facilities. The institute's on-campus complex includes the IMS administrative office; research laboratories; offices for researchers, postdocs, and visiting scientists; state-of-the-art analytical labs for marine chemistry, biology, and geology; a computer laboratory; culture rooms for invertebrates and algae; portable seagoing analytical labs; and support facilities for cruise staging.

The Joseph M. Long Marine Laboratory is the core of UCSC's Coastal Sciences Campus, an onshore site three miles from main campus on the coastline of the nation's largest national marine sanctuary. The laboratory's running seawater capabilities increase opportunities for research and instruction. Facilities include research laboratory buildings; outdoor tanks for research involving marine mammals (dolphins, seals, sea lions, and sea otters), seabirds, and fish; and teaching laboratories. Specialized laboratories and facilities for marine physiology, ecology, and marine mammal bioacoustics studies are available. Adjacent to the lab are 55 acres of land for which plans have been developed and approved for an expanded marine lab campus with space for future research and educational facilities. The Coastal Sciences Campus also has a protected lagoon, a sandy beach, and rocky intertidal platforms for field research. Because Long Marine Lab is close to the campus, work there is easily incorporated into daily campus activities.

Each year, over 65000 people—including 10,000 schoolchildren—tour the Seymour Marine Discovery Center at Long Marine Lab. Trained volunteer docents welcome visitors, guide groups through the Center and around the site, and provide information on research in progress. The Seymour Center houses an aquarium, exhibits that interpret the research

underway within the institute, two classrooms for school groups, and an auditorium. All are open to the public—including K-12 classes—for a modest fee.

In addition, the Center for Ocean Health at Long Marine Lab houses offices and labs for marine sciences faculty and their research programs, as well as three nonprofits: the Nature Conservancy's Coastal Waters Program, Island Conservation, and the Natural Capital Project.

IMS maintains a number of small vessels equipped for nearshore coastal research, several small craft for inshore work, and a scientific diving program. In addition, IMS-associated faculty, researchers, and students work around the world aboard larger oceanographic vessels.

IMS has scientific control over use of [Año Nuevo Island](#), the largest elephant seal rookery on the Pacific coast.

IMS maintains active cooperative research agreements with both the Biological Resources Division and the Coastal and Marine Group of the U.S. Geological Survey that have 100 agency scientists and staff now housed adjacent to the Coastal Sciences Campus.

The institute also maintains a cooperative agreement with the National Marine Fisheries Service (NMFS). In 2000, this agency completed a fisheries laboratory at Long Marine Lab, which houses 105 scientists and staff working on salmon, bottom fish, and fishery-management issues. NMFS scientists study causes of variability in abundance and health of fish populations and the economics of exploiting and protecting natural resources. The California Department of Fish and Wildlife operates a Marine Wildlife Research Center at Long Marine Lab, which provides interior lab space and outdoor pool space for research on sea otters and the effects of oil and other contaminants on marine mammals and seabirds.

Additional collaboration also takes place with scientists at the Monterey Bay Aquarium Research Institute, Moss Landing Marine Laboratories, Hopkins Marine Station, the Monterey Bay Aquarium, the Naval Postgraduate School, and the Monterey Bay National Marine Sanctuary.

IMS web sites: ims.ucsc.edu and <http://www2.ucsc.edu/seymourcenter/>

Microbiology and Biomedical Research. The Division of Physical and Biological Sciences supports a broad range of biomedical research in the Departments of Chemistry and Biochemistry; Microbiology and Environmental Toxicology; and Molecular, Cell, and Developmental Biology. Structural biology, the molecular biology of RNA, genetics, bioinformatics, chromatin biology, and developmental biology are areas of particular strength. Researchers work in state-of-the-art laboratories, with additional access to shared facilities, equipment, and computational tools. Collaborative research is frequent, both among investigators within the division as well as with faculty in the Baskin School of Engineering, which is internationally recognized for its expertise in computational biology. These collaborative efforts are facilitated by the university's Center for Biomolecular Science and Engineering. There are excellent training opportunities for postdoctoral fellows, and graduate and undergraduate students in areas of biomedical research and the health sciences. Web: biomedical.ucsc.edu

Institute for the Biology of Stem Cells (IBSC)

The IBSC encompasses research, training, and facilities. Stem cell research at UCSC focuses on the basic biological systems operating in the processes of self-renewal and differentiation of stem cells. The institute was made possible by the high quality of biological and engineering research on the UCSC campus and by the California Institute for Regenerative Medicine (CIRM), which in September 2005 approved funding for UCSC to establish a training program in stem cell research. The UCSC Training Program in Systems Biology of Stem Cells provides predoctoral and postdoctoral students with a solid understanding of the biology of stem cells, the skills to use stem cells in their own research, and the ability to devise and use computational approaches in their stem cell research. Funding from CIRM also made possible the UCSC Shared Stem Cell Facility and other major projects that have supported stem cell research on this campus, such as a major facility award that funded the IBSC space in the Biomedical Sciences Building. Web: stemcell.ucsc.edu

Santa Cruz Predatory Bird Research Group

The Santa Cruz Predatory Bird Research Group (SCPBRG) was formed in 1975 to restore an endangered peregrine falcon population in California. Since then, more than 1,000 peregrine falcons have been released to the wild and the Pacific Coast population has recovered and been removed from State and Federal Endangered Species Lists.

SCPBRG advises students on their senior theses, directs interns in individual studies, and teaches a College 8 class, Peregrine Falcon Recovery—A Case Study in Conservation Success. In addition, we lead a large conservation education and outreach program that includes falcon nest cameras posted on our web site, training for volunteers who monitor peregrine falcons, and conservation education lectures for schools and community. SCPBRG is located at the Long Marine Laboratory and is affiliated with the Seymour Discovery Center. Web: www.scnbrg.org.

University of California High-Performance AstroComputing Center (UC-HiPACC)

Based at UCSC, this is a consortium of nine University of California campuses and three Department of Energy laboratories (Lawrence Berkeley National Laboratory, Lawrence Livermore Laboratory, and Los Alamos National Laboratory). The mission of UC-HiPACC is to foster collaborations among astronomers, computational astrophysicists, computer scientists, computer hardware engineers, and the builders and users of UC telescopes. The center supports activities that facilitate research collaborations and working groups of scientists from multiple UC campuses and labs pursuing joint projects in computational astrophysics and sponsors workshops and conferences on topics in computational astrophysics. The center also sponsors an annual summer school open to UC graduate students and postdocs as well as participants from around the world. Web: hipacc.ucsc.edu

Physical and Biological Sciences Division Research Facilities and Laboratories

Chemical Screening Center (CSC)

UCSC's CSC offers access to high-throughput screening technologies to speed the identification of small molecules that modulate biochemical or cellular processes and have the potential to alter disease states. The CSC maintains a suite of modern robotic instrumentation that permits high-throughput biochemical and cell-based screening of up to 50,000 compounds a day. In addition to targeted and known drug libraries purchased from commercial vendors, the CSC curates a growing collection of natural products. All libraries housed at UCSC are submitted to a panel of screens in diverse organisms, pairing each compound with a broad bioactivity profile. Active compounds are prioritized based on potency and phenotype, and target ID may be immediately pursued using affinity approaches. Through collaboration with UC investigators, the CSC aims to accelerate the path from new discoveries in biology to validated biological targets to provide novel small-molecule therapies for fighting diseases such as cancer, malaria, Parkinson's disease, and cholera. Web: <https://cscenter.pbsci.ucsc.edu/>

Climate Change and Impacts Laboratory (CCIL)

The CCIL is a computational facility sponsored by the National Science Foundation, the California Energy Commission, and UCSC. The facilities include a 32-processor (quad core) Dell PowerEdge M1000e supercomputer, numerous high-performance workstations, and multiterabyte data storage and backup facilities. The goals of CCIL are to calculate scenarios of likely future climate change and to investigate the possible impacts of climate change on the various dimensions of a given region, providing a multidisciplinary and multidimensional view of the possible effects of future climate change at regional scales. The current focus is concentrated on a region centered in California because of its complex topography, diverse microclimates and ecosystems, large and growing population, and vulnerability to water. CCIL members are scientists from the departments of Earth and Planetary Sciences, Ecology and Evolutionary Biology, Environmental Studies, Microbiology and Environmental Toxicology, and Ocean Sciences, and represent a wide range of expertise on aspects of California's human and natural systems. Web: ccil.ucsc.edu

Crustal Imaging Laboratory (CIL)

The CIL provides researchers with the sophisticated hardware and software resources necessary to perform high-resolution studies of the Earth's surface and outer layers. CIL facilities consist of a network of Linux and PC workstations, a variety of input/output and mass-storage devices, multichannel seismic interpretation packages, and remote sensing software. Research is focused on surface bathymetric and roughness mapping, 2D and 3D seismic-reflection imaging, hyperspectral and InSAR remote sensing, and quantitative geomorphology. Web: <http://eps.ucsc.edu/research/facilities/geophysical.html>

Earth System Modeling Laboratory

The laboratory is home to the Paleoclimate and Climate Change Research Group, which is presently focused on past and future climatic and environmental change, and hosts several national and international visitors each year. This research takes many forms and involves the use of various kinds of models and observations, as well as a wealth of paleoclimate proxy data from many marine and terrestrial locations. Computing facilities include a Dell PowerEdge M1000e Blade server with 16 PowerEdge M600 blades (2 quad core Xeon processors per blade), numerous high-performance workstations and servers, and multi-terabyte data storage and backup facilities. The computing resources are used for global and regional climate-modeling efforts and data analysis. Web: <http://eps.ucsc.edu/>

Electron Paramagnetic Resonance Facility

The facility is used to examine the structure and properties of metal-containing inorganic complexes, peptides, proteins, enzymes, nanoparticles, and biological membranes. The facility's Bruker ELEXSYS 580 X-band spectrometer operates in either continuous-wave or pulsed mode, with variable temperature control. A high-sensitivity Bruker EMX is especially useful for the limited sample sizes often encountered in biological studies. Web: biomedical.ucsc.edu/ESR.html

Hydrogeology Facilities

These facilities include hardware, software, and technical expertise applied to field sampling and measurements, lab analyses, and computer modeling. Hydrologic equipment and supplies include: a state-of-the-art particle size analyzer; autonomous field scale infiltration testing system; pressure and temperature data loggers; total station and other surveying equipment; dedicated hydrogeology field truck; flow meters and rain gauges, autonomous and networked conductivity, temperature, pressure, and water-content sensors; hydraulic and hand augers and other soil-sampling equipment; infiltrometers, lysimeters, piezometers, and tensiometers; and a borehole geophysical logging system. Lab space is dedicated to water and sediment analysis, including geotechnical and hydrologic testing of core samples. Outstanding analytical facilities are available throughout the Earth and Planetary Sciences and Ocean Sciences departments, and the Institute of Marine Sciences, including IC, ICP-OES, Latchet, and stable isotope mass spectrometers. These and additional capabilities at regional collaborator institutions allow for specialized analyses of water, sediment, and rock samples. A dedicated computing lab is equipped with fast workstations (Linux, PC, and Mac), portable (field) computers, printers (black and white, and color), a large-format plotter, scanners, and other devices and associated software for interfacing with field and lab instruments. Software includes public domain, commercial, and custom programs for coupled and multi-phase transport through soils and aquifers. Web: <http://es.ucsc.edu/%7eafisher/>

Life Sciences Microscopy Center

A core facility supported by California Institute for Regenerative Medicine (CIRM) and California Institute for Quantitative Biosciences (QB3), personalized assistance is provided on various aspects of imaging, from sample preparation to training on the shared microscopes and image analysis. The light microscopy facility is housed within the CIRM Shared Stem Cell Facility and supports the stem cell research community as well as other biomedical research. Light microscopy instrumentation includes widefield, single and multi-photon laser-scanning confocal, and spinning disk confocal microscopes as well as a live cell imaging scope. Electron microscopy instrumentation includes a Transmission Electron Microscope (TEM) which is a user-sponsored resource supervised by Professor Melissa Jurica. Web: <http://stemcell.soe.ucsc.edu/facilities/microscopy>

Macromolecular X-ray Crystallography Facility

The facility houses a state-of-the-art rotating-anode/imaging-plate X-ray crystallography

data collection suite, a cryosystem, and a collection of Apple, SGI and Linux computer workstations and software for crystallography data collection and computation, molecular visualization, and model building. UCSC scientists have used the facility to investigate the structure of the ribosome, catalytic RNA ("ribozymes"), the spliceosome, and protein structures relevant to cell-cycle regulation. Users of the facility also collaborate with the Lawrence Berkeley National Laboratory's Advanced Light Source synchrotron radiation facility and the Stanford Synchrotron Light Source. Web: biomedical.ucsc.edu/Xray.html

Marine Analytical Laboratories

The Marine Analytical labs are a part of the Institute of Marine Sciences at UC Santa Cruz (see [above](#)). They consist of a general access analytical facility for the support of research in the marine sciences. Scientific instruments and other equipment to aid research in marine chemistry, biology, geology, and environmental toxicology are housed in a central lab complex within the Earth and Marine Sciences Building. Analytical instrumentation; instruction in use of the equipment; consultation in experimental design, sampling, analysis, and data interpretation; and general assistance in all aspects of analytical science are available. Web: ims.ucsc.edu/mal

Mass Spectrometry Facility

Mass spectrometry is an analytical technique used to measure the mass-to-charge ratio of chemical ions. The facility currently houses two mass spectrometers: a Thermo Finnigan LC/MS/MS (LTQ) and an Ettan MALDI-TOF. This equipment is capable of determining the molecular weight of both small molecules and peptides, identifying proteins, and characterizing protein modifications. Web:

<http://www.chemistry.ucsc.edu/research/facilities/mass-spec.html>

Microarray Facility

Used for genome-wide splicing and expression analyses of diverse organisms, from microbes to humans, the facility supports both spotted microscope slide and Affymetrix microarray research. Equipment includes an Affymetrix GeneChip system, a robotic microscope slide arrayer, an Axon slide scanner, and a 96-channel automated liquid handler. The staff offers wet-lab expertise to investigators. Web:

biomedical.ucsc.edu/Microarray.html

Mineral Physics Laboratory

The properties of the materials that make up the Earth and other planets are probed in the Mineral Physics Laboratory. Specifically, we determine the phase equilibria and thermochemical and elastic properties of planetary materials at ultrahigh pressure (up to 150 GPa) and temperature (up to 6,000 K) of planetary interiors. High P-T conditions are generated using the diamond anvil cell coupled with laser heating. Presently, both Raman and infrared spectroscopic facilities are available for characterization of the structural and bonding properties of minerals and fluids in situ at pressures and temperatures characteristic of planetary interiors. In addition, we utilize state-of-the-art synchrotron x-ray sources at particle accelerators (primarily the Advanced Light Source at Lawrence Berkeley Labs) to determine the equations of state and phase equilibria of mineral assemblages relevant to the Earth's mantle and core. Our analytic and experimental capabilities are also deployed on projects that range from mineralogy and petrology to characterizations of archaeological materials. Web:

<http://eps.ucsc.edu/research/facilities/geophysical.html>

Molecular Ecology and Evolutionary Genetics Facility

The MEEG facility provides molecular technologies for analyses of the structure and dynamics of genetic diversity found in animal, plant, and microbial populations. The facility includes all equipment necessary for PCR and preparation of samples for cloning, microsatellite analysis and Sanger sequencing; a Qubit fluorometer, electrophoresis and imaging equipment, micropipettes, PCR machines, a fume hood, water baths, stir plates, a pH meter, a shaking incubator, a biosafety cabinet, microcentrifuges, vortexes, and a refrigerated microcentrifuge. The facility also maintains data analysis resources such as several computers and software licenses. Web:

http://bio.research.ucsc.edu/meeg/Welcome_to_the_MEEG_Facility/Welcome_to_the_MEEG.html

Nanosecond Time-resolved Laser Spectroscopy

The Department of Chemistry and Biochemistry maintains several laser spectroscopy systems capable of measuring time-resolved spectra from the far UV to the near IR regions. Various systems are optimized to measure nanosecond-resolution time-resolved absorption spectra, linear dichroism spectra, circular dichroism spectra, magnetic circular dichroism spectra, optical rotatory dispersion, or magnetic optical rotatory dispersion. Software is available to collect and analyze data to obtain kinetics and spectra of reaction intermediates from nanosecond to second time scales. These facilities are used in a wide variety of research, including photochemical and photobiological studies, examination of materials properties, examination of functional and folding mechanisms of peptides and proteins, and investigation of fast electron and proton transfer in proteins involved in mitochondrial and bacterial respiration. Web: biomedical.ucsc.edu/Laser.html

Nuclear Magnetic Resonance Facility

The NMR facility brings together an interdisciplinary group of researchers from the departments of Chemistry and Biochemistry, Microbiology and Environmental Toxicology, Molecular, Cell, and Developmental Biology, and Biomolecular Engineering. Ongoing research includes structural elucidation of anticancer and antiviral natural products isolated from marine organisms, organic intermediates for drug synthesis, specially designed peptide intermediates, and tumor suppress proteins. At present, the facility manages three high-resolution NMR spectrometers: two 3-channel Varian Unity+ 500s with direct and inverse detection probes and a Varian INOVA 600 system with a triple resonance cold-probe system. Initial funding came from the Lucille P. Markey Charitable Trust and the W. M. Keck Foundation, as well as individual research grants from the National Institutes of Health, the National Science Foundation, and other sources available to UCSC. Web: <http://nmr.ucsc.edu>

Paleomagnetism Laboratory

This lab is located in a remote building specially constructed with nonmagnetic materials and isolated from major sources of man-made magnetic noise. Inside this building, a magnetically shielded room houses a state-of-the-art superconducting magnetometer, a sensitive spinner magnetometer, thermal and alternating field demagnetizers, and paleointensity equipment. A second lab, devoted to the study of rock and mineral magnetic properties and housed in the Earth and Marine Sciences Building, contains another spinner magnetometer, devices for measuring Curie temperatures, magnetic susceptibility and its anisotropy, hysteresis loops, and computer facilities for data analysis and graphics. Web: <http://eps.ucsc.edu/research/facilities/geophysical.html>

Rock Preparation Facility

The facility is fully equipped to aid researchers in petrographic section making, rock crushing, sample sieving, and mineral separation. Web: <http://eps.ucsc.edu/research/facilities/geochem-rock.html#rock>

Scientific Diving and Boating Safety

The university's Diving Safety Program (DSP) is housed within the Institute of Marine Sciences, with offices at Long Marine Lab. Scuba diving and small boats are tools used in science classes and by UCSC faculty, staff, and student researchers in Monterey Bay and at study sites worldwide. In order to ensure safe scuba diving and scientific boating practices, DSP provides training and oversight for all scuba diving (scientific and recreational) and scientific boating activities conducted under UCSC auspices. The diving safety officer teaches Biology 75, Scientific Diving Certification, which is a prerequisite for all UCSC courses and research using scuba diving as a tool. DSP maintains a fleet of boats and diving equipment for researchers to use. DSP assists faculty, staff, and student researchers in complying with federal OSHA standards for scientific scuba diving. Anyone who needs to use scuba diving or small boats for scientific purposes should contact the DSP Office at srclabue@ucsc.edu. Web: www2.ucsc.edu/sci-diving

Recreational diving opportunities offered by the Office of Physical Education, Recreation, and Sports (OPERS) include numerous scuba courses and the Scuba Club. Web: <http://www.ucsc.edu/opers/scuba>

Stable Isotope Laboratory

program in environmental studies includes a focus on agroecology and sustainable food systems (see [Environmental Studies](#)); graduate students have access to CASFS facilities for field-based work. Students have also pursued undergraduate and graduate studies with CASFS by working through the Departments of Biology, Education, Anthropology, and Sociology. UCSC faculty and other researchers have access to CASFS facilities for field-based research (see [Research Opportunities](#)).

In conjunction with student and faculty representatives, CASFS also coordinates activities funded by UCSC's Measure 43, the Sustainable Food, Health and Wellness Initiative. Measure 43 supports research and education grants to UCSC undergraduate students, on-campus events and speakers, and a variety of educational programming for UCSC undergraduates, such as the Food Systems Learning Journeys offered through the OPERS Recreation program. To read more about Measure 43 opportunities, please see <http://casfs.ucsc.edu/farm-to-college/measure-43-initiative/index.html>.

In addition, approximately 40 people complete a six-month apprenticeship organized and taught by CASFS staff each year, earning a Certificate in Ecological Horticulture through UCSC Extension. Through workshops, lectures, and hands-on instruction, apprentices master basic organic farming, gardening and direct marketing techniques, and learn about food systems issues.

CASFS gives high priority to forging links with, and serving as a resource for, researchers on and off campus, government agencies at many levels, nongovernmental organizations, producers, consumers, students, gardeners, and other individuals interested in multiple aspects of sustainable agriculture and food systems. Staff coordinate conferences, teach short courses, and make presentations at agricultural and food systems events.

CASFS manages two facilities: the 30-acre Farm on a lower meadow of campus and the three-acre Alan Chadwick Garden on the upper part of campus. As the primary on-campus research facility, the CASFS Farm includes research plots, raised-bed gardens, row crops, and orchards, as well as staff offices, a laboratory, greenhouses, and a visitor center. The Chadwick Garden showcases small-scale intensive horticulture and supports a diverse collection of ornamentals, vegetable crops, fruit trees, and native California plants.

The CASFS Farm and Alan Chadwick Garden are open to the public daily from 8 a.m. to 6 p.m. In conjunction with the Friends of the UCSC Farm and Garden, CASFS sponsors a variety of public education events for the community, including an active docent program offering tours of the facilities. For further information, contact CASFS at (831) 459-3240 or casfs@ucsc.edu; for directions to the Farm and Garden, call (831) 459-4140. Web: casfs.ucsc.edu.

Center for Educational Research in the Interest of Underserved Students (CERIUS)

CERIUS develops, conducts, and disseminates educational research to improve the teaching and learning of the nation's increasingly diverse student population and the teachers who serve them. The center is transdisciplinary, drawing on studies of education from multiple theoretical perspectives. CERIUS serves as a hub to integrate the work of scholars who are organized in research groups focusing on three research domains:

- Teachers and Teacher Development
- Literacy Education
- Science, Technology, Engineering, and Mathematics (STEM) Education

Taken together, the research conducted by faculty, graduate students, and academic researchers under the auspices of CERIUS aims to reinvent the institutional and organizational settings for education in order to meet the educational needs of students from underserved communities. CERIUS pursues extramural sources of funding to support its research and other scholarly activities. For information, e-mail rtogawa@ucsc.edu.

Center for Global, International and Regional Studies (CGIRS)

[The Center for Global, International and Regional Studies \(CGIRS\)](#), established in 1996 through a merger of the Global Transformations ORU and the IGCC-funded Stevenson College Program on Global Security, is the primary center for the study of international

affairs at UCSC. CGIRS is also the institutional home for the Everett Program, the administrative office for the systemwide UC Pacific Rim Research Program, and the campus affiliate for the Institute on Global Conflict and Cooperation.

CGIRS and its affiliates work to seek better understanding of the complex issues surrounding the environmental, economic, social and political structures of the 21st century, through innovative, thoughtful, and critical faculty research, undergraduate curricula, public outreach, and policy analysis and action. Its programs and activities recognize that contemporary societies are anchored in specific regions and locales even as they are also linked to other places and levels by complex political, economic, social, and cultural networks of communication and action. For further information, contact CGIRS at (831) 459-2833 or e-mail global@ucsc.edu or elnish@ucsc.edu. Web: cgirs.ucsc.edu

Center for Integrated Water Research (CIWR)

The [Center for Integrated Water Research](#) at UC Santa Cruz undertakes research on policy, economics, and communications issues related to fresh water supply. Fresh water is critical to our health and quality of life, to providing ample food supplies, to maintaining a vibrant economy, and to supporting the environmental systems we depend on and enjoy. Billions of dollars and millions of skilled workers are employed in the water sector. Policies on fresh-water management have profound impacts that can last for decades.

Water supply challenges in the early 21st century include meeting growing demand from all categories of water users, replacing and upgrading aging infrastructure, reversing declines in water quality, and adapting to climate and groundcover that affect water availability and quality.

To meet these challenges, society has developed an array of new water treatment and supply technologies, as well as new approaches to managing when and how water is gathered and used. Some water treatment technologies are so innovative they do not fit in well with our existing laws and regulations, so regulatory adaptation is necessary.

The center serves the UCSC campus by providing internship opportunities and supporting conference attendance by students. It develops and maintains relations with individuals in the business, finance, and regulatory sectors who often lecture at UCSC, thereby helping students learn about cutting-edge issues. The center also collaborates with local water agencies to provide innovative teaching and training programs, including WaterLab, the Water Teaching and Research Laboratory, a collaboration with the Watsonville Water Resources Center, which trains students to operate advanced water treatment systems.

Further information is available on the web at <http://ciwr.ucsc.edu>, by e-mail at bhaddad@ucsc.edu, or by phone at (831) 459-4149.

Chicano/Latino Research Center (CLRC)

Since 1992, the [Chicano Latino Research Center \(CLRC\)](#) has helped make UC Santa Cruz a vibrant hub for Chicano, Latino, Latin American, and migration studies. Drawing from and bringing together the social sciences, humanities, and arts, the center's work explores the diversity of the Americas, with a focus on the mobility of people, ideas, and commodities. The CLRC addresses questions related to class, economics, education, embodiment, everyday cultures, gender, identities, indigeneity, labor, language, nation, place, politics, policy, race, representation, sexuality, social movements, the state, and statelessness.

A forum for investigation and exchange, the CLRC hosts conferences, symposia, workshops, public lectures, and film screenings by UCSC faculty and students, community members, and visitors to UC Santa Cruz. We sponsor [Research Clusters](#) on topics proposed by UCSC faculty and students, distribute [Individual Faculty Research Awards](#) and [Graduate Student Mini-grants](#), and co-administer the [Lionel Cantú Memorial Award](#) with the Latin American and Latino Studies and Sociology departments. With the center's support, CLRC affiliates have produced numerous publications, including single-authored books, edited volumes, [research reports, and working papers](#). In addition, the CLRC helps prepare UCSC students for an increasingly diverse, complex, and changing world by providing them with mentorship and hands-on research experience via our [Undergraduate Research Apprenticeship Program](#).

Center for Learning Architecture-Silicon Valley

The Center for Learning Architecture–Silicon Valley (CLA–SV) was established in 2013 as a partnership between the University of California, Santa Cruz (UCSC) and the National Laboratory for Education

Transformation (NLET). CLA–SV joins cross–disciplinary teams of researchers with community agencies and industry in the region to employ information technology to transform education.

CLA–SV designs systems that foster deep, personalized learning for all students—with an emphasis on students from underserved communities—by integrating cutting–edge technologies with contemporary forms of social organization. Combined with advanced data analytics, these responsive, instructional platforms support learning activities that enhance student engagement and academic outcomes.

Multidisciplinary teams from UCSC, which involve social sciences and engineering, conduct research to:

- Understand human and social factors that influence learning;
- Advance technologies that facilitate learning; and
- Develop data–analytic techniques applicable to solving educational problems.

For information about CLA–SV, please contact its Director, Rodney Ogawa at rrogawa@ucsc.edu

Institute for Scientist and Engineer Educators (ISEE)

The [Institute for Scientist and Engineer Educators \(ISEE\)](#), an innovative initiative at UC Santa Cruz, will prepare science and engineering (S&E) graduate students for their educational role as future faculty members, and a wide range of other science and engineering careers requiring teaching skills.

Web: isee.ucsc.edu

Santa Cruz Institute for International Economics (SCIIE)

Home to the largest number of international economists at any American public university, the [Santa Cruz Institute for International Economics \(SCIIE\)](#) facilitates scholarly collaboration to further knowledge and debate on global economics and policies. An annual conference draws participation from leading academicians, researchers, and financial professionals.

Web: sciie.ucsc.edu

Social Sciences Division Research Facilities

CineMedia Project (CMP)

This is a noncirculating research archive dedicated to the study of Latin American and Latino film and video. The CMP film, video, and DVD holdings are located in Crown 206. The CMP books, journals, and files are located in Crown 123, and are available by contacting the LALS Department. Visit us at <http://lals.ucsc.edu/research/research-groups.html>.

Center for Integrated Spatial Research (CISR)

One of the most exciting developments in research over the past decade has been the increasing sophistication of spatial technology, along with a dramatic increase in the availability of spatially referenced data. Spatial technology is an information technology field that acquires, manages, interprets, integrates, displays, analyzes, or otherwise uses data focusing on the geographic, temporal, and spatial context. Today, spatial technology is recognized as the primary means of dealing with information referenced to a specific location and is being integrated across a broad range of disciplines.

CISR (pronounced “scissor”) is located in the Department of Environmental Studies, Division of Social Sciences, and serves as a central facility for spatially focused research and training at UCSC. CISR is focused on integrating advanced spatial technology, methods, and data (geographic information systems—GIS, global positioning systems—GPS, remote sensing, spatial modeling and statistics) with interdisciplinary research challenges in terrestrial, marine, and urban environments. The central goal of the center is to foster cross–domain

cooperation in the application of these tools and to promote a diversity of research by increasing campus and community literacy in spatial methods.

CISR manages both a research and teaching facility specializing in state-of-the-art spatial technology, software applications, and data, as well as, an expanded training program. Training options include three academic courses focused on spatial theory and methods (see Environmental Studies course listing); short courses through a professional development certificate program in GIS; and regular workshops and symposia. Access to CISR facilities is limited to current UCSC students, faculty, researchers or staff involved in spatial research and/or courses through the CISR. Web: spatial.cisr.ucsc.edu

Life Lab Science Program

Life Lab helps bring learning to life in a garden through curriculum, professional development, and innovative programs at our Garden Classroom site, located on the UCSC Farm. Web: <http://www.lifelab.org>

Museum of Natural History Collections (MNHC)

MNHC is dedicated to cultivating an increased understanding and appreciation of the natural world by promoting the use of its natural science collections for teaching, research, and aesthetics. The museum, part of the Environmental Studies Department, is the main repository for natural science collections at UC Santa Cruz. Collections include specimens of plants, fungi, insects, fishes, amphibians, reptiles, birds, and mammals. Web: mnhc.ucsc.edu

Physical Anthropology and Archaeology Laboratories

These laboratories are dedicated to teaching and research in both anthropological archaeology and physical (biological) anthropology. Within the labs are spaces for the study of ceramics, lithics, household archaeology, spatial archaeology (including GIS), zooarchaeology, comparative anatomy and osteology, and forensic anthropology. The laboratories maintain collections related to local Monterey Bay archaeology, as well as comparative vertebrate osteology and taphonomic specimens. Web: anthro.ucsc.edu/labs/

UCSC Farm and Alan Chadwick Garden

The Center for Agroecology and Sustainable Food Systems (CASFS) manages the 30-acre UCSC Farm and 3-acre Alan Chadwick Garden for research, education and public service activities. These unique campus and community resources use organic practices and are certified by the California Certified Organic Farmers (CCOF).

The Center's Farm and Garden facilities are available to faculty, staff, and students interested in pursuing field or laboratory research, and for use by classes. Researchers from other institutions, such as Cooperative Extension, may also collaborate on Center research projects or propose new projects. For more information, contact CASFS at 831.459-3604 or by email. Web: casfs.ucsc.edu/about/facilities

For more information on the UCSC Farm and the Alan Chadwick Garden, please see:

<http://casfs.ucsc.edu/about/facilities.html>

UCSC Greenhouses

UCSC Greenhouses is a core support facility used primarily for instructional and research programs for the departments of [Ecology and Evolutionary Biology](#) (EEB) and [Environmental Studies](#) (ENVS). UCSC Greenhouses is comprised of three separate growing areas all located on the roofs of buildings on Science Hill in the center of the UC Santa Cruz campus. More information on UCSC Greenhouses can be found at: greenhouse.ucsc.edu.

Social Sciences Division Research Activities

Bruce Initiative on Rethinking Capitalism

The [Bruce Initiative on Rethinking Capitalism](#) aims to connect those who are technically adept at the new financial technologies with scholars of culture, institutions, ethics and theology. Original research in political economy and the social study of finance is supported. Founded in the wake of the recent economic turmoil, the goal of Rethinking Capitalism is to reconsider the liquidity crisis and imagine what comes after. What distinguishes this project is the foundational premise that exploring the full range of

“capitalist futures” requires a critical, multidisciplinary understanding of derivatives, speculation and financial markets. The Project aspires to create conceptual and empirical tools of economic practice and regulation, both locally and globally, that give capitalism a future that may diverge from its past. This triple commitment: to advance interdisciplinary research on political economy and finance; to foster a community of academics, regulators, and practitioners; and to promulgate the best ideas in this emerging field to broader audiences entails an ambitious program to disseminate intellectual content through various media. Web: rethinkingcapitalism.ucsc.edu

Center for Collaborative Research for an Equitable California (CCREC)

The [Center for Collaborative Research for an Equitable California](http://ccrec.ucsc.edu/) (CCREC) was established in 2009 by the UC Office of the President as part of a program designed to support multi-campus research initiatives that focus on topics critical to the state of California. CCREC brings together university researchers, community leaders, and policymakers to seek community-driven solutions to the state's interconnected crises in the economy, education, employment, health, nutrition, housing, and the environment. Based at UC Santa Cruz with affiliated research centers and faculty fellows at the other nine UC campuses, CCREC repositions the University of California to confront complex interrelated problems from an interdisciplinary perspective. CCREC provides seed and development funding for innovative projects, incubates regional-scale projects demonstrating best practices in equity-oriented, collaborative, community-based research, and supports UC graduate students and early career scholars to disseminate their work. CCREC is helping to establish national standards for the distinctive ethical quandaries of collaborative research, and it also fosters data- and research-based public deliberations on matters of significance for a democratic society. Web: ccrec.ucsc.edu/

Center for Informal Learning and Schools (CILS)

The [Center for Informal Learning and Schools](http://cils.exploratorium.edu) (CILS) is focused on the strengthening of K-12 science education through broadening the understanding of learning in both formal and informal environments. Funded by the National Science Foundation, CILS is a collaboration between the University of California Santa Cruz, the Exploratorium, and Kings College London. Web: cils.exploratorium.edu

Center for Labor Studies (CLS)

The UCSC [Center for Labor Studies](http://labor.ihr.ucsc.edu), founded in 2007, is dedicated to the study of working people, the labor movement, and the challenge of the broader global economy as it impacts the working people of California and beyond. Through conferences, workshops, public lectures, and a range of guest speakers, in particular, on the relationship between the labor movement, social movements, and democratic practices; on gender, race, and ethnic dynamics; and on labor activism in international context. Web: labor.ihr.ucsc.edu

Center for Statistical Analysis in Social Sciences (CSASS)

Founded in 2012, CSASS, is administered by the Division of Social Sciences. Its mission is to facilitate the use and training of statistical, psychometric, and computational methods in social science research within the context of research designs represented by the division's academic departments of Anthropology, Economics, Education, Environmental Studies, Latin America and Latino Studies, Politics, Psychology, and Sociology. CSASS provides statistical and methodological support to the research missions of all departments within the Division of Social Sciences by providing free statistical consulting and quantitative training workshops. Web: csass.ucsc.edu

Center for Tropical Research in Ecology, Agriculture, and Development (CenTREAD)

The goal of the [Center for Tropical Research in Ecology, Agriculture, and Development](http://centread.ucsc.edu/) (CenTREAD) is to foster interdisciplinary research and training to understand tropical environmental issues and develop ecologically-based, economically viable, culturally respectful, nonexploitative solutions that serve as a foundation for future generations. For more information, see: <http://centread.ucsc.edu/>

Learning and Experimental Economics Projects of Santa Cruz (LEEPS)

[Learning and Experimental Economics Projects of Santa Cruz \(LEEPS\)](http://leeps.ucsc.edu/) began operation in

1986 with the Double Auction Asset Market, the world's second fully computerized market system. The lab is run by economists at UCSC and elsewhere who conduct research on individual decision-making as well as strategic interaction and market design. Funding is mainly from the National Science Foundation, with occasional support from industry and nonprofits. Web: <http://leeps.ucsc.edu/home/>

Science and Justice Research Center

The [Science and Justice Research Center](#) brings together faculty and graduate students from all five academic divisions on the UC Santa Cruz campus to collaboratively address common problems. As science and technology increasingly shape our lives, the Science and Justice community generates modes of inquiry and empirically rigorous research that can enable a diversity of livable techno-scientific worlds. UCSC's innovative initiative in Science and Justice is funded by the university and the U.S. National Science Foundation and is increasingly recognized nationally and internationally for its leading role in developing new forms of inquiry and action at the intersection of science and society. The initiative builds on the UCSC campus' historic commitments to social justice and strengths in science studies and interdisciplinary research. Web: <http://scijust.ucsc.edu/>

South Asia Studies Initiative

UC Santa Cruz is the University of California campus that meets the needs of Silicon Valley, including the vibrant South Asian diaspora that has contributed to the region's innovations and economic growth. An important aspect of the campus's educational mission is creating a major new South Asia Studies Center with global visibility, contributing to understanding not only South Asia's priceless heritage, but also its future trajectory. The center will focus particularly on India's new role as a leading participant in the world economy, including its emergence as a source of management expertise, entrepreneurship, capital, and innovation. The initiative is a campuswide collaboration that builds on existing initiatives and research from multiple disciplines and in strong partnership with the region's South Asian community. The initiative hosts an India public lecture series, featuring speakers from around the world focusing on issues of science, technology, economics, and politics in India and the region. For additional information, please contact the Assistant to the Dean of Social Sciences at (831) 459-2919. Web: <http://southasia.ucsc.edu/>

Sury Initiative on Global Finance and International Risk Management (SIGFIRM)

The [Sury Initiative on Global Finance and International Risk Management \(SIGFIRM\)](#) seeks to become a world class research center for the design, development, and dissemination of new investment and risk management strategies, techniques, and policies. Web: <http://sigfirm.ucsc.edu/>

Interdisciplinary and Systemwide Research Programs and Resources

Arboretum

The [Arboretum](#) at UCSC is a research and teaching facility committed to plant conservation that serves both the campus and the public. Its rich and diverse collection, containing representatives of more than 300 plant families, provides beginning students with a broad survey of the plant kingdom. Facilities for growing plants offer students and research faculty opportunities to experiment with living plants. The Arboretum maintains collections of rare and threatened plants of unusual scientific interest. Particular specialties include world conifers, primitive angiosperms, and native succulents. Large assemblages of plants from Australia, New Zealand, and South Africa, and California are displayed on the grounds. Many of the species in these collections are not otherwise available for study in American botanical gardens and arboreta.

Arboretum events educate and engage the public about plant diversity and conservation. The Arboretum's activities in importing, selecting, and breeding choice ornamental plants, especially those that are drought tolerant and pest resistant, are of service to the public and nursery industry. To date, the Arboretum has selected from the wild in California or imported more than 1,500 different selections of choice ornamentals. Many of these have been and will continue to be the plants of future California gardens. The Arboretum is open 9 a.m. to 5 p.m. daily. Admission is free to UCSC students.

Norrie's, the Arboretum's volunteer-run gift shop, supports the Arboretum and is open every day, 10 a.m. to 4 p.m.

Arboretum: (831) 427-2998; Norrie's gift shop: (831) 423-4977; e-mail: arboretum@ucsc.edu; Web: arboretum.ucsc.edu. Facebook: UC Santa Cruz Arboretum and Norrie's.

California Carlyle Edition

UCSC's Humanities Division is the focus of an exciting and innovative effort by an international group of scholars to publish an eight-volume critical edition of Thomas Carlyle's major works. Headquartered at UCSC, it is the first "scientific" edition of Carlyle, using computer technology to compare all the lifetime editions of each work in order to establish an accurate text, as well as providing explanatory notes for the modern reader.

The edition promises to set the agenda for work on Carlyle and the Victorian era for the next generation. In addition to producing a much needed critical edition of the works of Carlyle, the project is using the campus's computer facilities to develop and demonstrate many state-of-the-art applications of data-processing technology in the humanities, from optical scanning of some editions and machine-assisted collation and proofreading, to desktop typesetting and the creation of an online Carlyle textual archive. The first volume, *On Heroes, Hero Worship, and the Heroic in History*, was published in 1993 by the University of California Press. The second volume, *Sartor Resartus*, was published in 2000, followed by *Historical Essays*, in 2003, and *Past and Present*, in 2006. *The French Revolution* is forthcoming. Web: <http://www3.nd.edu/~carlyle/strouse.html>

California Institute for Quantitative Biosciences (QB3)

One of four California Institutes for Science and Innovation, QB3 is a multi-disciplinary research institute at the University of California created to drive the state's economy and improve the quality of life for its residents. QB3's domain is the quantitative biosciences, in which scientists take on challenges in molecular biology using the techniques of physics, chemistry, and computer sciences. The QB3 faculty members—professors at UC Berkeley, UC San Francisco, and UC Santa Cruz—publish regularly in top academic journals, patent their discoveries, and launch spinoff companies. QB3 brings scientists together across disciplines, connects industry and academia in mutually beneficial partnerships, and helps entrepreneurs start successful companies. At UC Santa Cruz, QB3 is run by the Center for Biomolecular Science and Engineering. Web: <https://qb3.soe.ucsc.edu/>

Center for Biomolecular Science and Engineering (CBSE)

CBSE promotes and supports genomic and stem cell research, technology innovation, and education. An umbrella organization of UCSC's Jack Baskin School of Engineering and the Division of Physical and Biological Sciences, the center supports a vast array of biological and engineering research that is fueling biomedical advances and the biotechnology explosion. CBSE started in 2000, when UCSC scientists helped the Human Genome Project reach a stunning milestone by providing the computational solution that produced the first assembly of the human genome, the map of our genetic make-up. This early accomplishment evolved the widely used UCSC Genome Browser, followed by the UCSC Cancer Genomics Browser. Much of the research combines cutting-edge computational approaches with laboratory experimentation. In addition, through collaboration with affiliates in sociology, the center supports the exploration of the ethical, legal, and social implications of genome research.

Web: <http://cbse.soe.ucsc.edu/>

Center for Information Technology Research in the Interest of Society (CITRIS)

CITRIS was created to "shorten the pipeline" between world-class laboratory research and the creation of start-ups, larger companies, and whole industries. CITRIS facilitates partnerships and collaborations among more than 300 faculty members and thousands of students from numerous departments at four University of California campuses (Berkeley, Davis, Merced, and Santa Cruz) with industrial researchers from over 60 corporations. Together, the groups are thinking about information technology in ways it's never been thought of before.

CITRIS works to find solutions to many of the concerns that face all of us today, from monitoring the environment and finding viable, sustainable energy alternatives, to simplifying health care delivery and developing secure systems for electronic medical records and remote diagnosis, all of which will ultimately boost economic productivity. CITRIS represents a bold and exciting vision that leverages one of the top university systems in the world with highly successful corporate partners and government resources. Web: www.citris-uc.org

Educational Partnership Center (EPC)

Established in 1999, the EPC coordinates UCSC's new and long-standing student academic preparation efforts with the goal of increasing access and opportunity to postsecondary education for students in the Monterey Bay and Silicon Valley/San Jose regions. EPC is an umbrella organization for a variety of complementary, integrated academic preparation and educational partnership programs serving students, teachers, and families from middle through high school. To build a college-going culture, EPC partners with K-12 districts in Santa Clara, Santa Cruz, and Monterey Counties to help students and families navigate the college-going pathway and achieve their higher-education goals.

EPC's mission is to equip students with the knowledge, tools, and support network to navigate the academic pipeline and advance toward higher education. EPC offers college and academic prep services and materials that motivate and empower students of diverse backgrounds to seek and achieve a college education. EPC provides an array of direct services and programs to support students on the college-going pathway through tutoring, mentoring, academic planning and counseling, leadership training, test preparation, college awareness and enrichment, family involvement initiatives, and teacher professional development.

EPC's key to success is providing an integrated services model that brings all of the student academic preparation programs together and creates synergy across programs that are each grounded in measurable goals and research-based best practices. Coordinating services across middle and high school programs has been essential to providing students and families with vital information on the various pathways to college. EPC programs include:

California Reading and Literature Project (CRLP) is one of nine California subject-matter projects. It supports professional development opportunities for teachers in pre-K-12 classrooms. Governed by the UC Office of the President, CRLP supports pre-K-12 students in the Monterey Bay region in achieving the highest standards of academic performance by developing teachers' content knowledge and expanding their teaching strategies, focusing on academic English language development to prepare all students to meet or exceed academic content standards. CRLP creates a statewide pool of expert teacher-leaders to train other teachers on sound classroom practices, and also links universities, schools, and districts together in collaborative partnerships to improve teaching and learning through teacher professional development.

California State Summer School for Mathematics and Science (COSMOS) is a four-week summer residential program at four UC campuses that provides students with an unparalleled opportunity to work side-by-side with outstanding researchers and university faculty, covering topics that extend beyond the typical high school curriculum. The academic experience includes nine clusters taught by UCSC faculty, special discovery lectures, academic field trips, and enrichment sessions. Students' residential life includes weekend events and fun-filled peer activities, and COSMOS alumni have opportunities to attend the California Nobel Laureate event, receive research awards and college scholarships, and participate in an industry internship program.

California Student Opportunity and Access Program (Cal-SOAP) is a vital component in California's effort to build an educated workforce for the 21st century by providing college, career, and financial aid assistance to traditionally non-college-going students. The program was established by the California Legislature in 1978 and is administered by the California Student Aid Commission. Statewide projects support the Commission's objective "to make education beyond high school financially accessible to all Californians." The project sustains and enhances the work of K-12, college, and university partners and increases the value and reach of other important federal and state college preparation

programs. Cal-SOAP communicates important information about financial aid, postsecondary opportunities, and career technical education. San José Cal-SOAP provides academic tutoring, peer mentoring, college and career advisement, college access and admissions counseling, SAT/ACT test preparation, college tours and financial aid workshops and grants. In addition, the San José Cal-SOAP Consortium convenes key stakeholders from higher education institutions, K-12 districts, county offices of education, the City of San Jose, and community agencies and businesses to collaboratively develop and implement academic preparation activities to maximize resources and avoid duplication of efforts.

Early Academic Outreach Program (EAOP) is the University of California's largest academic preparation program. EAOP works with students at underserved schools to prepare for postsecondary educational opportunities, complete all UC/CSU eligibility requirements, and apply for college and financial aid. EAOP partners with families, schools, and communities to make college dreams a reality and provides a variety of year-round services designed to increase the academic preparation, awareness, and motivation of high school students toward higher education and to inform parents about available education opportunities.

Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP) is a federally funded discretionary grant program designed to increase the number of low-income students who are prepared to enter and succeed in postsecondary education. Through the collaborative efforts of school and district partners, along with additional business and community partners, GEAR UP provides critical academic preparation and support for students and families to help them navigate the college-going pathway. GEAR UP partnerships supplement existing school reform efforts and use research-proven practices to promote academic rigor and student achievement. The program brings much-needed resources to increase student academic performance and preparation for college, increase student and family college awareness, increase teachers' capacity to prepare students for college, and create a college-going culture within the broader community. EPC provides a variety of school-based academic services in its two GEAR UP partnerships in Watsonville/Pájaro Valley and south Monterey County.

The Mathematics, Engineering, Science Achievement (MESA) Schools Program provides academic development for middle and high school students to prepare them for success in baccalaureate degree programs in STEM (Science, Technology, Engineering, Mathematics) majors. The MESA Schools Program works in partnership with the MESA Community College and MESA Engineering Programs, which support students after high school along college and career pathways. The primary goal of the MESA Schools Program is to support educationally disadvantaged students through fun-filled, hands-on projects and other college awareness activities to promote STEM college and career opportunities. The UCSC MESA program provides STEM academic support and enrichment, college knowledge, parent leadership, and teacher professional development to students, families, teachers, and partner schools in Santa Cruz and Monterey counties. The annual MESA Day Preliminary Competition brings hundreds of students to campus to compete against their peers in a variety of science, math, and engineering events.

EPC is located at the UCSC campus at the Oakes College Administrative Offices. For more information, call (831) 459-3500 or visit online at <http://epc.ucsc.edu>.

Monterey Bay Education, Science, and Technology (MBEST) Center

UCSC has played a leading role in the development of a multi-institutional center for science, technology, education, and policy—the MBEST Center—as a cornerstone of the Fort Ord defense conversion redevelopment plan.

The mission of the MBEST Center is to promote collaborative interaction among private businesses, government research agencies, public and private education and research institutions, and policy makers in strategic alliances to address the environmental opportunities and challenges of the new millennium.

In 1994, about 1,100 acres at the former Fort Ord Military Reservation were conveyed to the University of California. Of that land, 479 acres are available for development, and 605 acres of adjacent natural habitat are now part of the UC Natural Reserve System. Investments in roadway and utilities infrastructure have been completed, making 55 acres of real estate ready for development. In addition, the UC MBEST Center headquarters was

constructed and a high-technology business incubator was established in 2001.

Information about the center is available from the UC MBEST Center Office, 3180 Imjin Road, Suite 104, Marina, CA 93933, (831) 402-2165; via e-mail: info@ucmbest.org; Web: www.ucmbest.org

Santa Cruz Institute for Particle Physics (SCIPP)

Research in high-energy particle physics and astrophysics is done in the setting of an Organized Research Unit, the Santa Cruz Institute for Particle Physics (SCIPP). With approximately two dozen faculty from the Department of Physics, the Department of Astronomy and Astrophysics, and SCIPP appointments, plus post-docs, research staff, students, visitors, and administrative staff, SCIPP is home to vibrant and evolving research in experimental and theoretical particle physics and particle astrophysics. An especially exciting aspect of work in SCIPP is the productive interaction among the different research groups, including the close connections between theoretical and experimental work on topics such as measurements of the Higgs boson, searches for supersymmetry, the nature of dark matter, tests of fundamental physics, and a wide variety of high-energy phenomena on the ground, in the atmosphere, and in space.

SCIPP faculty, research staff, students, engineers, and technicians play major roles in experiments at the frontier accelerator laboratories in the world, including CERN (the European Organization for Nuclear Research), as well as in a variety of experiments that do not involve terrestrial accelerators, to answer the most important questions in particle physics and high energy astrophysics. These efforts usually include groundbreaking work on the technologies needed to advance this research. SCIPP is recognized as a world leader in the development of custom readout electronics and silicon micro-strip sensors for state-of-the-art particle detection systems. Always creating new opportunities, SCIPP personnel are also pursuing the application of these technologies to other scientific fields such as neurophysiology and biomedicine.

The research interests of the SCIPP Theory Group fall into two broad topical categories: (1) Theory and phenomenology of high-energy particles, with an emphasis on physics beyond the Standard Model of particle physics, and (2) Theoretical astrophysics and cosmology. High-energy particle physics is an excellent example of the close connections between the Theory Group and SCIPP experimental or observational efforts, especially with the Large Hadron Collider at CERN, planning for future international colliders, and the Fermi Gamma-ray Space Telescope, to which faculty and students have contributed many of the key early studies and publications. Theoretical cosmology studies on dark energy, dark matter, and structure formation and evolution are key to the SCIPP involvement in the Dark Energy Survey and future large surveys.

Graduate and undergraduate students take part in essentially all SCIPP projects, finding many opportunities for thesis work, independent study, and part-time employment. Students also gain experience in electronics, computer-aided design (CAD), large-scale scientific computing, instrumentation, and data analysis. The work by students in both theory and experiment often results in highly cited scientific journal publications. Web: scipp.ucsc.edu

University Affiliated Research Center (UARC)

Under an extended 10-year, \$330 million research contract between NASA and the University of California, which began in September 2003, UC Santa Cruz is leading the UC-wide UARC at NASA Ames. The UARC was established to increase the safety, effectiveness, and scientific impact of NASA's missions through the infusion of new technologies and research knowledge. The UARC's primary mission is to perform mission-driven multi-disciplinary, integrative research and technology development that supports NASA's long-term program requirements.

UARC research, which takes place at the NASA Ames's Moffett Field facility as well as at several UC campuses, focuses on multidisciplinary research in the following areas:

- Aerospace Systems
- Earth Science
- Information Technology and Computer Sciences

- Quantum Computing
- Space Sciences
- Biological Sciences and Synthetic Biology
- Nano Sciences

In addition to task-based support provided by a team of scientists, engineers and support staff, the UARC engages in two education programs. Our Aligned Research Program (ARP) funds research by University of California faculty and students working in collaboration with NASA Ames scientists on projects directly aligned with NASA's priorities. The Systems Teaching Institute (STI) provides opportunities for students to work alongside university and Ames researchers, enhancing their educational experiences while training them to become world-class 21st-century scientists, engineers, and educators. By efficiently collaborating with organizations that are the best in their fields, the UARC is able to deliver excellence-driven research, while training the scientists of tomorrow. Web: uarc.ucsc.edu

University of California Observatories (UCO)

UCO astronomers became partners with California Institute of Technology astronomers to operate and provide instruments for the W. M. Keck Observatory, located at the summit of Mauna Kea in Hawaii. The two Keck 10-meter telescopes began operating in 1993 and 1996. These are the largest and most capable optical/IR telescopes in the world.

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In 1988 the Regents established an organization to manage the university's ground-based optical and infrared observatories as a single unit. Known as the University of California Observatories (UCO), the organization includes Lick Observatory and UC's component of the Keck Observatory and is headquartered at UCSC. UCO plays a large role in the Keck enterprise: both of the Keck telescopes' secondary mirrors were polished in the optical laboratory at Santa Cruz, and the high-resolution echelle spectrograph (HIRES), designed and constructed in the instrument-development laboratories here, was the first Keck instrument to become fully operational. The laboratories have also designed and constructed instruments for the second Keck telescope, including a powerful optical imager and multi-object spectrograph (DEIMOS) and a higher-resolution echelle optical spectrograph and imager (ESI). Web: www.ucolick.org

As resident members of the Santa Cruz faculty, the UCO staff are members of UCSC's Department of Astronomy and Astrophysics, which offers the graduate program in astronomy and astrophysics and an undergraduate minor (see [Astronomy and Astrophysics](#)). B.S. degrees in astrophysics are offered through the Physics Department (see [Physics](#)). The UCO laboratories are located on campus, as are optical, electronics, engineering, programming, and detector/instrument-development groups. There are resources for measurement, analysis, and computation of data on campus as well.

The telescopes and accompanying facilities on the 3,762-acre reservation on Mt. Hamilton east of San Jose are operated as an observatory, with observers either commuting to use the facility in person or using remote control rooms available at UCSC and at UCLA. Telescopes include the Lick 36-inch refractor, the CAT 24-inch and Nickel 40-inch reflectors, and the Katzman 30-inch robotic reflector, dedicated to searching for supernovas. The newest and now-operational telescope is the 94-inch Automated Planet Finder (APF), which is one of the world's most sensitive for discovering Earth-like planets among the stars. The largest and most powerful of the Lick telescopes is the Shane 120-inch reflector, which was completed in 1959 and remains one of the world's most productive telescopes. The observatory's equipment also includes a variety of auxiliary instruments used in connection with observations at the 120-inch telescope. Among them is the Hamilton echelle spectrograph, judged to be one of the world's most efficient instruments for high-resolution analysis of the light of stars and galaxies and the instrument by which astronomers have discovered new planets outside our solar system. Another instrument is the Kast double spectrograph, a pioneering example of UCO's

innovative instrumentation capabilities. One of the most exciting technological innovations developed at Lick Observatory, originally in conjunction with Lawrence Livermore National Laboratory, is the use of an adaptive-optics system with an artificial, laser-produced guide star to sharpen images normally blurred by the atmosphere. Advanced and improved adaptive-optics designs are continuing to be designed, built, and tested on the Shane Telescope by a team from UCSC and then used for science by UC astronomers. The observatory is a system-wide facility used extensively by faculty, researchers, and students from eight of the ten UC campuses and two national laboratories.

UCSC's courses in astronomy and astrophysics are taught on campus. Advanced students gain observing experience with the Mt. Hamilton telescopes and conduct research directed by the staff.

UCO astronomers work on a wide variety of astrophysical topics, including solar system and star formation, exoplanets, stellar evolution, the origin and evolution of the Galaxy and external galaxies, abundances of the chemical elements, the interstellar/circum-galactic/inter-galactic gas, dark matter and dark energy, and the size, structure, and evolution of the universe.

Since 2000, UCO has been a partner in an international project called the Thirty-Meter Telescope (TMT). This giant telescope with a 30-meter diameter primary mirror will be nearly 10 times more powerful than a 10-meter Keck telescope and is being built near the two Keck Telescopes in Hawaii. Its advanced adaptive optics systems and innovative instruments will make the TMT one of the most powerful astronomical facilities in the world for decades to come.

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