



# NSF AT UCSB



**A**ccelerated progress in the sciences and engineering is essential to our nation's future. Thanks in large part to UCSB's longstanding partnership with the National Science Foundation—and vigorous new industry alliances—science and technology research, development, education and training are flourishing. • Approximately 25 junior faculty members have active CAREER awards. Since 2005, more than 17 percent (21 of 131 assistant professors) received NSF CAREER awards, placing the campus 16th among the top institutions nationwide in terms of total awards. • In the last fiscal year, NSF funding (\$52 million) accounted for more than 27 percent of UCSB's extramural dollars and 40 percent of all federal monies. • UCSB ranked 17th in 2008 among universities based on total NSF dollars received and is among the top 20 universities in five out of six NSF directorates: *Biological Sciences; Computer and Information Sciences and Engineering; Mathematical and Physical Sciences; Social, Behavioral and Economic Sciences, and Geosciences.* • Of UCSB's 11 national research centers, NSF funds eight:

- CENTER FOR NANOTECHNOLOGY IN SOCIETY
- INTERNATIONAL CENTER FOR MATERIALS RESEARCH
- KAVLI INSTITUTE FOR THEORETICAL PHYSICS
- MATERIALS RESEARCH LABORATORY
- NATIONAL CENTER FOR ECOLOGICAL ANALYSIS AND SYNTHESIS
- NATIONAL NANOFABRICATION INFRASTRUCTURE NETWORK
- SOUTHERN CALIFORNIA EARTHQUAKE CENTER (BRANCH VIA USC)
- UC CENTER FOR THE ENVIRONMENTAL IMPLICATIONS OF NANOTECHNOLOGY (BRANCH VIA UCLA)

**The National Center for Ecological Analysis and Synthesis (NCEAS)** recognizes that human life increasingly depends on how well the world's natural ecosystems are protected and managed. Although scientific understand-

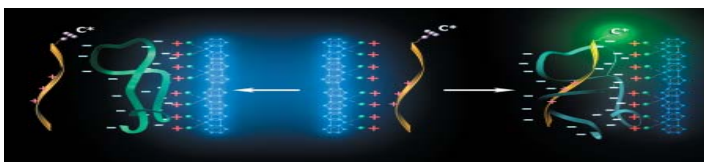


*NCEAS ecosystem experts found that without wild pollinators like bees and hummingbirds—which are threatened by habitat loss and disease—35 percent of all U.S. crops simply could not be produced.*

ing based on sound data is essential, most of the information that researchers have collected worldwide is *not* readily available to the scientific community. At NCEAS, resident and visiting scientists from 500 countries and many disciplines are tackling issues of accessing, organizing, and understanding diverse data. The goal is to provide public access to virtually all the world's ecological knowledge, which will allow scientists, resource managers, and policy makers everywhere to tackle global dilemmas that are currently intractable.

**The Kavli Institute for Theoretical Physics (KITP)** draws distinguished physicists from around the world to resolve some of the most challenging questions of our day in an atmosphere of rich intellectual exchange. At any given time, KITP is host to as many as 60 resident faculty, visiting senior scientists, and post-doctoral members in the many areas of physics. Research under way ranges from biomolecular networks, the brain, and planet formation to quantum matter and string theory. A mathematical description of subatomic particles that is so unifying it is called the “theory of everything,” string theory is a research focus of KITP's director, David Gross, who received the 2004 Nobel Prize in Physics.

**The Materials Research Laboratory (MRL)** is a national asset. Teams of materials scientists, engineers, physicists, chemists, biologists, and geologists are making breakthroughs in five intensive research areas—reversible, programmable bonding in molecular materials; oxides as semiconductors; engineered self-assembly of conjugated polymer- and oligomer-based optical and electronic systems; soft cellular materials; and nanostructured materials by molecular beam epitaxy. Revolutionary materials developed will, for example, combine properties in new ways or form the



*Biologically inspired signal amplification for HIV detection*

basis for micromachines. Such materials and model systems provide building blocks for new technologies and for applications such as drug-delivery microdevices, artificial tissues, vastly improved industrial catalysts, and high-performing circuits.

### Partnerships for International Research and Education in Electron Chemistry and Catalysis at Interfaces (PIRE-ECCI)

Since a third of the world's economy involves catalytic chemistry, improving these processes will help address the world's escalating energy needs. This program creates partnerships between UCSB professors and students and their interdisciplinary counterparts at three research institutions in the People's Republic of China. The goal is to groom international leaders in science and business who can collaborate across geographical boundaries. As part of two-way exchange programs, UCSB graduate students in science and engineering—who will learn to speak Chinese—will spend up to four months conducting research in China. Research connections will also be strengthened through bi-weekly international seminars at UCSB, international technology transfer training and biannual summer schools.

**An IGERT training grant** equips science and engineering graduate students to solve global problems:

- **Conversion of Energy through Molecular Platforms**



A \$1 LED (light-emitting diode) light bulb is 20 times more efficient than incandescent

*(ConvEne)* trains graduate students to resolve challenging problems related to energy consumption. Worldwide, quality of life is directly related to consumption of energy. Our ability to tap into new (renewable) energy sources and to make more efficient use of existing (non-renewable) energy sources will be critical for maintaining quality of life in the United States and enable developing

countries to improve quality of life. ConvEne graduate researchers gain interdisciplinary skills and a complementary research philosophy while studying molecular approaches to the generation and transformation of energy in ways that are scientifically, economically and environmentally sound.

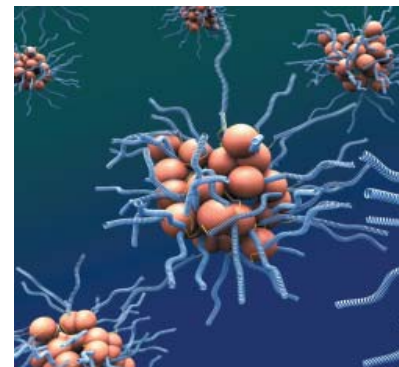
### International Center for Materials Research (ICMR)

is funded by the Division of Materials Research and the Office of International Science and Engineering at the National Science Foundation. ICMR goals are to enable groundbreaking discoveries in materials science and engineering by facilitating international, multidisciplinary research collaborations; to provide opportunities for young researchers

to develop the skills needed to excel in a global research environment; and to integrate materials research experiences with an awareness of environmental and developing world issues into undergraduate curricula. The ICRM conducts an International Research Fellowship competition to support research visits to non-U.S. laboratories for graduate students, postdocs and junior faculty affiliated with U.S. institutions.

### The National Center for Nanotechnology in Society (CNS)

is one of only two National Science and Engineering Centers established to understand how emerging nanotechnologies affect society. Structures and devices have already been produced at the scale of 1 to 100 nanometers (a human hair is about 80,000 nm wide), and they possess highly unusual properties. While



Nanoparticle clusters—health-related research that may benefit society

nanotechnology breakthroughs in areas such as energy, drug efficiency, communications and security would bring social and economic benefits, the effects on health, safety and the environment are still unknown. Through CNS, social scientists, humanists, engineers and scientists will address that question and also study the public perception of nanotechnology.

### Long-Term Ecological Research (LTER)

UCSB has three LTER programs—more than any other U.S. university. The *Palmer LTER on the Antarctic Marine Ecosystem* investigates the fish and animal ecosystem in waters where annual pack-ice fluctuations may affect every level of the food web. The *Santa Barbara Coastal LTER* protects living systems, especially giant kelp forests, in the ecologically and economically invaluable zone where ocean meets land. The *Moorea Coral Reef LTER* focuses on stony corals in the



Observing water flow through Moorean coral

Pacific Islands. Findings will benefit the world's endangered reefs, whose demise would affect ocean life, human health, livelihoods and entire economies.