Marine Science Institute

msi annual report

2005-06

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Director's Statement

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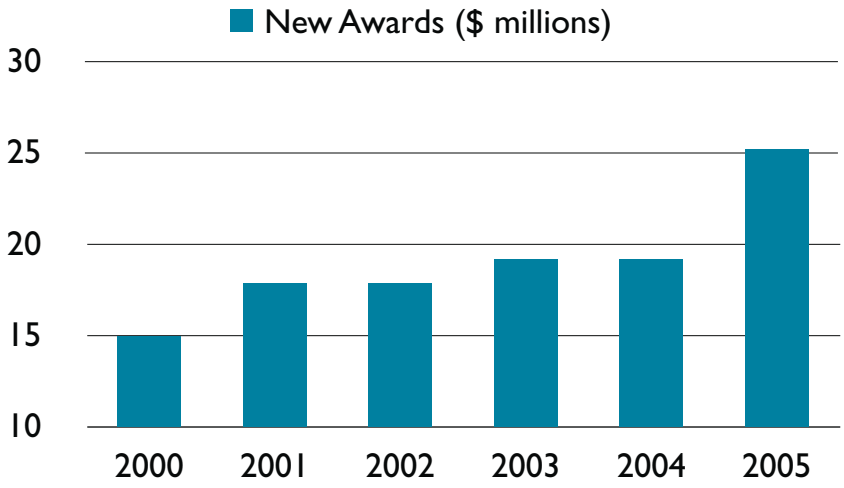
The Marine Science Institute is inching toward its 40th birthday, and there is a lot to celebrate. MSI was founded to promote interdisciplinary research in marine science. In some ways fulfilling this mission is an easy task, since UCSB's unique location as an ocean campus attracts faculty interested in ocean issues to a wide range of academic departments across campus. Marine science is embedded within the campus fabric.
In the vast majority of marine programs at other universities around the country, marine science is separated from the main campus. In many cases, the marine program is hours away in a separate marine lab or oceanographic institute. The isolation of a marine lab is wonderful, but it has historically isolated much of marine science from other disciplines. Over the years, we have exploited the interdisciplinary opportunities that arise from simple proximity to do things at MSI that are difficult to do elsewhere. We believe this is one of the hallmarks of our success.

To tap the interdisciplinary potential at UCSB, MSI has employed a two pronged strategy – entice participation by encouraging innovation and an entrepreneurial spirit and support these efforts with an outstanding administrative staff dedicated to a culture of excellence in grant administration. The combination of creative programs with superb implementation has been the secret to MSI's long success.

In many ways, MSI was ahead of its time. National funding priorities often cited the need for interdisciplinary research, but agencies typically parceled out funding within disciplines. In the last decade, this approach has changed dramatically in a number of federal agencies. In addition, private Foundations with interests in ocean science and conservation have emerged as major sources of new interdisciplinary research funding. MSI was preadapted for these institutional changes and has grown dramati-cally, more than tripling in new research awards in the last decade.
This past year clearly highlights this rapid growth. As we nuzzled close to the $20 million landmark for new research awards in each of the last two years, this year MSI researchers brought in more than $25 million in new awards. This is a dramatic increase of more than 30% in a single year. Most of the dramatic growth over the last decade has come from the continuing addition of large, multi-investigator awards. Of particular note this year, was a new $5 million program funded by the Paul G. Allen Foundation to promote the development of new, more sustainable approaches to fisheries management. This new program is one of several new emerging partnerships between MSI, NCEAS (the National Center for Ecological Analysis and Synthesis) and the Bren School of Environmental Science and Management.



Although research funding is one metric of the success of any research in-stitute, an even more important metric is the findings that emerge as a result of this research support. With an institute as large as MSI that produces hundreds of publications each year from more than 100 researchers and several hundred graduate students and postdoctoral fellows spanning more than a dozen different broad disciplines, singling out the most important findings is an impossible task. All I can do to show the vibrancy of the collective efforts of the institute is to highlight a diverse few of the many major research successes from the past year.

M. Medina-Elizada & D. Lea addressed one of the most pressing issues in climate change research – the functional link between CO2 concentration in the atmosphere and temperature. Using a remarkable 1.3 million year record, they showed that variation in CO2 concentration has indeed been a major driver of variation in sea surface temperatures over this long period of earth's history. D. Wilson led an international team of researchers who, for the first time, recovered black rocks known as gabbros from intact ocean crust. This finding has eluded marine scientists for over 40 years and opens new opportunities for under-standing the fundamental processes that form ocean crusts, a key process in the cycle of plate tectonics. R. Warner and colleagues showed that the microchemistry of larval fish ear bones differed sufficiently among sites along California's coastline that they could be used to identify the locations of individuals and begin to unravel the mysteries of where microscopic fish drift as they develop. M. Love and colleagues showed that artificial structures, such as oil platforms and pipelines, harbor surprisingly large populations of fishes relative to nearby natural habitats, a finding with significant implications for the decommissioning and removal of these manmade structures. Finally, working groups and postdoctoral fellows at NCEAS were spectacularly productive and generated major advances in fields that extend far beyond the boundaries of the oceans. Major findings ranged from the observation that the removal of top predators by fishing can have surprising large cascading effects on kelp forest dynamics to a disturbing global synthesis that shows that declines in birds and bees are putting a wide range of terrestrial plant species at risk of extinction.

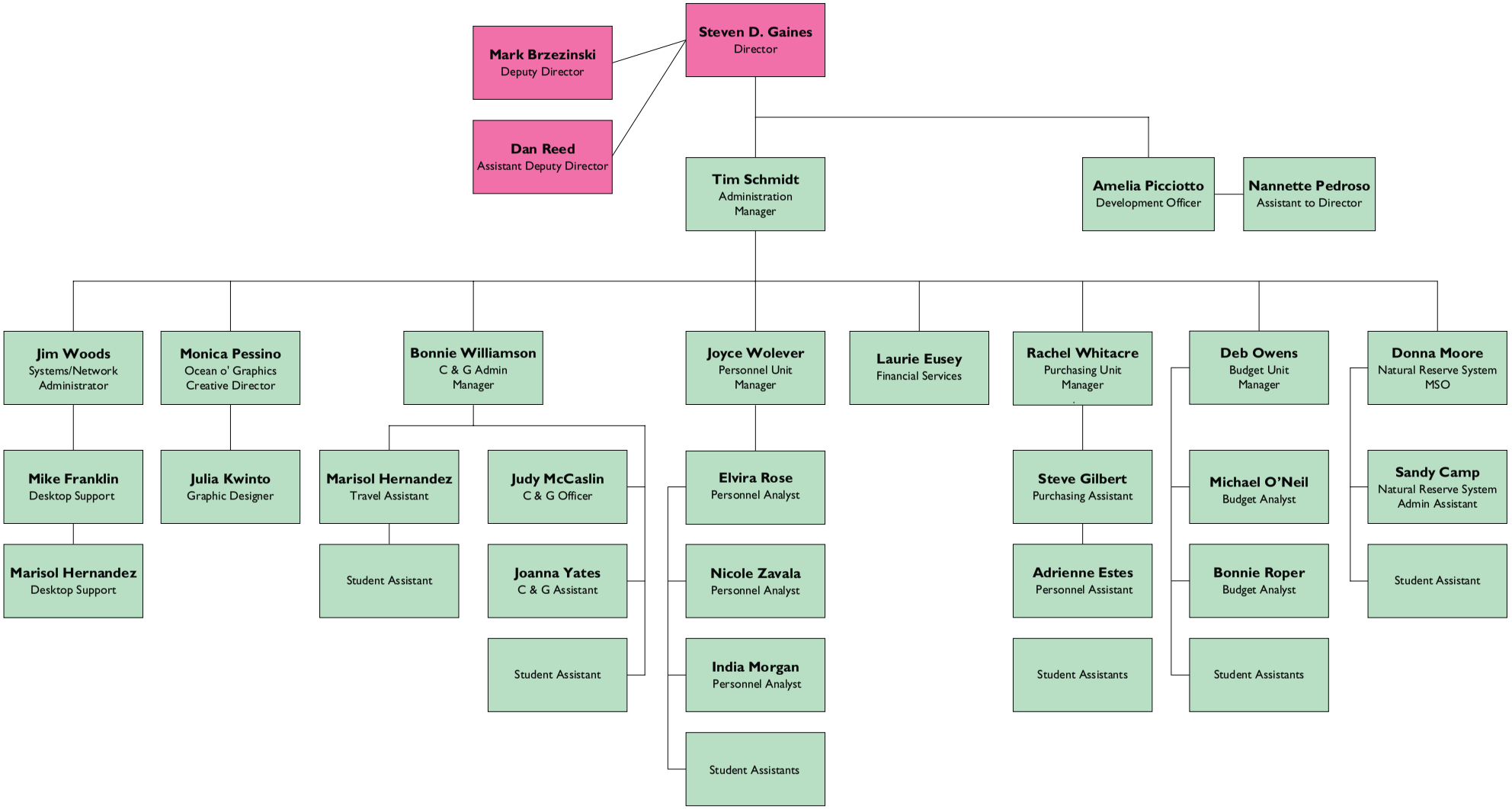
By any metric, this has been an incredibly exciting and productive year at MSI. With the continuing rapid expansion of our research programs and the onset of major new initiatives, I am certain that this excitement will only grow in the future.

Steven D. Gaines
Director

Organizational Charts

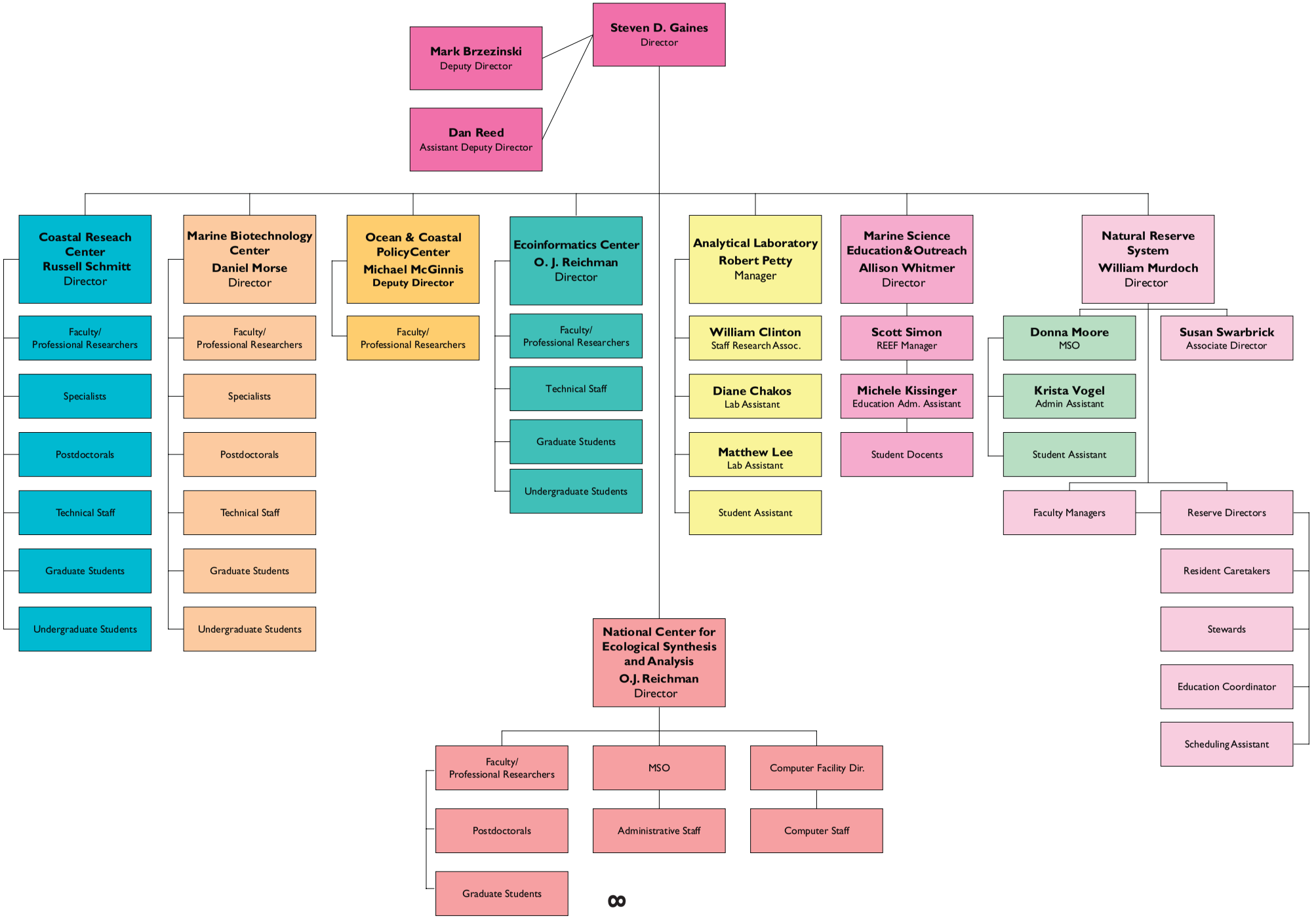
MARINE SCIENCE INSTITUTE

2005–2006 ORGANIZATIONAL CHART



MARINE SCIENCE INSTITUTE

2005–2006 ORGANIZATIONAL CHART



Other Projects & Activities

Seminars, Workshops, Conferences, and Meetings

The Marine Science Institute continues to support various seminars, workshops, conferences and meetings. During the 2005-2006 fiscal year 125 events took place, in which a wide range of marine science topics were highlighted.

Dates	Coordinator	Topic
July 5-9, 11, 13, 2005	Allison Whitmer Scott Simon	Marine Science Instutite, K-12 Outreach Program
July 6-August 2, 2005	John Alroy	Paleobiology Database: Summer Course (Hosted by NCEAS)
July 9-16, 2005	Evgeny Zilov* Marianne Moore* Stephanie Hampton	The 60-year data set of plankton dynamics in Lake Baikal: Examining facets of the jewel of Siberia
July 25-29, 2005	O. J. Reichman	Knowledge and capacity-building to support ecosystem-based management for sustainable coastal-marine systems (EBM)
July 26-27, 2005	Satie Airame	Partnership for Interdisciplinary Studies of Coastal Oceans
August 13-14, 2005	John Alroy	Paleobiology Database: Advisory Board (Hosted by NCEAS)
August 15-16, 2005	Ben Halpern Kimberly Selkoe Hunter Lenihan Fiorenza Micheli*	Putting ocean wilderness on the map: Building a global GIS atlas of pristine marine environments
August 15-18, 2005	John Alroy	Paleobiology Database: Marine Invertebrates (Hosted by NCEAS)
August 18-21, 2005	Margaret Palmer* J. David Allan*	A synthetic analysis of the scientific basis of ecological restoration of stream ecosystems
August 24, 2005	Allison Whitmer	San Roque School Marine Program
August 25, 2005	Daniel Reed	San Onofre Nuclear Generating
August 26, 2005	Stephen Schroeter	Station Mitigation Project Monitoring Program
September 7-9, 2005	O. J. Reichman	NCEAS Scientific Advisory Board Meeting
September 9-12, 2005	Mark Wilson* Leslie Real*	Global change and infectious disease
September 9-11, 2005	John Alroy	Paleobiology Database: Vertebrate Paleontology (Hosted by NCEAS)
September 16, 2005	Allison Whitmer	San Roque School Marine Program

* Non-UCSB personnel

September 24, 2005	Robert Warner	Channel Islands National Marine Sanctuary: Research Activities Panel
September 20-21, 2005	Michael Willig*	High Performance Computing Conference, National Science Foundation (NSF) (Hosted by NCEAS)
September 21-25, 2005	Gary Mittelbach* Howard Cornell* Douglas Schemske*	Gradients in biodiversity and speciation
September 22-24, 2005	John Moore* Quan Dong*	Detritus and dynamics of populations, food webs and communities
September 23, 2005	Allison Whitmer	San Roque School Marine Program
September 26-29, 2005	Peter Kareiva Taylor Ricketts* Gretchen Daily* Stephen Polasky*	Conservation priorities: Can we have our biodiversity and ecosystem services too?
September 26-30, 2005	Matthew Jones Mark Schildhauer James Beach* Bertram Ludaescher* William Michener*	Science Environment for Ecological Knowledge (SEEK) (Hosted by NCEAS)
September 30-October 2, 2005	John Alroy	Paleobiology Database: Taphonomy (Hosted by NCEAS)
October 3-7, 2005	Jonathan Shurin Helmut Hillebrand* Daniel Gruner*	Comparing trophic structure across ecosystems
October 6, 2005	EcoLunch Seminar Series	Jim Regetz: The ups and downs of Chinook salmon populations in the Pacific Northwest: understanding patterns of variation (Seminar)
October 7-9, 2005	Sandy Andelman	Tropical Ecology, Assessment, and Monitoring (TEAM) Monitoring Meeting, Conservation International (CI) (Hosted by NCEAS)
October 5-7 & 10-14, 2005	Allison Whitmer	San Roque School Outreach Program
October 10-12, 2005	Charles Mitchell* Alison Power*	The roles of natural enemies and mutualists in plant invasions
October 13, 2005	EcoLunch Seminar Series	Janneke Hille Ris Lambers: Effects of global change on plant seed production and the benefits of using hierarchical Bayesian statistics for ecological analyses (Seminar)
October 13, 2005	Russell Schmitt	Moorea Coral Reef LTER Executive Committee Planning Meeting
October 14, 2005	Langdon Quetin	Dive Control Board Meeting

* Non-UCSB personnel

October 16-20, 2005	Dov Sax Steven Gaines Jay Stachowicz*	Exotic species: A source of insight into ecology, evolution, and biogeography
October 18. 2005	EcoLunch Seminar Series	Phill Cassey: Human induced species turnover : a series of island bird case studies (Seminar)
October 21, 2005	Daniel Reed Stephen Schroeter	SONGS Mitigation Program and California Coastal Commission
October 21-26, 2005	Rebecca Shaw*	Global climate change and adaptation of conservation priorities (Hosted by NCEAS)
October 25, 2005	EcoLunch Seminar Series	Elsa Cleland: Reducing invasion in roadside restoration: the role of native plant community composition and nitrogen availability (Seminar)
November 2, 2005	Allison Whitmer	Planning for Education and Outreach at MSI
November 2-5, 2005	Jason Hoeksema* Nancy Johnson* James Umbanhowar*	Narrowing the gap between theory and practice in mycorrhizal management
November 6-9, 2005	William Morris* Christine Pfister* Shripad Tuljapurkar*	Stochastic demography for an increasingly variable world
November 10, 2005	EcoLunch Seminar Series	Drew Allen: Kinetic effect of temperature on rates of genetic divergence and speciation (Seminar)
November 10-14, 2005	Robin Chazdon* Daniel Griffith* Gretchen Daily	Biodiversity and conservation value of agricultural landscapes of Mesoamerica
November 17, 2005	EcoLunch Seminar Series	David Stockwell: A critique of the use of ecological niche models in climate-induced species extinction and dendroclimatology studies (Seminar)
November 17-20, 2005	Gail Osherenko Elliott Norse* Larry Crowder* Oran Young Satie Airame	Ecosystem-based management for the oceans: The role of zoning
November 28-29, 2005	Russell Schmitt Sally Holbrook	Moorea Coral Reef LTER All Scientists Meeting
December 2, 2005	Allison Whitmer	Richard Hutton: Strange Days on Planet Earth (Seminar/Discussion)
December 4, 2005	EcoLunch Seminar Series	John Orrock: Some ecological and evolutionary consequences of landscape connectivity (Seminar)
December 4-7, 2005	Kim Cuddington* Jeb Byers*	Habitat modification in conservation problems: Modeling invasive ecosystem engineers

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December 6, 2005	Allison Whitmer	Michael Hanrahan: Ocean Channel
December 8, 2005	EcoLunch Seminar Series	Mark Ritchie: Organizaton vs. power: thermodynamic strategies of plants in response to resource enrichment and herbivory (Seminar)
December 9-12, 2005	Rafe Sagarin*	Ecological and evolutionary models for homeland security strategy
December 9-13, 2005	John Alroy	Paleobiology Database: Paleobotany (Hosted by NCEAS) Assessment Tool (U-BAT)
December 12-13, 2005	James Case	An Underwater Bioluminescence Working Group
December 12-16, 2005	Evan Preisser* Daniel Bolnick*	When, and how much, does fear matter? Quantitatively assessing the impact of predator intimidation of prey on community dynamics
December 15, 2005	EcoLunch Seminar Series	Peter Abrams: Competition and coevolution of specialists and generalists in fluctuating environments: A theoretical analysis (Seminar)
December 31-January 7, 2006	Evgeny Zilov* Marianne Moore* Stephanie Hampton	The 60-year data set of plankton dynamics in Lake Baikal: Examining facets of the jewel of Siberia
January 9-13, 2006	Claire Kremen* Neal Williams*	Restoring an ecosystem service to degraded landscapes: Native bees and crop pollination
January 10, 2006	EcoLunch Seminar Series	Kim Selkoe: Linking population genetics with population ecology: an investigation of connectivity for a coastal marine fish at large and small scales (Seminar)
January 10, 2006	Daniel Morse	Alan Lowe, University of Cambridge Seminar
January 11, 2006	Will McClintock	Marine Life Protection Act Initiative
January 17-20, 2006	T. Douglas Beard*	NBII/GAP Meeting (Hosted by NCEAS)
January 19, 2006	EcoLunch Seminar Series	Allen Hurlbert: Resource-based determinants of species richness: testing species-energy theory with birds and flies (Seminar)
January 19, 2006	Robert Warner	Channel Islands Marine Science Committee and Channel Islands National Marine Sanctuary Research Activities Panel
January 23-26, 2006	William Murdoch Susan Swarbrick	Natural Reserve System, Annual Reserve Director's Meeting

* Non-UCSB personnel

January 24, 2006	Kim Selkoe Steven Gaines	Population Connectivity of Coastal Fishery Species across the California-Mexico International Border – Planning Meeting
January 24-27, 2006	Jonathan Losos*	Comparative study of adaptive radiation
January 25, 2006	Tim Schmidt Susan Swarbrick	Dan Dawson and Andrew Brooks: NRS Activities at SNARL and Carpinteria Salt Marsh
January 26, 2006	EcoLunch Seminar Series	Robert Ricklefs: Connections that shape the life histories of birds (Seminar)
January 28-30, 2005	Margaret Palmer* J. David Allan*	A synthetic analysis of the scientific basis of ecological restoration of stream ecosystems
January 29-February 1, 2006	Fiorenza Micheli* Andrew Rosenberg*	A synthetic approach to the science of ecosystem-based management of coastal marine ecosystems (EBM)
February 6-10, 2006	Robert Orth* William Dennison*	Global trajectories of seagrasses: Establishing a quantitative basis for seagrass conservation and restoration
February 7-8, 2006	Barbara Benson*	LTER Information Management Executive Committee Meeting (Hosted by NCEAS)
February 8-12, 2006	Allison Whitmer	LTER Planning Grant Committee and Advisory Committee Meeting (Hosted by NCEAS)
February 9-10, 2006	Allison Whitmer	LTER Network Workshop
February 11, 2006	Allison Whitmer	Saturdays with Scientists Program with Los Angeles City Youth
February 13-14, 2006	Andrew Dobson* O. J. Reichman	Ecology and Health (Hosted by NCEAS)
February 17, 2006	Travis Longcore* Shawna Dark* Cristina Sandoval	Meta-analysis of management and monitoring data of endangered species: Status and trends of Western Snowy Plover on California's Central Coast
February 17-20, 2006	Boris Worm* Enric Sala*	Linking marine biodiversity to ecosystem functions and services
February 21-23, 2006	Peter Kareiva Taylor Ricketts* Gretchen Daily* Stephen Polasky*	Conservation priorities: Can we have our biodiversity and ecosystem services too?
February 24-25, 2006	William Freudenburg	Santa Barbara Summit on Environmental Studies
March 1, 2006	O. J. Reichman	NCEAS Scientific Advisory Board Meeting

* Non-UCSB personnel

March 3-6, 2006	Daniel Doak* James Estes* Tim Wootton* Terrie Williams*	Conservation planning for ecosystem functioning: Testing predictions of ecological effectiveness for marine predators (EBM)
March 8-17, 2006	O. J. Reichman	A unified framework for management and dissemination of heterogeneous data and metadata from Kruger National Park (Hosted by NCEAS)
March 13-14, 2006	Qianlai Zhuang* Jerry M. Melillo* Ronald G. Prinn* A. David McGuire*	Toward an adequate quantification of CH4 emissions from land ecosystems: Integrating field and in-situ observations, satellite data, and modeling
March 13-15, 2006	Pamela Templer* Michelle Mack* Knute Nadelhoffer*	The fate of nitrogen inputs to terrestrial ecosystems
March 16-17, 2006	Steven Gaines	Oiled Wildlife Care Network Advisory Board Meeting
March 17-19, 2006	Mark Harmon*	Analysis of long-term litter decomposition experiments: Synthesis at the site, regional, and global levels
March 20-22, 2006	Allison Whitmer	Santa Barbara County Science Fair
March 20-25, 2006	Mark Urban* Mathew Leibold*	Evolutionary and ecological sorting in space
March 22-23, 2006	Steven Gaines Tim Schmidt	Marine Science Institute External Review Committee Meetings
March 24-27, 2006	Elsa Cleland*	Fertilization Synthesis (Hosted by NCEAS)
March 28-30, 2006	Christopher B. Field* Josep Canadell*	Vulnerability of carbon in permafrost: Pool size and potential effects on the climate system
April 3-7, 2006	Jonathan Shurin* Helmut Hillebrand* Daniel Gruner*	Comparing trophic structure across ecosystems
April 19, 2006	Allison Whitmer	Sedgwick Docent Training, LACC
April 20, 2006	Tim Schmidt	Milton Love: The Secret Lives of Fish (Seminar)
April 20, 2006	EcoLunch Seminar Series	Egbert Leigh: The role of mathematical theory in tropical forest ecology (Seminar)
April 18-21, 2006	Gary Mittelbach* Howard Cornell* Douglas Schemske*	Gradients in biodiversity and speciation

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April 20, 2006	Jennifer Caselle	CRANE: Cooperative Research and Assessment of Nearshore Ecosystems, California Department of Fish & Game
April 22-23, 2006	Scott Simon	Outreach Program
April 23-27, 2006	Stefan A. Schnitzer* Robyn J. Burnham*	Lianas and tropical forest dynamics: Synthesis of Pan-tropical patterns from regional data sets
April 27, 2006	EcoLunch Seminar Series	James Bever: Movement underfoot and the dynamics of plant communities (Seminar)
April 27-May 2, 2006	Jason Hoeksema* Nancy Johnson* James Umbanhowar*	Narrowing the gap between theory and practice in mycorrhizal management
May 1-4, 2006	Christoper Lortie* Lonnie Aarssen* Julia Koricheva* Tom Tregenza*	A quantitative exploration of the role of publication-related biases in ecology
May 4, 2006	EcoLunch Seminar Series	Forest Rohwer: Viruses, microbes and coral reefs (Seminar)
May 5-8, 2006	Julia Koricheva* Jessica Gurevitch*	Meta-analysis in ecology: Lessons, challenges and future
May 7-10, 2006	Kim Cuddington* Jeb Byers*	Habitat modification in conservation problems: Modeling invasive ecosystem engineers
May 11, 2006	EcoLunch Seminar Series	Bill Fagan: Dynamic consequences of growth rate variation: Lessons from Mount St. Helens and beyond (Seminar)
May 9-15, 2006	Diane W. Davidson*	Ecological stoichiometry and the temporal dynamics of arthropods
May 14-21, 2006	Sandy Andelman	Kruger National Park and NCEAS collaboration on the KNB (Hosted by NCEAS)
May 18, 2006	EcoLunch Seminar Series	John Alroy: Limits to diversity in the fossil record of marine animals (Seminar)
May 18, 2006	Jennifer Caselle	Channel Islands Marine Science Committee
May 25, 2006	EcoLunch Seminar Series	Nancy Baron: Journalists are from Venus, Scientists are from Mars: Bridging the Worlds of Science and Journalism (Seminar)
May 25-26, 2006	Daniel Morse	BiMat-URETI NASA Workshop
June 1, 2006	EcoLunch Seminar Series	Carrie Kappel: Conservation of biodiversity and ecological function in coral reef seascapes of the Bahamas archipelago (Seminar)

* Non-UCSB personnel

June 1, 2006	Daniel Reed	Santa Barbara Coastal LTER Annual Meeting
June 1, 2006	Langdon Quetin	Dive Control Board Meeting
June 8, 2006	EcoLunch Seminar Series	Marcelo Aizen: The tropical heritage of the temperate forest of southern South America is reflected in leaf margins (Seminar)
June 9-12, 2006	Robin Chazdon* Daniel Griffith* Gretchen Daily*	Biodiversity and conservation value of agricultural landscapes of Mesoamerica
June 11-14, 2006	Jeff Houlahan* C. Scott Findlay* David Currie*	Spatial and temporal community dynamics: Sharing data to answer questions
June 12-13, 2006	Gail Osherenko	Climate Impacts on Top Oceanic Predators – Social Science Working Group
June 19-23, 2006	Gail Osherenko Elliott Norse* Larry Crowder* Oran Young Satie Airame	Ecosystem-based management for the oceans: The role of zoning
June 20, 2006	EcoLunch Seminar Series	Chris Naylor: Conservation the Lebanon, the Middle East (Seminar)
June 26-30, 2006	Daniel Reed Allison Whitmer Jennifer Caselle Steven Gaines	7th International Temperate Reefs Symposium
June 27-30, 2006	Mark Harmon*	Analysis of long-term litter decomposition experiments: Synthesis at the site, regional, and global levels
June 27-July 24, 2006	John Alroy	Paleobiology Database: Summer Course (Hosted by NCEAS)
June 29, 2006	Steven Gaines	Sustainable Fisheries Meeting

* Non-UCSB personnel

Coastal Research Center

The Coastal Research Center is an organizational unit within the Marine Science Institute at UCSB. The central theme of the Center is to develop scientific knowledge to gain a more complete understanding of coastal and island ecosystems, which is necessary for sound management of the natural resources within coastal and island regions. The Center links academic scientists from a wide variety of disciplines, enhancing the ability to address marine environmental issues.

While CRC scientists work in marine environments throughout the world, much effort is focused on coastal, sub-tidal, rocky reefs found in the Santa Barbara Channel region and the coral reefs surrounding the island of Moorea, French Polynesia. These two locations provide excellent model systems for the scientific exploration of a wide range of marine issues and scientists at UCSB have long valued these environments as natural laboratories for scientific study. Both areas are enjoyed by those seeking recreation, support important local fisheries and are faced with growing conflicts amongst different user groups as human population pressures increase; a trend that is common for many marine environments. The nearshore marine environments of California and the islands of French Polynesia are used increasingly as a disposal site for waste products. Renewed exploitation of oil and natural gas reserves has augmented the number of conflicting demands placed upon the Channel resources, while issues related to global climate change have increased concerns about the sustainability of coral reef ecosystems. Local issues related to the sustainability of commercial and sport fisheries in both regions mirror global concerns regarding management of exploited stocks. The cumulative effects of human activities on the natural resources of both of these regions are just beginning to be understood. It is imperative that we learn how to balance the multiple uses of nearshore ocean waters in an environmentally sound manner. Lessons learned by scientists in the Coastal Research Center have wide implications for understanding and resolving present and future problems, and will help local, regional and national regulators develop better management policies.

Development of sound management plans for areas such as the Santa Barbara Channel or the islands of French Polynesia is hampered by scientific uncertainty about the consequences of human activities. To understand and predict natural and anthropogenic disturbances, synthesis of new and existing knowledge of many scientific aspects of coastal marine systems - including biology, ecology, genetics, geology, chemistry and oceanography - will be necessary. Further, the development of new approaches and the use of emerging technologies are needed to resolve fundamental questions, some of which have remained unanswered for many years. Only with these advances will it be possible to make reliable predictions about the consequences of various activities, to develop the ability to restore degraded habitats and conserve valuable resources, and to foster development of environmentally sound policies for use of coastal or island regions in general.

The Center has four major objectives:

- To act as a center for production and integration of basic scientific information to more fully understand coastal and island ecosystems and their natural and exploited populations.
- To evaluate and predict effects of human activities on the marine environment, and to develop measures to ameliorate lost or degraded natural resources.
- To train students in basic research on marine environmental issues that may be applicable to decision-makers.
- To facilitate and promote interdisciplinary research initiatives.

Faculty/Professional Research Participants: 2005-2006

Russell J. Schmitt, Director and Professor of Biology

Alice Alldredge, Professor of Biological Oceanography

Richard F. Ambrose, Associate Professor of Biology (UCLA)

Giacomo Bernardi, Associate Professor of Molecular Ecology (UCSC)

Andrew Brooks, Assistant Research Biologist

Mark Brzezinski, Professor of Biology

Alison Butler, Professor of Chemistry

Bradley Cardinale, Assistant Professor of Biology

Craig Carlson, Associate Professor of Biology

Robert C. Carpenter, Professor of Biology (CSU-Northridge)

Gary Cherr, Professor of Environmental Toxicology and Nutrition (UCD)

Joseph H. Connell, Research Professor of Zoology

Jenifer E. Dugan, Assistant Research Biologist

Peter J. Edmunds, Professor of Biology (CSU-Northridge)

John M. Engle, Associate Research Biologist

A. Russell Flegal, Professor of Environmental Toxicology (UCSC)

Steven D. Gaines, Professor of Biology

Ruth D. Gates, Assistant Research Biologist (University of Hawaii)

Scott Hodges, Associate Professor of Biology

Gretchen Hofmann, Associate Professor of Biology

Sally J. Holbrook, Professor of Biology

Evelyn Hu, Professor of Electrical and Computer Engineering

Ronald Iltis, Professor of Electrical and Computer Engineering

Robert Jacobs, Professor of Biology

Jennifer A. Jay, Assistant Professor of Civil and Environmental Engineering (UCLA)

Ryan Kastner, Assistant Professor of Electrical and Computer Engineering

Michael I. Latz, Research Biologist, (Scripps - UCSD)

David Lea, Professor of Geology

Hua Lee, Professor of Electrical and Computer Engineering

James J. Leichter, Assistant Professor of Oceanography, (Scripps -UCSD)

Hunter Lenihan, Assistant Professor of Environmental Science

Milton Love, Research Biologist

Sally MacIntyre, Professor of Limnology and Oceanography

Stéphane Maritorena, Assistant Researcher

John Melack, Professor of Biology

Daniel Morse, Professor of Biology

Erik Muller, Assistant Research Biologist

Roger M. Nisbet, Professor of Biology

Steven Murray, Professor of Biology (CSU-Fullerton)

Henry M. Page, Assistant Research Biologist

Brian Palenik, Associate Professor of Marine Biology (SIO-UCSD)

Peter T. Raimondi, Associate Professor of Biology (UCSC)

Daniel C. Reed, Research Biologist

Volkan Rodoplu, Assistant Professor of Electrical and Computer Engineering

Daniel Schlenk, Professor of Aquatic Ecotoxicology (UCR)

Stephen C. Schroeter, Research Biologist

David Sedlak, Associate Professor of Civil and Environmental Engineering (UCB)

Mary Silver, Professor of Biology (UCSC)

Mark Steele, Associate Researcher (CSU-Northridge

Hannah Stewart, Postdoctoral Researcher

Allan Stewart-Oaten, Professor of Biology

Bradley Tebo, Professor of Marine Microbiology, (Scripps - UCSD)

David Valentine, Assistant Professor of Geological Sciences

Libe Washburn, Professor of Geography

Allison Whitmer, Research Biologist

Susan Williams, Professor of Environmental Science and Policy (UCD)

Leslie Wilson, Professor of Biology

EcoInformatics Center

Profound amounts of research directed toward identifying and understanding the natural world have been conducted, leading to the acquisition of monumental amounts of information. Yet, virtually none of that information is readily available to users, *including those who gathered it*. The lack of ready access to information is not surprising when considering the vast history of science or even the period since the dawn of the discipline of ecology barely 80 years ago. But it is also true for information garnered within the lifetime of the youngest ecologist, or even within the last five years. In fact, it will be true tomorrow for data gathered today. The unfortunate circumstance is that despite many years and dollars spent in pursuit of useful information about the environment, even the simplest forms of communication between providers and users of the information is impossible. Environmental data are highly distributed and exist in extremely heterogeneous forms. As a result, ecologists are now limited not only by a lack of information, but also by an inability to access the vast amount of information that exists.

The EcoInformatics Center (EIC) was established in July 2003 to address this situation by making what is already known available to potential users, from students and scientists to resource managers, regional planners, and policy makers. The EIC, which leverages information that is already available into understanding and knowledge, involves both the technical and human aspects of data acquisition, sharing, and utilization.

The EIC resides under the Marine Science Institute and is a partner Center to the National Center for Ecological Analysis and Synthesis (NCEAS). Approaches developed at NCEAS will be used to identify, develop, and test emerging concepts, technologies, and software.

The Mission of the EIC is:

- Develop and employ cutting edge technology to generate an Ecological Information Access System to locate and utilize the dispersed and heterogeneous information that characterizes data pertinent to ecological and environmental issues.
- Extend core data-access capability to develop and distribute contemporary information tools for scientists, students, conservationists, resource managers, policy makers, and planners.

To accomplish this mission, the EIC is composed of the following elements:

1. Research on tools to promote data acquisition, distributed access, and long term storage and archiving.
2. Analyses of the cultural and sociological aspects of information sharing
3. Training of students and scientists in the use of data management tools

Information is the raw material of knowledge. The research enterprise is designed to generate information – data – and facilitate its incorporation into higher order understanding and true knowledge of the system under consideration. Information has accumulated in a somewhat haphazard way for centuries. In certain focused areas, such as medicine, basic information has been turned into operational outcomes (diagnoses, treatments, pharmaceuticals) that have benefited humans. However, the geometric increase in information, and its availability in machine form, have made the amount of accessible information overwhelming; unfortunately it has not led to a commensurate increase in knowledge in most fields.

This is particularly true for ecological information, which is important for advancing the basic understanding of natural systems and for making wise management and policy decisions about natural resources. Within the universe of information, ecological data may be as dispersed and heterogeneous as any of interest to scientists and other users. Decisions commonly rely on integrating data as diverse as climatological records, spatial distributions of individuals, changes in biodiversity over space and time, responses of species to experimental manipulations, genetic structure of populations, patterns

of human alterations of ecosystems, and much more. The scope of information needed to understand ecological systems is enormous.

Ecological information is inherently diverse, and it grows more diverse each day as new types of relevant information emerge. As a result, a database designed for today would be exceedingly complex, and it would be outdated long before it could ever be developed. Thus, the environment needs a different data management model that provides generic access to information in place of a uniform database structure. Rather than standardizing inputs and outputs, the solution lies in an approach analogous to the Internet that standardizes how information is characterized (through metadata, or information about the data itself). Information, once characterized with metadata, can be made accessible in context-dependent ways that are both comprehensive and efficient. The key tools are an efficient, flexible, and standardized way to describe ecological information, and a powerful information searching capability.

An EcoInformatics Model – Given the need to understand the natural world, including our place in it and influence on it, it is imperative to develop generic solutions that provide access to the broad array of environmentally pertinent data. This is an extraordinarily difficult task given what is arguably the most dispersed and heterogeneous suite of information of interest to scientists, resource managers, policy makers, planners, students, and teachers. Understanding complex ecological and environmental issues requires information across many scales and disciplines, from the molecular level to whole organisms and from genetics to global change.

To make environmental information available in a useful form to many communities of users will require a major effort that coordinates both technological and cultural aspects of information sharing. Accordingly, the EcoInformatics Center has been established, with its three primary research and implementation goals of developing technological tools, an understanding of information sharing, and education in the implementation of data management tools.

The primary faculty and research scientists associated with the Center include:

Dr. Richard Appelbaum, Department of Sociology and Director, Institute for Social, Behavioral, and Economic Research
Dr. Steven Gaines, Department of Ecology, Evolution, and Marine Biology and Director, Marine Science Institute
Matt Jones, Database and Information Specialist, National Center for Ecological Analysis and Synthesis
Chris Jones, Information Systems Coordinator, Marine Science Institute
Dr. Dan Reed, Research Biologist, Marine Science Institute
Dr. O. J. Reichman, Department of Ecology, Evolution, and Marine Biology and Director, National Center for Ecological Analysis and Synthesis
Dr. Mark Schildhauer, Director of Computing, National Center for Ecological Analysis and Synthesis
Dr. Robert Warner, Department of Ecology, Evolution, and Marine Biology

Marine Biotechnology Center

UCSB is recognized internationally for its leadership in Marine Biotechnology. This exciting field uses the latest breakthroughs in modern molecular biology, genetic engineering and cell science to solve basic problems in marine resource biology; to improve the production of medical, chemical, food, and energy resources from the ocean; and to develop new products and industries based on more efficient use of the ocean's resources.

The Marine Biotechnology Center is unique in the University of California system. It helps coordinate fifteen different research programs in this area at UCSB, and helps obtain funding for the vitally needed practical training of advanced students and professionals to help meet the future needs and changing requirements of the nation's marine and biotechnology industries. Close interactions with California's biotechnology, aquaculture and pharmaceutical industries provide new products and highly trained scientific personnel to the industrial sector, and provide support from industry for research and training in the University. The state-of-the-art Marine Biotechnology Laboratory Building - the first such facility of its kind in the United States - provides facilities needed to accommodate the rapid growth of research and teaching in Marine Biotechnology on the campus.

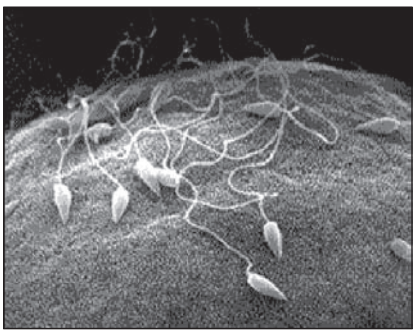
Research and training in Marine Biotechnology are focused at UCSB in three inter-related areas: (1) the development of new methods and approaches from molecular and cellular biology to investigate the basic mechanisms controlling life in the oceans and its responses to environmental change; (2) the development of new industries, resources and products from the oceans; and (3) the use of marine organisms as models for biomedical research. Recent progress in these areas is summarized below.

UCSB scientists are using the tools of biotechnology to unravel the ocean's mysteries in environments as diverse as the Antarctic, tropical seas and reefs, the great ocean depths, and California's resource-rich coastline. These investigations include pioneering studies of the molecular mechanisms of photosynthesis and carbon dioxide fixation by the ocean's phytoplankton, effects on these processes caused by the depletion of ozone in the Antarctic atmosphere, and effects of global warming, pollution and other environmental changes. UCSB scientists and students have discovered receptor molecules and chemical signals that control life in the ocean. The discovery of these signals, and of the receptors, transducing molecules and genes that respond to these signals, has shed new light on the underlying processes regulating the reproduction, development and growth of species ranging from tropical corals to valuable marine resources (urchins and abalones) in California waters and around the world.

Researchers in the Marine Biotechnology Center are developing the tools and techniques of molecular and cellular biology to better understand the biodiversity of marine organisms, and how they affect, and are affected by, physical, chemical and geochemical oceanic processes. Marine biota, particularly the microscopic plankton, are dominant mediators of geochemical change on Earth, yet the genetic diversity, abundance and function of these microorganisms in complex communities is still not completely understood. Researchers at the Marine Biotechnology Center are developing new ways to monitor these microscopic communities, and are discovering previously unsuspected diversity and population structure in globally distributed marine microbial populations. These studies are helping to reveal the influence of microorganisms on global biological and geochemical cycles, and are also providing the tools and baseline data necessary for realistically assessing the impacts of man-made and naturally-occurring environmental change. In addition, the recognition of previously unrecognized marine biodiversity is providing a rich resource for new development of biotechnological products and processes. Several teams are involved in an international effort to annotate the genome of the California purple sea urchin, an organism that serves as an excellent biomedical model system as well as being an integral component of the marine benthic community. Sea urchin genome consortium members at UCSB are helping to develop bioinformatic and functional genomic technologies that can be applied to genomic analyses of other marine organisms as well.

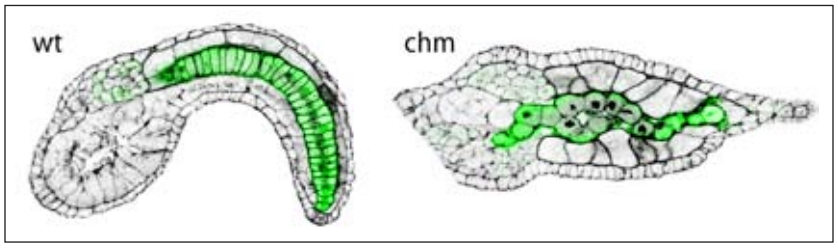
Research at UCSB in the development of new products and industries from marine resources has led to the discovery of promising new diagnostic and therapeutic agents for diseases including cancer, arthritis, epilepsy and Alzheimer's disease, and the development of powerful new enzyme catalysts, novel bioadhesives, and marine microorganisms capable of degrading and detoxifying chlorinated hydrocarbons and other pollutants. Members of the Marine Biotechnology Center are working with researchers in Chemistry, Physics and Engineering through UCSB's new Army-supported Institute for Collaborative Biotechnologies, and through the NSF-sponsored National Materials Research Laboratory, the California NanoSystems Institute and NASA's Biomolecular Materials program to develop valuable new materials based on the structures made by marine organisms which exhibit exceptional strength, resiliency, hardness and enhanced electrical and optical performance. With the help of the marine biotechnologists' skills in genetic and protein analysis and engineering, and close collaborations with colleagues in Chemistry, Physics and Engineering, the fundamental molecular structures and mechanisms underlying the enhanced performance of these natural materials made by marine organisms are being revealed, and translated into practical engineering solutions for the development of novel advanced materials. Teams are working with experts in the Department of Electrical and Computer Engineering to harness the mechanisms of low-temperature catalysis and molecular recognition of proteins that direct biomineralization in marine organisms to help direct the nanoscale fabrication of ultra-small crystals used for magnetic information storage and semiconductors, to help reduce the size and defect-density of electronic components, and to make new photovoltaic materials with improved efficiency to harness the sun's energy. A new generation of tough, water resistant adhesives and coatings has been inspired by sessile intertidal invertebrates, and the fangs and beaks of marine polychaetes and squids are the pointing the way to new lightweight polymeric materials with the hardness and wear resistance usually associated with ceramics. Research aimed at practical applications with economic value also has led to improvements in the economic efficiency and yield of cultivation of valuable marine fish, shellfish and plants grown for food and pharmaceuticals. These findings have led directly to the growth of new and "environmentally friendly" industries in Santa Barbara that now are producing abalones, urchins and marine algae using innovations in aquaculture technology developed at UCSB.

Research using marine organisms as model systems for biomedical research has led to a host of new and far-reaching discoveries at UCSB. Many marine invertebrates, because of their relatively simple design, and the ease of their maintenance and analysis in the laboratory, have provided a rich source of new information and serve as desirable, non-mammalian models for research. A major area of emphasis is in regard to the genetic control of normal development and of tumor formation. Professor Kathleen Foltz and her students make use of marine model systems to investigate fundamental questions of reproductive biology and early development. They discovered that the molecular recognition processes controlling oocyte maturation and fertilization are highly conserved across species; information gained from studying the eggs and embryos of many marine invertebrates (such as sea urchins, sea stars and sea squirts) can be applied to other animals, including mammals. Over the past year, this research group has been actively involved in the Genome Project for the California Purple Sea Urchin, Strongylocentrotus purpuratus. Their team is part of an international consortium, coordinated through the Human Genome Sequencing Center at Baylor College of Medicine, that has completed the first echinoderm genome sequence. The information gained from this genome project is being used to identify and understand the gene networks that regulate early development, and to investigate the evolutionary underpinnings of animal development. The Foltz research team is using the genomic information to describe the egg "proteome" – the identification of all of the proteins present in the egg – and to study their regulation in the first few minutes of fertilization and during early development. Using a functional proteomics approach, nearly 250 sea urchin egg proteins that undergo modifications at fertilization have been identified. Most of these proteins are conserved in mammals and thus may provide insight into fertility and contraception.



High-magnification electron micrograph of sea urchin sperm fertilizing an egg.

Professor William Smith and his students are pioneers in the study of chordate developmental biology using the ascidian ("sea squirt") as a model organism. Ascidians are invertebrate members of the chordate phylum, and are the closest living relatives of the vertebrates. However, despite their kinship with the vertebrates, the ascidians have many features that are more like those found in invertebrate model organisms such as worms and insects, including a small genome, and a simple embryo that develops according to an invariant cell lineage. Professor Smith and his group have used two locally abundant species of ascidians to identify the genes that are turned on sequentially to regulate the differentiation of the embryo into an adult. To help them with this identification, they've isolated mutants that disrupt the development of various tissues including the nervous system and notochord (the analog of the spinal cord in these animals). These mutants have helped them identify genes that code for proteins required for the normal development of the brain and other neuronal structures. In embryos bearing one of these mutations, the anterior neural tube fails to close - thus providing a model for one of the most common types of human birth defects. Their detailed genetic and developmental studies are revealing for the first time the pathways that orchestrate the differentiation, proliferation and migration of cells required to form the coherent tissues and defined structures of the nervous system. Their studies thus have established a tractable, simple marine animal model that is yielding remarkable insights into the molecular, genetic and cellular mechanisms that regulate tissue morphogenesis and assembly.



Confocal microscopic image of notochord cells (green) in normal (wt) and mutant ascidian embryos.

In addition, marine model systems have shed light on the mechanisms that nerve cells use to produce, store release and respond to chemical messengers and how the resulting regulation of these cells results in information processing, storage and memory. Many of these discoveries have had direct implications for human and other mammalian research. Professor J. Herbert Waite's laboratory studies the specialized teeth, fangs, beaks, spines, and claws of marine invertebrates that equip these animals for feeding, defense, and predation. Their studies in marine polychaetes, squids and snail egg capsules are providing insights into alternative strategies for making robust, tough, lightweight, and self-healing materials.

Close-up photograph of the jaws of a marine worm, discovered to owe their hardness and self-sharpening performance to unique metal constituents.

Another important area of research is water resistant adhesion. Water is the nemesis of practical adhesive bonding, yet the rocky intertidal seashore is home to a host of organisms that spend their lives attached to solid surfaces surrounded and assaulted by water and waves. Professor Waite and his students discovered that the amino acid known as Dopa is a key to the remarkable underwater adhesion in mussels and sand castle worms. In related studies, discoveries first made at UCSB on the biological mechanisms controlling the nanofabrication and toughness of the abalone shell have now been extended By Professor Paul Hansma and his students to human bone, with profound implications for diseases such as osteoporosis and arthritis.

Faculty/Professional Researcher Participants
Mark A. Brzezinski, Professor of Marine Biology
Alison Butler, Professor of Chemistry and Biochemistry
Craig A. Carlson, Associate Professor, Ecology, Evolution and Marine Biology
Bradley F. Chmelka, Professor of Chemical Engineering
Steven DenBaars, Professor of Electrical and Computer Engineering
Evelyn Hu, Director of the California NanoSystems Institute and Professor of Electrical and Computer Engineering
Kathleen R. Foltz, Professor of Molecular, Cellular and Developmental Biology
Paul K. Hansma, Professor of Physics
Kevin F. Lafferty, Research Biologist
Robert Jacobs, Professor of Pharmacology
Aileen N.C. Morse, Research Biologist
Daniel E. Morse, Director, Professor of Molecular Genetics and Biochemistry
William Smith, Professor of Molecular, Cellular and Developmental Biology
Galen D. Stucky, Professor of Chemistry and Biochemistry; Professor of Materials
Matthew Tirrell, Dean of the College of Engineering and Professor of Chemical Engineering
J. Herbert Waite, Professor of Molecular, Cellular and Developmental Biology
Leslie Wilson, Professor of Molecular, Cellular and Developmental Biology

National Center for Ecological Analysis and Synthesis

The National Center for Ecological Analysis and Synthesis (NCEAS) was created in May 1995 with funding from NSF, the State of California, and UCSB. The Center focuses on the use of collaborative and synthetic approaches to solve fundamental ecological and environmental problems, and emphasizes application of up-to-date analytical and informatics tools to existing data sets and the development of new modeling approaches. NCEAS is associated with the Marine Science Institute and is located in downtown Santa Barbara.

NCEAS staffing includes the Director (O. J. Reichman), Deputy Director (Stephanie Hampton), Director of Computing (Mark Schildhauer), Director of Ecosystem-Based Management (Erica Fleishman), and thirteen full- and part-time personnel, including eight administrative and five technical support staff.

The Science Advisory Board (SAB) of 19 eminent ecologists met September 7-8, 2005 and March 1-2, 2006 to review proposals and provide guidance on the Center's mission and research directions.

Research activities focus on working groups, sabbatical fellows, postdoctoral associates and graduate student internships. During the 2005-2006 fiscal year, NCEAS hosted 10 meetings and 63 working group meetings, involving a total of 886 visits by 658 different scientists. In addition, the Center hosted 11 Center Fellows (sabbatical visitors), 21 postdoctoral fellows, 17 graduate student interns and one undergraduate intern.

Several research areas have emerged as part of NCEAS activities, including analysis of large scale processes, complex population dynamics, disease ecology, ecological response to climate change, analysis of broad biogeographical patterns, development of new analytical and statistical methods, projects related to ecological conservation, restoration and resource management, and ecological informatics. Projects outside the core of ecology have grown, such as evolutionary and security strategies, and urban ecology.

The Ecosystem-Based Management (EBM) program, funded by the Packard Foundation, is prospering with the addition of 2 postdoctoral fellows and a program-dedicated Director. The EBM project involves the analysis and synthesis of existing data and development of new tools to address gaps in knowledge critical to successful implementation of ecosystem-based management.

NCEAS has become a leader in developing technical solutions to overcome obstacles related to the dispersed and heterogeneous nature of ecological data. The Center has collaboratively developed generic data access tools for analysis of ecological data by a broad user community. These ecoinformatics tools are being deployed in a number of settings. For details, see http://www.nceas.ucsb.edu/ecoinformatics.

Outreach efforts have increased at NCEAS. NCEAS released the first Call for Proposals for Distributed Graduated Seminars, which facilitate collaborative synthetic research among globally distributed students. In this program, NCEAS will recruit greater participation of Minority-Serving Institutions. Development of online ecological databases and information engages the scientific research and management community, and the Kids Do Ecology program is intended to enhance K-12 student appreciation of ecology and the scientific process.

NCEAS relies almost exclusively on the Internet to disseminate Center-related information and findings, in addition to the usual peer-reviewed publications. The Center receives e-mail at nceas@nceas.ucsb.edu, and our World Wide Web URL is http://www.nceas.ucsb.edu. The NCEAS home page provides interactive access to a large array of information, including summaries of current and pending research, descriptions of computing resources at NCEAS and elsewhere, funding and employment opportunities at NCEAS, ecological data archives, and NCEAS reports and publications.

Date	Coordinator	Number of Participants	Topic
July 6-August 2, 2005	John Alroy	17	Paleobiology Database: Summer Course (Hosted by NCEAS)
July 9-16, 2005	Evgeny Zilov Marianne Moore Stephanie Hampton	7	The 60-year data set of plankton dynamics in Lake Baikal: Examining facets of the jewel of Siberia
July 25-29, 2005	O. J. Reichman	3	Knowledge and capacity-building to support ecosystem-based management for sustainable coastal-marine systems (EBM)
August 13-14, 2005	John Alroy	13	Paleobiology Database: Advisory Board (Hosted by NCEAS)
August 15-16, 2005	Ben Halpern Kimberly Selkoe Fiorenza Micheli Hunter Lenihan	4	Putting ocean wilderness on the map: Building a global GIS atlas of pristine marine environments
August 15-18, 2005	John Alroy	12	Paleobiology Database: Marine Invertebrates (Hosted by NCEAS)
August 18-21, 2005	Margaret Palmer J. David Allan	11	A synthetic analysis of the scientific basis of ecological restoration of stream ecosystems
September 9-12, 2005	Mark Wilson Leslie Real	9	Global change and infectious disease
September 9-11, 2005	John Alroy	6	Paleobiology Database: Vertebrate Paleontology (Hosted by NCEAS)
September 20-21, 2005	Michael Willig	11	High Performance Computing Conference, National Science Foundation (NSF) (Hosted by NCEAS)
September 21-25, 2005	Gary Mittelbach Howard Cornell Douglas Schemske	20	Gradients in biodiversity and speciation
September 22-24, 2005	John Moore Quan Dong	7	Detritus and dynamics of populations, food webs and communities
September 26-29, 2005	Peter Kareiva Taylor Ricketts Gretchen Daily Stephen Polasky	19	Conservation priorities: Can we have our biodiversity and ecosystem services too?
September 26-30, 2005	Matthew Jones Mark Schildhauer James Beach Bertram Ludaescher William Michener	10	Science Environment for Ecological Knowledge (SEEK) (Hosted by NCEAS)

September 30-October 2, 2005	John Alroy	8	Paleobiology Database: Taphonomy (Hosted by NCEAS)
October 3-7, 2005	Jonathan Shurin Helmut Hillebrand Daniel Gruner	19	Comparing trophic structure across ecosystems
October 7-9, 2005	Sandy Andelman	8	Tropical Ecology, Assessment, and Monitoring (TEAM) Monitoring Meeting, Conservation International (CI) (Hosted by NCEAS)
October 10-12, 2005	Charles Mitchell Alison Power	5	The roles of natural enemies and mutualists in plant invasions
October 16-20, 2005	Dov Sax Steven Gaines Jay Stachowicz	21	Exotic species: A source of insight into ecology, evolution, and biogeography
October 21-26, 2005	Jonathon Cole Carlos Duarte Yves Praire	10	Integrating the aquatic with the terrestrial component of the global carbon budget
October 21-26, 2005	Rebecca Shaw	20	Global climate change and adaptation of conservation priorities (Hosted by NCEAS)
November 2-5, 2005	Jason Hoeksema Nancy Johnson James Umbanhowar	13	Narrowing the gap between theory and practice in mycorrhizal management
November 6-9, 2005	William Morris Christine Pfister Shripad Tuljapurkar	17	Stochastic demography for an increasingly variable world
November 10-14, 2005	Robin Chazdon Daniel Griffith Gretchen Daily	16	Biodiversity and conservation value of agricultural landscapes of Mesoamerica
November 17-20, 2005	Gail Osherenko Elliott Norse Larry Crowder Oran Young Satie Airame	15	Ecosystem-based management for the oceans: The role of zoning
December 4-7, 2005	Kim Cuddington Jeb Byers	8	Habitat modification in conservation problems: Modeling invasive ecosystem engineers
December 9-12, 2005	Rafe Sagarin	12	Ecological and evolutionary models for homeland security strategy
December 9-13, 2005	John Alroy	9	Paleobiology Database: Paleobotany (Hosted by NCEAS)
December 12-16, 2005	Evan Preisser Daniel Bolnick	15	When, and how much, does fear matter? Quantitatively assessing the impact of predator intimidation of prey on community dynamics

December 31-January 7, 2006	Evgeny Zilov Marianne Moore Stephanie Hampton	8	The 60-year data set of plankton dynamics in Lake Baikal: Examining facets of the jewel of Siberia
January 9-13, 2006	Claire Kremen Neal Williams	20	Restoring an ecosystem service to degraded landscapes: Native bees and crop pollination
January 17-20, 2006	T. Douglas Beard	18	NBII/GAP Meeting (Hosted by NCEAS)
January 24-27, 2006	Jonathan Losos	10	Comparative study of adaptive radiation
January 28-30, 2005	Margaret Palmer J. David Allan	6	A synthetic analysis of the scientific basis of ecological restoration of stream ecosystems
January 29-February 1, 2006	Fiorenza Micheli Andrew Rosenberg	17	A synthetic approach to the science of ecosystem-based management of coastal marine ecosystems (EBM)
February 6-10, 2006	Robert Orth William Dennison	13	Global trajectories of seagrasses: Establishing a quantitative basis for seagrass conservation and restoration
February 7-8, 2006	Barbara Benson	9	LTER Information Management Executive Committee Meeting (Hosted by NCEAS)
February 8-12, 2006	Ali Whitmer	7	LTER Planning Grant Committee and Advisory Committee Meeting (Hosted by NCEAS)
February 13-14, 2006	Andrew Dobson O. J. Reichman	13	Ecology and Health (Hosted by NCEAS)
February 17, 2006	Travis Longcore Shawna Dark Cristina Sandoval	9	Meta-analysis of management and monitoring data of endangered species: Status and trends of Western Snowy Plover on California's Central Coast
February 17-20, 2006	Boris Worm Enric Sala	11	Linking marine biodiversity to ecosystem functions and services
February 21-23, 2006	Peter Kareiva Taylor Ricketts Gretchen Daily Stephen Polasky	24	Conservation priorities: Can we have our biodiversity and ecosystem services too?
March 3-6, 2006	Daniel Doak James Estes Tim Wootton Terrie Williams	12	Conservation planning for ecosystem functioning: Testing predictions of ecological effectiveness for marine predators (EBM)

March 8-17, 2006	O. J. Reichman	4	A unified framework for management and dissemination of heterogeneous data and metadata from Kruger National Park (Hosted by NCEAS)
March 13-14, 2006	Qianlai Zhuang Jerry M. Melillo Ronald G. Prinn A. David McGuire	14	Toward an adequate quantification of CH4 emissions from land ecosystems: Integrating field and in-situ observations, satellite data, and modeling
March 13-15, 2006	Pamela Templer Michelle Mack Knute Nadelhoffer	18	The fate of nitrogen inputs to terrestrial ecosystems
March 17-19, 2006	Mark Harmon	9	Analysis of long-term litter decomposition experiments: Synthesis at the site, regional, and global levels
March 20-25, 2006	Mark Urban Mathew Leibold	11	Evolutionary and ecological sorting in space
March 24-27, 2006	Elsa Cleland	9	Fertilization Synthesis (Hosted by NCEAS)
March 28-30, 2006	Christopher B. Field Josep Canadell	15	Vulnerability of carbon in permafrost: Pool size and potential effects on the climate system
April 3-7, 2006	Jonathan Shurin Helmut Hillebrand Daniel Gruner	17	Comparing trophic structure across ecosystems
April 18-21, 2006	Gary Mittelbach Howard Cornell Douglas Schemske	13	Gradients in biodiversity and speciation
April 23-27, 2006	Stefan A. Schnitzer Robyn J. Burnham	18	Lianas and tropical forest dynamics: Synthesis of Pan-tropical patterns from regional data sets
April 27-May 2, 2006	Jason Hoeksema Nancy Johnson James Umbanhowar	14	Narrowing the gap between theory and practice in mycorrhizal management
May 1-4, 2006	Christoper Lortie Lonnie Aarssen Julia Koricheva Tom Tregenza	5	A quantitative exploration of the role of publication-related biases in ecology
May 5-8, 2006	Julia Koricheva Jessica Gurevitch	12	Meta-analysis in ecology: Lessons, challenges and future
May 7-10, 2006	Kim Cuddington Jeb Byers	8	Habitat modification in conservation problems: Modeling invasive ecosystem engineers

May 9-15, 2006	Diane W. Davidson William F. Fagan	11	Ecological stoichiometry and the spatial distributions and temporal dynamics of arthropods
May 14-21, 2006	Sandy Andelman	3	Kruger National Park and NCEAS collaboration on the KNB (Hosted by NCEAS)
June 9-12, 2006	Robin Chazdon Daniel Griffith Gretchen Daily	12	Biodiversity and conservation value of agricultural landscapes of Mesoamerica
June 11-14, 2006	Jeff Houlahan C. Scott Findlay David Currie	6	Spatial and temporal community dynamics: Sharing data to answer questions
June 19-23, 2006	Gail Osherenko Elliott Norse Larry Crowder Oran Young Satie Airame	16	Ecosystem-based management for the oceans: The role of zoning
June 27-30, 2006	Mark Harmon	10	Analysis of long-term litter decomposition experiments: Synthesis at the site, regional, and global levels
June 27-July 24, 2006	John Alroy	16	Paleobiology Database: Summer Course (Hosted by NCEAS)

Ocean and Coastal Policy Center

Ocean and coastal policy issues are becoming increasingly important in California, nationally, and internationally. The University of California, Santa Barbara is in a key position to make significant contributions in research and policy analyses of local, state, national, and international ocean management issues.

The need for programmatic attention on ocean and coastal policy in California has never been greater. California has one of the longest and most valuable coastlines in the nation. Offshore California, significant development of offshore resources takes place and the ocean and coastal zone are used, with increasing frequency, by a wide range of users - including offshore oil and gas extraction, recreation, marine transportation, fishing, and marine research. Offshore oil development and the attendant multiple-use controversies, in particular, have dramatized the need for better methods of ocean policy planning.

The Ocean and Coastal Policy Center (OCPC) is oriented toward problem-solving of significant coastal and ocean policy issues. Work at the center is interdisciplinary, involving perspectives from the different social science disciplines (broadly defined as political science, economics, law, history, anthropology, sociology, geography and aspects of environmental studies) and from the natural and physical sciences. In addition to interdisciplinary research, the Center engages in applied projects which directly relate research to specific marine policy problems. The OCPC is one of the few centers in California focusing on these issues.

Major themes of the center include:

- Coastal watershed management and ecosystem planning
- California marine and coastal policy
- Aquatic and marine biodiversity conservation policymaking
- Studies in ecological restoration

The OCPC has received support from the National Science Foundation, U.S. Department of the Interior, and other governmental agencies. The Center has also produced a "White Paper Series" that includes several essays devoted to ecological and policy-related activities of the Southern California Bight and associated coastal watersheds and wetlands. The special series is available on the center's webpage.

Academic Participants
Michael McGinnis, Deputy Director
Keith Clarke, Professor of Geography
Gail Osherenko, Research Scientist
Robert Wilkinson, Director, Water Policy Program
Oran Young, Professor of Environmental Science and Management

UC Natural Reserve System

The mission of the UC Natural Reserve System is to contribute to the understanding and wise management of the Earth and its natural systems by supporting university-level teaching, research, and public service at protected natural areas throughout California.

The University of California administers 35 natural reserves throughout the state which serve as outdoor classrooms and research laboratories for faculty, researchers, and college students in the field sciences and humanities. Community groups and K-12 classes also benefit from the reserve system through field trips and outreach programs. The reserves are natural areas that represent the ecological diversity of California. Most of the major habitats of California are included in the NRS. Each reserve is managed by a UC campus. UC Santa Barbara oversees seven of these reserve sites with habitats as diverse as coastal wetlands, coastal dunes, rocky intertidal, oak woodlands, grasslands, Monterey pine forest, island marine and terrestrial environments, and the mountain and Great Basin environments of the eastern Sierra. Unlike wilderness areas that are available for recreation, the University reserves are devoted entirely to teaching and research. The reserves serve as "living laboratories," where researchers, teachers, and students can pose questions of the natural world that can only be answered by studying the natural environment.

• **Carpinteria Salt Marsh Reserve** is a significant coastal wetland reserve located 20 miles east of UCSB. It consists of 120 acres of south coast estuary, mudflats, beach and intertidal habitats, providing areas for studies on wildlife and fisheries biology, botany, and ornithology (site of several endangered species).

Reserve Staff
Andrew J. Brooks. Reserve Director
William Rice, Faculty Advisor

• **Coal Oil Point Natural Reserve** is located on the West Campus of UCSB and is composed of 158 acres of vulnerable and valuable coastal dunes, coastal terrace, south coastal estuarine lagoon, vernal pools, mudflats, beach and rocky intertidal habitats. This reserve is an ideal location for studies of migratory shorebirds and waterfowl, estuarine plants and animals, water quality and the impacts of human activities on coastal environments. Because of its close proximity to the main campus, the Coal Oil Point Natural Reserve provides a unique and accessible research and teaching resource.

Reserve Staff
Cristina Sandoval, Resident Reserve Director
Carla D'Antonio, Faculty Advisor

• **Kenneth S. Norris Rancho Marino Reserve** lies along the Cambria coast. This 500 acre reserve offers access to giant kelp forests, as well as rocky shore, coastal terrace grassland, soft chaparral, and Monterey pine forest. Overnight facilities available.

Reserve Staff
Don Canestro, Resident Reserve Director
Steven Gaines, Faculty Advisor

• **Santa Cruz Island Reserve** comprises 46,020 acres of the largest and most topographically diverse of Southern California's offshore islands. It is located 24 miles offshore from Santa Barbara and facilitates research and teaching at all the northern Channel Islands, especially Santa Cruz Island. The reserve provides housing, laboratories, collections, information, and transportation for research and teaching on and around the island, and a GIS/database center.

Reserve Staff
Lyndal Laughrin, Resident Reserve Director
Sally J. Holbrook, Faculty Advisor

• **Sedgwick Reserve** is located less than one hour from the UCSB campus and is an excellent natural study area for classes in biology, botany, zoology, geography, geology, anthropology, agroecology, and environmental studies. Situated in the Santa Ynez Valley, the 5,860 acre reserve includes coast live oak forest, blue oak woodland, valley oak savannah, Ceanothus chaparral, coastal sage scrub, grassland, and willow riparian forest, plus a variety of wetland types, including vernal pools. The reserve's large size and environmental heterogeneity provide an exceptional opportunity for teaching and research on biodiversity and landscape ecology. The extensive repetition of small drainages, distinct geologic and soil regimes (including large areas of unique serpentines), and complete drainage systems make the site uniquely suitable for replicated experimental studies. At least one significant Chumash archeological site is located on the property.

Reserve Staff
Michael P. Williams, Resident Reserve Director
Joshua Schimel, Faculty Advisor

• **The Valentine Eastern Sierra Reserve** has two field sites in the Mammoth Lakes area, SNARL and Valentine Camp.

The Sierra Nevada Aquatic Research Laboratory (SNARL) is located on 51 acres of the eastern slope of the Sierra Nevada and is an ideal base for field research throughout the ecologically and geologically diverse eastern Sierra and Owens Valley. The reserve offers modern housing, including dormitory accommodations for short and long-term use by researchers and classes. Office space and laboratory facilities, including wet labs, controlled-environment rooms, chemistry and radio-isotope labs, and experimental stream channels, as well as meeting and classroom facilities, are offered on a year-around basis. An extensive GIS database, a library, and a computer/communications center are also available.

Valentine Camp encompasses 152 acres and contains one of the region's few pristine montane meadows. It provides varied habitats, including coniferous forest, chaparral, and sagebrush plains in which to conduct observational and experimental studies. The considerable ecological diversity within the reserve makes it an excellent teaching resource. The facilities include housing and laboratories which are open in the summer and early fall and, on a limited basis, in the winter. A system of foot trails provides access to all of the site's major habitats.

Reserve Staff
Daniel R. Dawson, Resident Reserve Director
John M. Melack, Faculty Advisor
Leslie Dawson, K-12 Education Coordinator

UCSB Natural Reserve System Administration
William W. Murdoch, Director
Susan L. Swarbrick, Associate Director
Donna Moore, MSO

Analytical Laboratory

The MSI Analytical Lab is a professionally managed shared-use instrumentation and chemical analysis facility, with the objectives of improving the quality and efficiency of present marine-related research efforts, and of providing advanced capabilities for new and expanded research programs. Originally established in 1977 to serve the needs of UCSB marine researchers, the facility is now recognized campus wide as well as nationally as a resource for high-quality analytical services, with a regular user base of over 50 faculty and professional researchers. Major capabilities of the Lab include elemental analysis, both inorganic (via flame and furnace atomic absorption spectrometry) and organic (CHN combustion analysis); stable isotope ratio determination of light isotopes (C, N, O, H, S) in biological and geological materials (continuous-flow IRMS); and automated determination of nutrients in natural waters (5-channel flow injection analyzer). Most of the Lab's current instrumentation was obtained with extramural funding, from grants submitted by the Lab manager in conjunction with interested faculty and researchers. The Lab operation is supported largely through user fees (recharges). Please visit our Web site at www.msi.ucsb.edu/Analab/index.html for more information.

OceansAlive!
MSI Education and Outreach

This has been a busy year for MSI's Education and Outreach Program, *OceansAlive!* Between The Science Fair Mentorship Program, The REEF, outreach visits to schools, community events and on-campus programs, *OceansAlive!* has provided marine science and environmental education to over 33,000 children and adults! This has been accomplished through the continued development of collaborations with a number of campus, local, state and national organizations and institutions, as well as the expansion of the Science Fair Mentorship Program to *hosting* this year's fair at UCSB.

Science Fair Mentorship Program: Through *OceansAlive!* MSI has worked in collaboration with a number of UCSB departments that include the California NanoSystems Institute (CNSI), the Materials Research Lab (MRL), Physics and EEMB to provide 125 local junior high, middle school and high school students with UCSB undergraduate and graduate student mentors for science fair projects. These secondary school students then compete at the local level with the opportunity to progress to the state and national levels.

The Research Experience & Education Facility, aka The REEF has been busy this year, as well. This has included visits from primary and secondary schools from King City in Monterey Co., to Sacramento and San Diego. The REEF also serves as a marine lab for many colleges including Cal Lutheran Thousand Oaks, CSU Channel Islands, and UCSB. At UCSB, The REEF serves as an interdisciplinary adjunct lab for Geology 4 (Intro to Oceanography), EEMB 3 (Intro Biology), EEMB 106 (Biology of Fishes), Writing 2 and Writing 109 ST. It also serves UCSB outreach and summer programs. This year had over on-campus 3,000 visitors.

This year The REEF also supported international programs, including middle school students from Taiwan as part of the Yuan-Lin Cultural Exchange Program and Graduate students from Osaka Japan.

MSI also worked with the Office of Academic Preparation and Equal Opportunity (APEO) Math Academy Program (Santa Maria & Santa Paula), The American Association of University Women's Tech Trek Program, the on-campus Youth Leadership & Advocacy Institute, the Santa Ynez Band of the Chumash Indian education program *Camp Kalawashaq'* to introduce over 350 kids to the *OceansAlive!* Floating Lab Program aboard the local whale-watching vessel *Condor Express.*

Other 2006 collaborations include:

- Further development with the NOAA Channel Islands National Marine Sanctuary (CINMS) and implementation LiMPETS Monitoring site at Campus Point that support CINMS Education and Outreach and will be linked with visits to The REEF.
- The SBC-LTER Watershed Education Program collaborated again with the Office of Academic Preparation and Equal Opportunity (APEO), and the Los Angeles Conservation Corps' (LACC) Clean and Green Program to bring 60 middle school students from inner-city LA to UCSB for a one-week residential research experience.

The Young Marine Scientist Program
2005-2006

The goal of the Young Marine Scientists Program (YMS) is to familiarize students and their teachers with scientific and social aspects of the marine ecosystems. Science and its research are presented as everyday common sense investigative activities, which we all utilize for survival. Thus, every surviving creature is in a sense a scientist, and the scientific method of investigation is a process of logical problem solving and critical thinking, used to solve sophisticated research questions.

The YMS program provides research opportunities to university undergraduate students, pre-professional student-teachers, K-12 teachers and their students, as well as parents and siblings of those who join the Young Scientists. The YMS students bring their experiences to the entire household, classroom and school. Hands-on/Minds-on activities, and creative, practical materials, have been developed for teaching science, aimed at appealing to every participant's natural fascination with the marine environment, and Nature, through all disciplines. Important YMS goals are to make updated and recent university research accessible to teachers in the community in order to encourage them to become involved in inquiry and classroom research. The teacher workshops we offer help teachers gain confidence in their approach to teaching scientific inquiry and the process of investigation, and integrating them into as many disciplines as they are capable of, especially reading and math. The teachers and their students are offered direct exposure to working diverse scientists who share their research questions, methods and tools, answer questions and provide guidance for research projects and enriched teaching at the individual, small group, class or whole school levels.

Dr. Miriam Polne-Fuller is the creator and director of the YMS program. She has shared her own research with teachers and students for more than twenty years. With the volunteered help of UCSB students and faculty from various departments, a number of research groups have been interacting with the local community of learners of all ages. Her personal research activities during the past year have focused on three topics: 1. The effects of low concentration of ethyl alcohol on living cells. 2. The use of seaweed extracts as potential inhibitors of eukaryotic cell division. 3. The marine amoeba Trichosphaerium.

Dr. Polne-Fuller has continued to work with UCSB undergraduate students, UCSB student teachers, and local K-12 teachers and students. She expanded on the development of marine science curricula, original lesson plans, and creative activities and research projects for elementary and secondary classrooms. Dr. Polne-Fuller's classroom tools include current cutting-edge research and discoveries, as well as science stories she has written, and original marine and land focused poems and music to enrich and integrate with the teaching of science. During this year, she worked with middle school science teachers through the Gevirtz Research Center at UCSB, teaching and guiding the preparation of science units, and the development of creative, original, and Science Standard-based teaching kits. Dr. Polne-Fuller worked with the "Youth Enrichment Program" 2006 program, as well as with the Tech Trek Girls in Science, and the LACC program through the Marine Science Institute Outreach Program.

In support of science education in the community, Dr. Polne-Fuller has been working with groups of junior high and high school science teachers in the Santa Barbara, Santa Maria, Oxnard and Ventura School Districts. She worked with the JASON Project teacher training program, and the outreach education unit of the Santa Barbara Maritime Museum. Other educational activities are listed below.

CAMPUS TEACHING AND EDUCATION WORK

UCSB Undergraduate Students:

- **Undergraduate Research** - Dr. Polne-Fuller worked with UCSB undergraduate students studying the toxicity of low alcohol on living cells

- **Welcoming Freshman Group** - Hosted groups of freshman students at the lab, sharing research projects and potential future involvement

- **Welcoming Freshman Summer Start students** - Participated in the Freshmen Summer Start Program lunch-hours to answer questions and share experiences about higher education, influences of college life, and maintaining a once-strong personal value system.

- **Research Mentorship Program (RMP)**: Celebrating its 12th anniversary, Dr. Polne-Fuller continues to teach and direct a UCSB Summer Session program for excelling high school students (Interdisciplinary 93S and 93SL, Research Mentorship Program 2006). This year, 11 MSI researchers served as mentors in this program, where 74 outstanding high school students participated and presented a high quality Research Symposium over three busy days: August 1st ,2nd ,3rd, 2006, at the Bren School Conference Room.

- **Shoreline Preservation ES-20**: Co-taught the course she developed entitled "Shoreline and Watershed Preservation Issues: From Watersheds to the Channel Islands," providing undergraduate students from campus-wide departments with hands-on views of environmental research taking place at UCSB, and developing an awareness of pending environmental issues affecting UCSB and the surrounding communities .

- **EEMB-4FS**: Taught a Freshman Seminar – Introduction to Research at UCSB.

- **Planned and co-taught "The Saturday with Scientists Program"**: Developed and presented by Dr. Polne-Fuller, this program hosts large numbers of high school students from under-served high schools. Buses bring about 100 high school students, counselors and teachers to spend a Saturday at UCSB visiting labs, experiencing research tools, and learning about the professional lives of researchers in a wide range of disciplines. The students come from a wide variety of under-served high schools, some among the UCSB Partnership Schools, and others from the vaster area of Inner City Los Angeles, and East and Central LA. The day-long program ends with a visit to the touch tanks maintained by the Marine Science Institute and the Department of Biological Sciences.

DONORS:
- Hosted individuals, and small groups of donors and potential donors with interests in education.

NEW INITIATIVES:
- Participation in an Gevirtz Research Center grant writing and project development for the TEAWET project, enriching 4-8 grade teachers with education and curriculum on the impacts of watersheds on the large water bodies.

RESEARCH and PRESENTATIONS for pre-college groups:
- **Jason Project**: Dr. Polne-Fuller has maintained her involvement with the teacher-enrichment aspects of the JASON-XVI project and participated in the JASON-XVI teacher preparation workshop at the Santa Barbara Maritime Museum, co-sponsored by the Marine Science Institute Outreach programs at UCSB.
- **Translating Research Into Education**: During the 2005-06 academic year she worked with local high school students, middle school students and primary school students, engaging all in scientific research and supporting Science Fair projects.
- **High School and Middle School Research Exposures** - Presented "Research as an Inquiry Experience" at the Laguna Blanca High School assembly and the Crane Country Day School.
- **Instructor Enrichment Informal Education** - Worked with the instructors and students at the local Boys and Girls Club chapters.
- **Grunion Midnight Field Trips** – Organized two guided Grunion Greeting Midnight Beach Walks for donors and their families.
- **Guided Beach Walks** and activities for the Tech Trek program supported by the American Women in Science Association and serving 13-14 year old girls from under-served schools in California.
- **Participated in the Chancellor's Back To School Night** – hosting donors and the Chancellor's advisory Group guests.

Awards Administered

Awards Administered

American Assn for the Advancement of Science

C. White, B. Kendall
SB060039 10/13/2005-10/12/2008 $39,000
Population Connectivity and the Management of Coastal Fishery Species across the California-Mexico International Border

American Assn for the Advancement of Science Subtotal $39,000

American Chemical Society

D. Valentine
44969-AC2 9/1/2006-8/31/2009 $80,000
Community succession and hydrocarbon oxidation in marine microbial mats: an in-situ time series experiment

American Chemical Society Subtotal $80,000

Cal State Lands Commission

I. Leifer
C2005-016 8/1/2005-7/31/2006 $4,900
Quantifying the Amount and Composition of Seepage from the Playa Del Rey Freshwater Marsh

I. Leifer
C2005-016 8/1/2005-7/31/2006 $2,100
Quantifying the Amount and Composition of Seepage from the Playa Del Rey Freshwater Marsh

I. Leifer, B. Luyendyk
C2005-041 4/1/2006-9/30/2007 $200,000
UCSB Coal Oil Point Seep Studies

Cal State Lands Commission Subtotal $207,000

California Department of Fish and Game

J. Caselle
P0470012 6/1/2005-6/1/2006 $19,561
California Sheephead Stock Assessment

J. Dugan
P0575002 7/1/2005-6/30/2006 $15,558
Investigation of the Depuration of Petroleum Hydrocarbons by Sand Crabs

S. Gaines
P0570008 1/1/2006-6/30/2007 $163,707
GIS and Analytical Support for the Marine Life Protection Act

D. Herbst
P0580088 7/1/2005-9/30/2006 $31,810
Stream Condition Inventory and Macroinvertebrate Bioassessment of Stream-Reaches in Grazed and Presently Ungrazed Portions of the Golden Trout Wilderness

R. Jellison, D. Herbst
P0460003 5/1/2005-12/31/2006 $54,315
Biological Stressor Identification at Hot Creek Fish Hatchery

California Department of Fish and Game cont'd

I. Leifer
P0375021 10/1/2005-6/30/2006 $13,500
Natural and Human Oil and Gas Seepage at Summerland: Assessing Risks with Potential Mitigation Strategies

California Department of Fish and Game Subtotal **$298,451**

California Regional Water Quality Control Board

D. Herbst
05-179-160-0 12/1/2005-3/31/2009 $384,000
Assessment of the Influence of Sediment on Benthic Stream Communities and Development of Guidance for Sediment TMDLs: Proposed Research Outline for TMDL Study

D. Herbst
05-280-160-0 5/1/2006-3/31/2009 $420,111
Bioassessment Comparability within Watershed Networks: Spatial and Temporal Components of Variation, and Development of Reference Site Selection Criteria

California Regional Water Quality Control Board Subtotal **$804,111**

Camille & Henry Dreyfus Foundation

D. Morse
SG-06-046 1/1/2006-12/31/2006 $20,000
Environmental Chemical Signals Bring New Life to Coral Reefs: Development of New Interdisciplinary Teaching and Public Education

Camille & Henry Dreyfus Foundation Subtotal **$20,000**

Caribbean Marine Research Center (Perry Foundation Inc)

M. Steele
CMRC-03-NRME-01-05C 2/1/2005-1/31/2006 $26,247
Density Dependence in Exploited Marine Fish: An Experimental Test and Theoretical Exploration of the Implications for Fisheries Enhancement via Marine Protected Areas

Caribbean Marine Research Center (Perry Foundation Inc) Subtotal **$26,247**

Channel Islands National Marine Sanctuary Foundation

H. Page, S. Schroeter, J. Dugan
SB060087 10/1/2005-9/30/2006 $30,456
Variation in Larval Supply Inside and Outside of a Marine Protected Area Within the Channel Islands National Marine Sanctuary

Channel Islands National Marine Sanctuary Foundation Subtotal **$30,456**

City of Santa Barbara

P. Holden
21429 6/15/2004-12/31/2005 $208,931
DNA-Based Source Tracking of Human Fecal Material: A Proposal to the City of Santa Barbara

City of Santa Barbara Subtotal **$208,931**

David and Lucile Packard Foundation

O. Reichman
2006-29539 1/1/2006-6/30/2006 $44,250
Search to Hire a Director for the NCEAS EBM Research Program

O. Reichman, S. Andelman
2004-27169 6/20/2005-6/20/2007 $741,035
Knowledge and Capacity-Building to Support Ecosystem-Based Management for Sustainable Coastal-Marine Systems

David and Lucile Packard Foundation Subtotal **$785,285**

Harvard University

J. Alroy
SB020042 9/1/2005-8/31/2006 $63,000
The Co-Evolution of Biodiversity and the Environment Through Geologic Time

Harvard University Subtotal **$63,000**

Joint Oceanographic Institutions, Inc.

D. Wilson
JSA-44 T309A44 7/10/2005-9/25/2005 $26,813
Integrated Ocean Drilling Program Scientific Cruise 309

D. Wilson
JSA-44 T309A44 7/10/2005-6/28/2008 $13,199
Integrated Ocean Drilling Program Scientific Cruise 309

D. Wilson
T312A44 11/12/2005-2/5/2006 $32,201
Integrated Ocean Drilling Program Scientific Cruise 312

D. Wilson
T312A44 2/6/2006-8/31/2007 $11,790
Integrated Ocean Drilling Program Scientific Cruise 312

Joint Oceanographic Institutions, Inc. Subtotal **$84,003**

Marine Biological Laboratory

D. Morse
27343 8/1/2005-8/31/2006 $215,970
Biomolecular Mechanism, Cloning, Sequencing and Analysis of Adaptive Reflectin cDNAs and Proteins

Marine Biological Laboratory Subtotal **$215,970**

National Aeronautics and Space Administration

C. Anderson, D. Siegel
NNG04GQ34H 9/1/2005-8/31/2006 $24,000
A Model for Remotely Detecting the Dynamics and Toxicity Of Pseudo-nitzchia Blooms in the Santa Barbara Channel

B. Campbell, D. Valentine
NGT5-50468 9/1/2005-8/30/2006 $24,000
Hydrogen Isotope Systematics of Lipid Biomarkers from Sulfate-Reducing Bacteria

National Aeronautics and Space Administration Subtotal **$48,000**

National Science Foundation

J. Alroy
0521425 9/15/2005-2/28/2006 $96,611
Collaborative Research: The Paleobiology Database: an International, Web-base Community Project to Assemble, Disseminate, and Analyze Paleontological Data

J. Alroy
EAR-0545059 4/15/2006-2/28/2007 $200,000
Collaborative Research: The Paleobiology Database: an International, Web-based Community Project to Assemble, Disseminate, and Analyze Paleontological Data

S. Andelman
DEB-0443453 9/1/2005-8/31/2006 $97,102
RCN: Biodiversity Conservation in Dynamic Landscapes (BCDL) Network

C. Carlson
MCB-0237725 4/1/2006-3/31/2007 $120,804
Collaborative Research: Linking Microbial Discovery to Biogeochemical Processes in an Oligotrophic Oceanic Microbial Observatory

E. Damschen, S. Gaines
SB060070 11/1/2005-10/31/2007 $10,000
Biological Informatics Postdoctoral Fellowship

K. Foltz
IOB-0415581 9/1/2006-8/31/2007 $125,000
Understanding the Fertilization Signalsome

R. Haymon, P. Holden
MCB 0406999 8/1/2005-1/31/2006 $16,171
SGER: Developing Metal-tagged DNA Probes for High Resolution Imaging of Microbial Phylotype Distributions and Nanoscale Mineral/Microbe Associations in Environmental Samples

R. Haymon, K. Macdonald
0324668 5/1/2004-4/30/2007 $12,875
Collaborative Research: Hydrothermal System Response to Magma Supply and Crustal Thickness Gradients along the Galapagos Spreading Center, 89.5°-94° W

G. Hofmann
ANT-0440799 5/1/2005-4/30/2006 $25,290
Towards an Understanding of Protein Homeostatis in Cold-adapted Antarctic Fish

G. Hofmann
ANT-0440799 5/1/2006-4/30/2007 $202,621
Towards an Understanding of Protein Homeostatis in Cold-adapted Antarctic Fish

J. Kennett, D. Pak, C. Nicholson, C. Sorlien
OCE-0623148 7/1/2006-6/30/2007 $132,326
Extending the High-Resolution Global Climate Record in Santa Barbara Basin: Evaluating Climate Change Potential

A. M. Kuris, K. D. Lafferty
NSF EF-0224565 6/1/2006-5/31/2007 $432,334
Anthropogenic Effects on Host-Trematode Dynamics

A. M. Kuris, K. D. Lafferty
NSF EF-0224565 6/1/2006-5/31/2007 $9,400
Anthropogenic Effects on Host-Trematode Dynamics

D. Lea
OCE-0502609 6/15/2005-5/31/2008 $304,003
Testing the Tropical Greenhouse Forcing Hypothesis Using a Halmahera Proxy SST Record

P. Miller
0409561 6/1/2005-5/31/2007 $10,000
NSF Minority Postdoctoral Fellowship

C. Nicholson, J. Kennett, C. Sorlien
OCE 0350573 4/1/2006-8/31/2006 $25,000
A Test for Extending the High-Resolution Climate History Back to ~450ka: The Interface Between Climate, Tectonics, and Sea-level Change in Santa Barbara Basin

National Science Foundation cont'd

C. Nicholson, C. Sorlien
EAR-0439859 8/1/2005-7/31/2006 $70,045
Accommodating Oblique Plate Motion in the California Continental Borderland: The Interaction Between Rotating and Non-Rotating Domains

C. Nicholson, C. Sorlien
EAR-0439859 8/1/2006-7/31/2007 $80,703
Accommodating Oblique Plate Motion in the California Continental Borderland: The Interaction Between Rotating and Non-Rotating Domains

D. C. Reed, S. D. Cooper, S. D. Gaines, S. J. Holbrook, J. M. Melack
NSF OCE 9982105 4/1/2005-3/31/2006 $33,000
LTER: Land/Ocean Interactions and the Dynamics of Kelp Forest Communities

D. C. Reed, S. D. Cooper, S. D. Gaines, S. J. Holbrook, J. M. Melack
NSF OCE 9982105 4/1/2005-3/31/2006 $17,500
LTER: Land/Ocean Interactions and the Dynamics of Kelp Forest Communities

D. C. Reed, S. D. Cooper, S. D. Gaines, S. J. Holbrook, J. M. Melack
NSF OCE 9982105 4/1/2006-11/15/2006 $440,417
LTER: Land/Ocean Interactions and the Dynamics of Kelp Forest Communities

D. C. Reed, S. D. Cooper, S. D. Gaines, S. J. Holbrook, J. M. Melack
NSF OCE 9982105 4/1/2006-3/31/2007 $15,000
LTER: Land/Ocean Interactions and the Dynamics of Kelp Forest Communities

O. J. Reichman
NSF DEB 0072909 8/1/2005-7/31/2006 $3,462,597
National Center for Ecological Analysis and Synthesis

O. J. Reichman
NSF DEB 0072909 8/1/2005-7/31/2006 $11,000
National Center for Ecological Analysis and Synthesis

O. Reichman, J. Orrock
DEB-0444217 3/15/2005-2/29/2008 $5,584
CRB: The Role of Apparent Competition and Patch Geometry in Mediating the Invasion and Restoration of Grassland Communities

O. J. Reichman, M. P. Schildhauer, M. Jones
NSF EF-0225676 10/1/2005-9/30/2006 $152,773
ITR Collaborative Research: Enabling the Science Environment for Ecological Knowledge

W. R. Rice
NSF DEB-0128780 2/1/2006-1/31/2007 $120,000
Gender-Specific Fitness and Intersexual Developmental Conflict in a Drosophila Model System

R. Ross, L. Quetin
ANT-0529087 1/1/2006-12/31/2008 $241,951
Collaborative Research: US SO GLOBEC Synthesis and Modeling:Timing is Everything: The dynamic coupling among Phytoplankton, Ice, Ice Algae and Krill (PIIAK)

R. Schmitt, S. Holbrook
OCE-0417412 9/1/2005-8/31/2007 $36,450
LTER: Long-Term Dynamics of a Coral Reef Ecosystem

R. Schmitt, S. Holbrook
OCE-0417412 9/1/2004-8/31/2009 $42,000
LTER: Long-Term Dynamics of a Coral Reef Ecosystem

R. Schmitt, S. Holbrook
OCE-0417412 9/1/2006-8/31/2007 $15,000
LTER: Long-Term Dynamics of a Coral Reef Ecosystem

R. Schmitt, S. Holbrook
OCE-0417412 9/1/2005-8/31/2006 $25,000
LTER: Long-Term Dynamics of a Coral Reef Ecosystem

R. Schmitt, S. Holbrook
OCE-0417412 9/1/2005-8/31/2006 $12,000

National Science Foundation cont'd

LTER: Long-Term Dynamics of a Coral Reef Ecosystem		
R. Schmitt, S. Holbrook		
OCE-0417412	9/1/2005-8/31/2006	$10,000
LTER: Long-Term Dynamics of a Coral Reef Ecosystem		
R. Schmitt, S. Holbrook		
OCE-0417412	9/1/2006-8/31/2007	$820,004
LTER: Long-Term Dynamics of a Coral Reef Ecosystem		
D. Valentine		
0447395	4/1/2006-3/31/2007	$124,709
CAREER: Microbial Geochemistry of Natural Marine Gas Seeps - A Research and Education Plan		
	National Science Foundation Subtotal	**$7,555,270**

Oregon State University

S. Gaines, R. Warner, L. Washburn, G. Hofmann		
F0395A-C	4/1/2006-3/31/2007	$1,574,435
Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)		
	Oregon State University Subtotal	**$1,574,435**

Paul G. Allen Charitable Foundation

S. Gaines, C. Costello, O. Reichman, J. Melack		
8637	5/1/2006-5/1/2009	$2,000,000
Sustainable Fisheries Project		
	Paul G. Allen Charitable Foundation Subtotal	**$2,000,000**

Princeton University

D. E. Morse, P. Hansma, G. D. Stucky, J. Waite		
00000532	8/19/2005-8/18/2006	$435,000
Synthetic Self-Healing Structural Materials		
D. E. Morse, P. Hansma, G. D. Stucky, J. Waite		
00000532	8/19/2005-8/18/2006	$215,000
Synthetic Self-Healing Structural Materials		
	Princeton University Subtotal	**$650,000**

Resources Legacy Fund Foundation

S. Gaines		
20050137M	12/1/2005-4/30/2007	$326,372
MLPA Initiative Evaluation Tool		
W. McClintock, S. Gaines		
2005-0072M	7/1/2005-7/31/2006	$19,946
Hardware and Support Enhancements to the Marine Life Protection Act Initiative Geographic Information System		
W. McClintock, S. Gaines		
2005-0072M	7/1/2005-7/31/2006	$16,285
Hardware and Support Enhancements to the Marine Life Protection Act Initiative Geographic Information System		
	Resources Legacy Fund Foundation Subtotal	**$362,603**

Santa Barbara Channelkeepers
C. Blanchette
SB060092 7/1/2005-5/31/2006 $6,943
Community-Based Restoration of Eelgrass Meadows at Santa Cruz Island, CA

Santa Barbara Channelkeepers Subtotal **$6,943**

Shoreline Preservation Fund – Associated Students UCSB
J. Dugan
Fall 05-07 12/1/2005-10/31/2006 $5,978
Investigating the Ecological Impacts of Coastal Armoring on Sandy Beaches
J. Melack
Fall 05-11 12/1/2005-10/31/2006 $2,237
The Creation of Adaptive Monitoring for Estuarine Ecosystems: Monitoring of the Devereux Slough, Coal Oil Point Reserve
C. Sandoval, S. Swarbrick
FALL05-10 1/1/2006-6/30/2006 $11,638
Buffer protection and restoration at Coal Oil Point Reserve (Renewal)
A. Whitmer
Fall 05-08 12/1/2005-6/30/2006 $6,009
Education and Outreach Internship

Shoreline Preservation Fund - Associated Students UCSB Subtotal **$25,862**

Simpson and Simpson Business and Personnel Services, Inc.
S. Schroeter, D. Reed, H. Page
SB060076 1/1/2006-12/31/2007 $1,115,506
San Onofre Nuclear Generating Station Mitigation Project Monitoring Program
S. Schroeter, D. Reed, H. Page
SB060076 1/1/2006-12/31/2007 $502,183
San Onofre Nuclear Generating Station Mitigation Project Monitoring Program - Wetland

Simpson and Simpson Business and Personnel Services, Inc. Subtotal **$1,617,689**

SRS Technologies
J. Dugan
MSD-06-PR-0980 2/16/2006-12/31/2006 $15,000
Assessing Habitat and Prey Resources for Western Snowy Plovers on Exposed Sandy Beaches of Vandenberg Air Force Base

SRS Technologies Subtotal **$15,000**

The Nature Conservancy
B. Halpern, S. Andelman
SB050084 4/1/2006-8/1/2006 $0
Predicting Community-level Responses to Marine Reserve Protection: The Causes of Food Web Stability
B. Halpern, S. Gaines
CR00016 4/1/2006-12/31/2006 $5,000
Threat Analysis for Marine Ecosystems of the North Pacific
O. Reichman
CR0002-64689 10/1/2005-3/31/2006 $20,000
A Workshop on Global Climate Change and Adaptation of Conservation Priorities

The Nature Conservancy Subtotal **$25,000**

The New Media Studio

C. Blanchette, A. Whitmer, V. Herrity

NNN04AA02A	2/1/2006-1/31/2007	$50,145

Adding Ocean Science Content and Embedded Assessment Tool Capabilities to the Satellite Observations in Science Education (SOSE) REASoN Project

The New Media Studio Subtotal **$50,145**

The PEW Charitable Trusts

S. Gaines

SB030106	9/1/2004-8/31/2006	$100,000

A New Conceptual Framework for Marine Reserve Networks

The Pew Charitable Trusts Subtotal **$100,000**

UC Berkeley

R. A. Knapp

MCSA3624	6/1/2005-5/31/2006	$94,048

Amphibian Disease Dynamics in a Fragmented Landscape

UC Berkeley Subtotal **$94,048**

UC Davis

R. M. Nisbet, A. J. Brooks, B. Kendall, P. A. Holden, K. D. Lafferty, E. Muller, H. M. Page, A. Stewart-Oaten

UCD R-82867601	3/1/2005-2/28/2006	$1,000

Western Center for Estuarine Ecosystem Indicator Research

UC Davis Subtotal **$1,000**

UC Institute for Energy Efficiency

R. Wilkinson

C-05-12B	1/1/2005-12/31/2006	$28,000

A Statewide Assessment of Energy Use Associated with California Water Use

UC Institute for Energy Efficiency Subtotal **$28,000**

UC Lawrence Livermore National Laboratory

D. Morse

B558555	2/25/2006-10/31/2006	$49,943

Purification and Mechanism of Action of APB Mineralization-Controlling Protein

UC Lawrence Livermore National Laboratory Subtotal **$49,943**

UC Mexus

J. Goddard

SG 05/10-07	11/1/2005-10/31/2006	$1,500

Developmental mode in benthic opisthobranch molluscs from the eastern tropical Pacific

C. Osovitz, G. Hofmann

SB060030	7/1/2005-6/30/2007	$12,000

Investigating the role of physiological tolerances in setting marine species' biogeographic boundaries

UC Mexus Subtotal **$13,500**

UC Office of the President

S. Gaines
05 T CEQI 08 0076 7/1/2005-6/30/2006 $193,615
Population Connectivity of Coastal Fishery Species across the California-Mexico International Border

S. Gaines
05 T CEQI 08 0076 7/1/2006-8/31/2007 $175,776
Population Connectivity of Coastal Fishery Species across the California-Mexico International Border

D. Reed, S. MacIntyre, M. Brzezinski, S. Holbrook
UCOP 012856-01 7/1/2005-8/31/2006 $178,951
Ecosystem Functioning in Giant Kelp Forests: Linking Hydrodynamics to an Essential Forage Species and its Benthos

R. Warner
SB060009 7/1/2005-6/30/2006 $30,000
Defining the Extent of Larval Exchange Among Kelp Rockfish (Sebastes atrovirens) Populations Using Otolith Microchemistry

UC Office of the President Subtotal **$578,342**

UC San Diego

R. Ross
518607/1247 3/1/2005-9/30/2005 $16,132
Long-Term Ecological Research on the Antarctic Marine Ecosystem: Climate Migration, Ecosystem Response and Teleconnections in an Ice-Dominated Environment

L. Washburn
0478.01SB 1/1/2006-12/31/2006 $191,685
Short-Medium Range Resolution/Long Range HF Radars-Task A.1

L. Washburn
0478.03SB 1/1/2006-12/31/2006 $10,828
Two Bight-Scale Sections Using an Underway CTD-Task C.1

UC San Diego Subtotal **$218,645**

UC Santa Cruz

J. M. Engle
UCSC 14350102CA85144 5/1/2006-4/30/2007 $36,000
Coordination of Database Development, Protocol Standardization, and Regional Activities Between Minerals Management Service and Others in the Multi-Agency Rocky Intertidal Monitoring Network

R. Wilkinson
SB060086 12/2/2005-9/30/2007 $114,560
Developing a Tool to Guide State and Local Desalination Planning: A Comprehensive Economic and Environmental Framework to Fully Assess the Benefits and Costs of Desalination

UC Santa Cruz Subtotal **$150,560**

UC Sea Grant

J. Dugan
R/CZ-PD121-F-1/1 4/1/2006-6/30/2006 $9,999
Balancing Human Health Needs with Sustainable Harvest of Marine Resources for Biomedical Use: The Case of the Giant Keyhole Limpet

A. Kuris, K. Lafferty
P/CZ-119PD-F-1/1 12/1/2005-6/30/2006 $9,999
Large-Scale Survey of a Potentially Inexpensive Ecological Indicator

UC Sea Grant cont'd

D. Morse
R/MP-95-F-2/3 3/1/2005-2/28/2006 $94,093
Marine Bio-Nanotechnology: High-Performance Materials from Sponge Silicatein

D. Morse
R/MP-95-TR 2/3 3/1/2005-2/28/2006 $26,974
Marine Bio-Nanotechnology: High-Performance Materials from Sponge Silicatein

D. Reed, C. Blanchette, S. Gaines, A. Whitmer
R/W-1200PR-F-1/1 3/15/2006-6/30/2006 $5,000
Rapid Response Support for the 7th International Temperate Reef Symposium

S. Schroeter
R/F-116PD-F-1/1 11/1/2005-6/30/2006 $10,000
Elements of Quantitative Stock Assessment for Evaluating Alternative Management Strategies

J. Waite
R/MP-97B-F-1/3 3/1/2005-2/28/2006 $51,081
Studies on the Rapid Self-assembly of Elastic Tensile Fibers From a Natural Protein Polymer Found in Marine Snails

J. Waite
R/MP-97B-TR-1/3 3/1/2005-2/28/2006 $27,861
Studies on the Rapid Self-assembly of Elastic Tensile Fibers From a Natural Protein Polymer Found in Marine Snails

UC Sea Grant Subtotal **$235,007**

UC Toxic Substances Research and Teaching Program

R. J. Schmitt
SB020063 7/1/2005-6/30/2006 $270,000
Coastal Toxicology Component of the UC TSR &TP

UC Toxic Substances Research and Teaching Program Subtotal **$270,000**

University of Hawaii

R. Warner
Z739835 2/1/2005-6/15/2005 $7,195
Larval Retention, Larval Exchange and Population Connectivity in the Hawaiian Islands

University of Hawaii Subtotal **$7,195**

University of Kiel

S. Mau, D. L. Valentine
MOIF-CT-2006-02164 5/1/2006-4/30/2008 $33,900
The Role of Water Column Methane Oxidation in the Global Carbon Budget - Marine CH4 Oxidation

University of Kiel Subtotal **$33,900**

University of Queensland

A. Morse
SB060101 1/27/2006-11/30/2009 $56,046
Coral Reef Targeted Research and Capacity Building for Management

University of Queensland Subtotal **$56,046**

University of Rhode Island

M. Steele
030603/532577 10/1/2005-9/30/2006 $20,000
A Test for Shelter Limitation of Reef Fish Populations at Large Spatial Scales: An Integrated Empirical and Theoretical Approach

University of Rhode Island Subtotal $20,000

University of Southern California

C. Nicholson
083262 2/1/2005-1/31/2006 $25,000
Continuing to Build and Evaluate the SCEC 3D Community Fault Model

University of Southern California Subtotal $25,000

University of Washington

W. Rice
UW 806099 8/1/2005-7/31/2006 $84,216
8/1/2006-7/31/2007 $0
IRCEB: The Origin of Barriers to Fertilization and Their Role in Speciation: From Populations to Proteins

University of Washington Subtotal $84,216

US Department of Agriculture

T. Dudley
2006-35302-16641 12/15/2005-12/14/2006 $152,500
Regional Targeting of Biological Control Agents Against Saltcedar (Tamarix spp.) in North America
D. Herbst, S. Cooper
05-JV-11272164-082 9/14/2005-9/14/2006 $120,000
Aquatic Invertebrate Research for Kings River Experimental Watershed
J. Levine
2005-35320-16273 8/1/2005-7/31/2008 $214,734
Plant-soil feedbacks and the regulations of native shrub recolonization of exotic grasslands

US Department of Agriculture Subtotal $487,234

US Department of Commerce

J. Caselle, L. Washburn
NCND6021-5-00015 7/15/2005-9/30/2005 $18,200
Maintenance of PISCO-CINMS Moorings in the Channel Islands National Marine Sanctuary

US Department of Commerce Subtotal $18,200

US Department of Energy

P. Holden
DE-FG02-05ER63949 11/15/2005-11/14/2006 $81,367
Stabilization of Plutonium in Subsurface Environments via Microbial Reduction and Biofilm Formation
J. Kennett
DE-FG02-03ER63696 9/15/2005-9/14/2006 $171,163
Effects of Oceanic Disposal of Carbon Dioxide on Benthic Microfauna: Foraminfera as Indicators of Dissolution and Ecosystem Health

US Department of Energy Subtotal $252,530

US Department of the Navy

J. Case
N00014-05-1-0046 11/1/2005-10/31/2006 $75,000
Coastal Bioluminescence: A Collaboration Dealing with Sources, Population Dynamics and Instrumentation

J. Case
N00014-05-1-0046 10/1/2005-10/31/2006 $36,330
Coastal Bioluminescence: A Collaboration Dealing with Sources, Population Dynamics and Instrumentation

US Department of the Navy Subtotal **$111,330**

US Department of Commerce, NOAA

S. Gaines
NA05NOS4291158 5/1/2005-4/30/2010 $3,825,495
Ocean Science Education Building, Phase I

US Dept. of Commerce, NOAA Subtotal **$3,825,495**

US Environmental Protection Agency

S. Henkel, G. Hofmann
FP-91654401 9/19/2005-9/18/2006 $9,992
2005 EPA Science to Achieve Results (STAR) Fellowship for Graduate Environmental Study Molecular Techniques for Predicting Invasion Potential: Comparisions Among Native and Invasive Kelp Species

S. Henkel, G. Hofmann
FP-91654401 9/19/2005-9/18/2006 $2,496
2005 EPA Science to Achieve Results (STAR) Fellowship for Graduate Environmental Study Molecular Techniques for Predicting Invasion Potential: Comparisions Among Native and Invasive Kelp Species

S. Henkel, G. Hofmann
FP-91654401 9/19/2005-9/18/2006 $2,496
2005 EPA Science to Achieve Results (STAR) Fellowship for Graduate Environmental Study Molecular Techniques for Predicting Invasion Potential: Comparisions Among Native and Invasive Kelp Species

US Environmental Protection Agency Subtotal **$14,984**

US Fish & Wildlife Service

T. Dudley
81440-5-G021 11/30/2005-9/30/2010 $100,000
Biological Control of Invasive Giant Reed (Arundo donax) in the Santa Clara River Watershed

US Fish & Wildlife Service Subtotal **$100,000**

US Forest Service

D. Herbst
04-CR-11052004-151 10/1/2005-6/30/2006 $16,000
Stream Condition Inventory and Macroinvertebrate Bioassessment of Stream-Reaches in Grazed and Presently Ungrazed Portions of the Golden Trout Wilderness

US Forest Service Subtotal **$16,000**

US Geological Survey

S. Gaines
USGS 0527WS001 7/1/2005-6/30/2006 $10,000
Channel Islands Field Station Marine Ecology Cooperative Agreement, Task 1

US Geological Survey Subtotal **$10,000**

USC Sea Grant

G. Osherenko, K. Clarke
101571 3/1/2005-2/28/2006 $42,211
California's Coastal Zone Management Program: Retaining Agricultural Land in the Face of Urban Growth

USC Sea Grant Subtotal **$42,211**

USDI - Minerals Management Service

J. E. Dugan
Task 17610 MMS-31063 7/1/2004-6/30/2006 $37,267
Joint UCSB-MMS OCS Student Internship Program

J. Dugan
0205P025828 9/15/2005-9/14/2006 $5,000
Development of Response Protocols for Oil Spills in Sandy Intertidal Habitats

M. Love
1435-01-05-CA-39315 8/5/2005-8/4/2009 $300,000
Reproductive Ecology and Body Burden of Resident Fish Prior to Decommissioning

M. Love
1435-01-05-CA-39315 8/5/2005-8/4/2009 $200,000
Reproductive Ecology and Body Burden of Resident Fish Prior to Decommissioning

M. Love
1435-01-05-CA-39322 8/3/2005-12/31/2005 $150,000
Fish Assemblages Associated with Platforms and Natural Reefs in Areas Where Data Are Non-Existent or Limited

M. Love
1435-01-05-CA-39322 1/1/2006-9/30/2006 $370,000
Fish Assemblages Associated with Platforms and Natural Reefs in Areas Where Data Are Non-Existent or Limited

D. Reed
0106PO39729 4/10/2006-7/1/2006 $10,000
Sponsorship of 7th International Temperate Reef Symposium

R. J. Schmitt
Task 17600 MMS-31063 8/1/2004-10/31/2006 $225,850
Coastal Marine Institute Program Management

USDI - Minerals Management Service Subtotal **$1,298,117**

USDI – National Park Service

J. Caselle
J8C07050004 7/1/2005-6/30/2008 $132,140
Establish Baseline Ecological Conditions of Newly Established Marine Reserves at the Channel Islands

R. Knapp
J8C07050005 7/1/2005-6/30/2006 $48,616
Reintroduce Yellow-legged Frogs to Fishless Lakes in Yosemite National Park

R. Knapp
J8C07050005 7/1/2005-6/30/2008 $18,000
Reintroduce Yellow-legged Frogs to Fishless Lakes in Yosemite National Park

R. Knapp
J8C07050005 7/1/2006-6/30/2007 $33,390
Reintroduce Yellow-legged Frogs to Fishless Lakes in Yosemite National Park

USDI - National Park Service Subtotal **$232,146**

Utah State University
R. Knapp
051861001 9/1/2005-8/31/2006 $10,000
Evaluation of Reference Site Classification Schemes, Probability-based Survey Designs, Biological Indicators, Biotic Tolerance Values, and the Comparability of Different Sampling Methods for Western Lakes and Ponds

Utah State University Subtotal **$10,000**

Virginia Institute of Marine Science
L. B. Quetin, R. M. Ross
518606/1247 10/1/2005-9/30/2006 $96,000
LTER: Palmer Antarctica LTER: Climate Change, Ecosystem Migration and Teleconnections in an Ice-Dominated Environment

Virginia Institute of Marine Science Subtotal **$96,000**

WetLabs, Inc.
J. Case
SB060041 8/1/2005-1/10/2006 $30,000
An Underwater Bioluminescence Assessment Tool (U-BAT)

WetLabs, Inc. Subtotal **$30,000**

Research Summaries
(Contracts/Grants Administered)
July 2005 – 2006

John Alroy **9/1/2000-8/31/2006** **$1,520,615**
Harvard University, SB020042

The Co-Evolution of Biodiversity and the Environment Through Geologic Time

The UCSB investigator and UCSB's National Center for Ecological Analysis and Synthesis will provide computational resources, meeting facilities and project coordination for a five-institution, multidisciplinary collaborative research endeavor. Major scientific objectives include building a comprehensive locality-level paleoecological database of Phanerozoic marine and terrestrial organisms; linking these data with geochemical time series to be provided by one of the other co-investigators; developing web-based database management and analysis software; building a web site that will provide public access to the database; and performing statistical analyses that will make corrections for sampling artifacts and quantify intrinsic biotic dynamics, extrinsic environmental forcings of biotic dynamics, and the effects of geographic scale, biogeography, and paleoenvironment on our view of the Earth's evolutionary history.

John Alroy **9/15/2005-2/28/2006** **$96,611**
National Science Foundation, 0521425

Collaborative Research: The Paleobiology Database: an International, Web-base Community Project to Assemble, Disseminate, and Analyze Paleontological Data

The Paleobiology Database is leading the discipline of paleontology into the 21st century by digitizing the global literature on fossils and spearheading research programs that are of broad interest throughout the biological and Earth sciences. Its work over the next five years will document major evolutionary innovations, mass extinctions, and the impact of global change on the biosphere. The Database is an international, distributed effort that covers every taxonomic group, geographic region, and time interval, and brings together 116 Ph.D.s from 73 institutions in 14 countries. It incorporates a wide variety of data types, including taxonomy and both the contents and contexts of fossil collections. The Database is at the forefront of efforts to integrate databases through collaboration with other organizations such as GBIF, MorphoBank, and CHRONOS and use of up-to-date standards and protocols. The Database's effort to translate the literature into digital form will permanently level the playing field for researchers from around the world. The Database has compiled information on 36,923 fossil collections and 66,506 taxa since its inception in 2000, and serves as a repository for multiple independent research consortia. Researchers in six scientific working groups will cover such specific topics as global Phanerozoic diversity and the interplay of diversity and biogeography, local-scale diversity, climate and ecomorphological convergence, and large-scale trends in body size and preservational factors.

John Alroy **4/15/2006-2/28/2007** **$200,000**
National Science Foundation, EAR-0545059

Collaborative Research: The Paleobiology Database: an International, Web-based Community Project to Assemble, Disseminate, and Analyze Paleontological Data

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to-date standards and protocols. The Database's effort to translate the literature into digital form will permanently level the playing field for researchers from around the world. The Database has compiled information on 36,923 fossil collections and 66,506 taxa since its inception in 2000, and serves as a repository for multiple independent research consortia. Researchers in six scientific working groups will cover such specific topics as global Phanerozoic diversity and the interplay of diversity and biogeography, local-scale diversity, climate and ecomorphological convergence, and large-scale trends in body size and preservational factors.

Sandy Andelman **9/1/2002-9/30/2006** **$30,000**
Andrew W. Mellon Foundation, SB030037

Using a Knowledge Network to Expand NCEAS-South Africa Collaboration: Scale-Dependence in the Relationship Between Biodiversity and Ecosystem Function

The National Center for Ecological Analysis and Synthesis (NCEAS) is involved in several large projects designed to develop software tools to facilitate remote access and management of ecological data. Ecological data are profoundly heterogeneous and highly distributed, making them difficult to locate and assimilate. To test the tools as they are developed, and to involve the ecological community in the design and refinement of the tools, NCEAS has employed a distributed graduate seminar approach that has been used at the Center to address other topics. In this approach, graduate seminars are conducted simultaneously at multiple universities around the country. All participating universities collaborate remotely to address a common central research theme, but each individual seminar also focuses on a form of that question targeting its own local geographic area. At the end of the semester, some of the students and faculty from each seminar come to NCEAS to conduct a grand synthesis of the information and ideas that emerged from each individual seminar. This has many benefits as both a pedagogical and intellectual instrument.

Sandy Andelman **2/1/2004-1/31/2007** **$37,000**
Andrew W. Mellon Foundation, SB040051

A Unified Framework for Management and Dissemination of Heterogeneous Data and Metadata from Kruger National Park

The Kruger National Park (KNP) is renowned for long-term ecological datasets generated from plant and animal monitoring programs. Some of these data comprise time series spanning more than five decades. Several major thematic layers, such as vegetation cover, plant composition, vertebrate herbivore counts, fire records, and the concomitant rainfall and hydrology are maintained in geo-referenced databases. In addition, the several hundred research projects registered in the Park generate further data, which also are catalogued. The potential benefits of these data for advancing ecological knowledge are significant, but have not been fully realized. The National Center for Ecological Analysis and Synthesis (NCEAS) is engaged in several major informatics research initiatives, and is developing tools for access, management and analysis of heterogeneous ecological data. To facilitate use of these tools by ecologists, and to obtain input into the evolution of the tools, NCEAS is coordinating a distributed graduate seminar series involving the use of new informatics tools and methods at multiple universities. With funding from the Mellon Foundation, NCEAS has expanded this distributed research and training model to involve collaboration with scientists from Kruger and elsewhere in South Africa.

Sandy Andelman **9/1/2005-8/31/2006** **$97,102**
National Science Foundation, DEB-0443453

RCN: Biodiversity Conservation in Dynamic Landscapes (BCDL) Network

Developing the conceptual foundations for biodiversity conservation in a dynamic and uncertain world requires understanding of the linkages among the dynamics of species, ecological systems, economic activities, and land-use change. Despite recognition of the need for this integration and common objectives, research in each of these areas commonly proceeds independently. This is a three-year interdisciplinary program of collaboration directed towards coordinating research in ecology, economics, policy, land-use, and operations research needed to catalyze the development of an interdisciplinary conceptual framework for biodiversity conservation. The BCDL Network

addresses a fundamental limitation of current biodiversity conservation approaches and will bridge the gap between conservation theory and practice. The Network will provide interdisciplinary training opportunities for graduate students and early career scientists and is committed to increasing participation in the Network by under-represented communities.

Clarissa Anderson **9/1/2004-8/31/2006** **$48,000**
David Siegel
National Aeronautics and Space Administration, NNG04GQ34H

A Model for Remotely Detecting the Dynamics and Toxicity Of Pseudo-nitzchia Blooms in the Santa Barbara Channel

Environmental controls of harmful algal blooms are variable at the regional level and not always anthropogenic. In the Santa Barbara Channel the highest concentrations of the toxic diatom group, Pseudo-nitzschia, coincide with periods of strong upwelling and minimal run-off from land. This project addresses bloom dynamics and toxicity of Pseudo-nitschia using the existing framework of the NASA supported Plumes and Blooms project and the SBC-LTER research site. These programs will provide many of the physical, chemical, and biological parameters necessary to parameterize bloom formation and toxin production. In situ data will be incorporated into a predictive model that assesses toxic bloom probabilities for this site. The model will be applied to the remote estimation of blooms using satellite ocean color (MODIS-Aqua & SeaWiFS), sea surface temperature (AVHRR), and high frequency radar determinations of surface currents to develop predictive tools for the onset and toxicity of Pseudo-nitzschia bloom dynamics.

Carol Blanchette **7/1/2005-5/31/2006** **$6,943**
Santa Barbara Channelkeepers, SB060092

Community-Based Restoration of Eelgrass Meadows at Santa Cruz Island, CA

The principal investigator will continue to build on prior efforts funded by TNC/NOAA to implement an eelgrass habitat restoration program at selected sites around Santa Cruz Island. Expansion of the restoration project will allow researchers to fill in any gaps that may exist and ensure the development of a fully-functional eelgrass meadow. As a result, it will be possible to gather much-needed information about both restored and natural eelgrass bed growth, density and biodiversity in an extremely ecologically significant marine habitat. Another aspect of this project will be to focus on developing diver training materials, a project website and seagrass restoration informational materials for several local marine science education and outreach centers.

Carol Blanchette **2/1/2005-1/31/2007** **$106,855**
Alison Whitmer
Vishna Herrity
The New Media Studio, NNN04AA02A

Adding Ocean Science Content and Embedded Assessment Tool Capabilities to the Satellite Observations in Science Education (SOSE) REASoN Project

The investigators will develop a curricular module focusing on ocean science, and a java-based software and learning evaluation tool designed to be integrated into the data access and visualization toolbox of the NASA SOSE REASoN project. The ocean science curricular module (Patterns and Processes in the Ocean) will be designed as a reusable content object (RCO) to be integrated into the SOSE internet-based toolbox. This will provide an incredibly valuable test to the "re-usability" of the RCE framework being developed through the SOSE project. This RCO will be based on NASA ocean-related datasets from several sources and will incorporate data-rich topics that span large scales in time and space. The primary data of interest are ocean temperature (SST), ocean color (chlorophyll), ocean winds and sea surface height. These datasets are perfect for illustrating and exploring physical relationships driving patterns and processes in the oceans across large scales in space ant time. This module will allow students to explore relationships among many physical and biological variables and begin to understand the physical processes influencing the distribution of organisms throughout the oceans.

Mark Brzezinski **4/1/2004-3/31/2008** **$594,338**
National Science Foundation, OCE-0350576

Testing the Utility of Natural Variations in Isotopes of Si as a Proxy for Silica Production in the Sea

In the mid 1990's it was discovered that diatoms fractionate isotopes of silicon during silicon biomineralization opening the possibility of using natural variations in isotopes of silicon in dissolved Si and in diatom frustules as a tool for assessing silica production in both the past and present day ocean. Diatoms with their silica ballast are key vectors of organic matter out of the euphotic zone. Their obligate need for Si means that their contribution to primary productivity and the biological carbon pump can be controlled by the availability of silicic acid in ocean surface waters. Natural variations in isotopes of Si in diatoms and silicic acid offer a possible means of assessing relative silicic acid use on longer time scales and larger spatial scales than any other technique currently available. This project proposes to continue evaluating and calibrating the ∂30 Si proxy.

Mark Brzezinski **12/1/2003-11/30/2007** **$155,755**
Oregon State University, OSU S0793A-G

Plankton Dynamics and Carbon Cycling in the Equatorial Pacific Ocean: Control by Fe, Si, and Grazing

In collaboration with investigators at Oregon State University, as part of a grant from the NSF Biocomplexity Program, the UCSB PI will participate on two cruises to the Equatorial Pacific Ocean. Dr. Brzezinski's primary responsibility is to make measurements of silica dissolution rates. UCSB's research team will also assist in measuring silicic acid concentration, biogenic silica concentration and silica production rates. Additionally, the UCSB researchers will participate in K-12 outreach workshops related to this project in Oregon and Maine.

Alison Butler **3/1/2004-8/31/2005** **$81,853**
UC Sea Grant, R/MP-94-F-TR-3/3

Molecular Approaches in Marine Pharmacology

Many marine natural products and enzymes have important medical applications in the diagnostic, pharmaceutical and biotechnological industries. These compounds and enzymes are at various stages of development, ranging from evaluation of their biological activities, to testing in clinical trials, to their incorporation into commercial products. Notwithstanding this success, the rise in drug-resistant infections demands new drugs and strategies for eradication or control of invading pathogenic organisms. In addition, early disease detection requires new or more sensitive biochemical diagnostic tools. Solutions to these problems can be provided through discovery of new bioactive compounds, studies of their biogenesis, including endogenous biosynthetic enzyme investigations, and elucidation of their molecular mechanisms of action. Such strategies will allow chemists and pharmacologists, working in a collaborative effort, to pursue the development of novel drugs and diagnostics.

Brian Campbell **9/1/2003-8/30/2006** **$72,000**
David Valentine
National Aeronautics and Space Administration, NGT5-50468

Hydrogen Isotope Systematics of Lipid Biomarkers from Sulfate-Reducing Bacteria

This graduate student research project will examine hydrogen isotope fractionation by sulfate-reducing bacteria (SRB). One objective is to understand deuterium/hydrogen (D/H) systematics in SRB. Pure cultures of SRB will be grown in media of varying _D/ lipids and metabolites will be monitored for D/H response. Another objective is to develop lipid biomarker proxies for anoxia. Compound-specific _D analyses will be conducted on lipid biomarkers from oxic and anoxic environments (e.g., Black Sea). A viable proxy (associating anoxia with _D of a particular compound) could place constraints on redox conditions of Proterozoic oceans, thereby contributing to the understanding of biological-planetary interactions.

Craig Carlson **4/1/2003-3/31/2007** **$479,228**
National Science Foundation, MCB-0237725

Collaborative Research: Linking Microbial Discovery to Biogeochemical Processes in an Oligotrophic Oceanic Microbial Observatory

This renewal project focuses on microorganisms that live in the ocean surface layer (0-300 m), one of the largest habitats on earth. Microorganisms in the ocean surface layer play an integral role in carbon transport from the atmosphere to the deep ocean. Small perturbations in the metabolism of DOC by microorganisms could strongly impact the balance between oceanic and atmospheric Co2. Thus, the microbial processes that determine DOM production, consumption and distribution in the oceans are important to the global carbon cycle. A relatively small set of microbial groups dominates the ocean surface. Most of these organisms have never been cultured for study in scientific laboratories. The goal of this project is to understand the cell biology and biogeochemical activities of the major bacterioplankton groups by applying new high throughput technologies for cell culturing, and studying the metabolism of these organisms in nature and their interactions with organic matter in the oceans. This effort will be focused on the Bermuda Atlantic Time-series Study (BATS) site, a subtropical gyre characterized by winter time convective overturn, spring phytoplankton blooms, and regular patterns of DOC cycling.

Craig Carlson **7/1/2004-6/30/2007** **$342,038**
National Science Foundation, OCE-0425615

The Effect of Mesoscale Eddy Perturbations on Microbial Processes and Community Structure in the Sargasso Sea

This is a companion project to the "EDDIES" (EDdy Dynamics, mixing Export, and Species composition) project funded by NSF Biological, Chemical and Physical Oceanography. This interdisciplinary field program was initiated in the Sargasso Sea during the summers of 2004 and 2005. Recent evidence suggests that mesoscale eddies are an important nutrient transport mechanism in the oligotrophic waters of the main subtropical gyres. Numerical simulations and satellite-based statistical estimates indicate that the magnitude of the eddy-driven nutrient flux could be sufficient to balance geochemical estimates of new production. Relatively few direct observations of this process are available, owing to the spatial and temporal intermittency of the events that drive it. Available data demonstrate that isopycnal displacements associated with certain types of eddies can transport nutrients into the euphotic zone, resulting in the accumulation of chlorophyll in overlying waters. Preliminary data indicate that coincident with the passage of a cyclonic eddy at the BATS site, bacterial production rates were significantly enhanced relative to the monthly mean values. However, the extent of the prokaryotic heterotrophic response and their impact on coupled biogeochemical cycles and export has yet to be elucidated. The principal investigator will sample parameters relevant to heterotrophic prokaryotes across mesoscale eddies documenting how these parameters vary inside the eddy through time and space (horizontal and vertical) relative to outside ("control") waters.

Craig Carlson **12/1/2004-11/30/2005** **$25,901**
National Science Foundation, OCE-0446987

SGER: DOM on U.S. Global Repeat Hydrographic Survey: Line P16S

The PI will conduct dissolved organic carbon (DOC) and nitrogen (DON) measurements on an ocean-basin-crossing section, as part of the US Repeat Hydrographic Survey project. The line is the southern half or a meridional section that runs the full length of the Pacific Ocean. The PI's laboratory occupied the northern section of the Atlantic A20 and A22 lines in 2003. The data collected displayed incredible information on the export of DOC with the formation of North Atlantic Deep Water, and the introduction to the North Atlantic of low DOC water from the south in Antarctic Bottom Water and Antarctic Intermediate water. The paucity of DOC and DON data in the South Pacific preclude understanding of how the introduction of Antarctic Bottom and Antarctic Intermediate water impact DOC transport and distribution in the South Pacific. DOM measurements on the P16S line must be made to complement the other funded carbon system measurements and to fully understand the processes controlling the abundance of this very large pool of carbon.

Craig Carlson **1/1/2003-12/31/2006** **$246,537**
University of Miami, UNIV MIAMI SB030082

Collaborative Research: Global Ocean Repeat Hydrography, Carbon, and Tracer Measurements

Dissolved organic matter (DOM), represents one of the largest exchangeable carbon reservoirs on earth. The global dissolved organic carbon (DOC) pool is estimated to be 685 Pg C (Pg = 1015 g C; Hansell and Carlson, 1998a), a value comparable to the mass of inorganic C in the atmosphere. Small perturbations in the production or sink therms of the oceanic DOC pool could strongly impact the balance between oceanic and atmosphericCO2. In this global ocean repeat hydrograph, carbon and tracer program, D. Hansell (University of Miami) and C. Carlson of UCSB will be responsible for at sea sampling and analyses of dissolved organic carbon (DOC) and nitrogen (DON) measurements. This program includes 17 legs of 10 cruises conducted in various ocean basins from 2003 - 2008.

Craig Carlson **9/1/2002-8/31/2007** **$253,359**
Virginia Institute of Marine Science, 519207/1248

Quantification and Modeling of DOC and DON Release in Marine Systems: A Study of Increasing Trophic Complexity

This project complements and expands the PI's ongoing work examining interactions between microbial communities and bioavailability of DOM. He will be responsible for measurements of the microbial dynamics community and selected characterization of the DOM pool. He will provide expertise towards the microbial dynamics and processing of organic matter, and will be responsible for measuring microbial biomass and production in both experimental and field work. Other tasks for the UCSB PI are to oversee the experimental design of the bioavailability study and bacterial growth efficiency experiments; to measure bulk DOM (DOC and DON) concentrations for the oceanic component of the project and for bioavailability studies; to characterize the dissolved combined neutral sugars and dissolved free amino acids in the field and in experimental studies using HPLC technologies; and to participate in data reduction and analysis and publication of papers and reports.

James Case **12/1/2004-10/31/2006** **$240,000**
US Department of the Navy, N00014-05-1-0046

Coastal Bioluminescence: A Collaboration Dealing with Sources, Population Dynamics and Instrumentation

The goal of this project is to complete a major line of ONR-supported research that received its initial impetus in 1983. As a result of his involvement as a member of the BIDS committee reporting to the Submarine Security Division of the Johns Hopkins Applied Physics Laboratory, the PI developed ideas leading to this line of research. For several years BIDS regularly reviewed ASW/SSN Security field tests dealing with bioluminescence related to submarine security and detection, followed development of an airborne system for detecting submarines at operational depths from their bioluminescence, and evaluated reports of related work by researchers from other sources, primarily the USSR. The PI's work has focused on development of an adequate bioluminescence detector to reliably sample the bioluminescent biota in the open sea to depths relevant to the Navy.

James Case **8/1/2005-7/31/2006** **$40,000**
WetLabs, Inc., SB060041

An Underwater Bioluminescence Assessment Tool (U-BAT)

This is part of a project that is funded by the Office of Naval Research under the Small Business Technology Transfer Program (STTR) with the lead institution WET Labs, Philomath, OR, a long-established developer and manufacturer of oceanographic equipment. WET Labs will lead in the development of numerous improvements to a profiling bioluminescence sensing instrument that was created by the Principal Investigator's group at UCSB with ONR support. The instrument will be further developed, tested and integrated into a general bio-optics instrument package.

Jennifer Caselle **6/1/2005-6/1/2006** **$19,561**
California Department of Fish and Game, P0470012

California Sheephead Stock Assessment

Since its development in the 1980's, the premium live-finfish fishery in California has expanded greatly. In Southern California, the main target species is the California sheephead (Semicossyphus pulcher), and the primary method of capture is trapping. Southern California commercial sheephead landings have increased from approximately 33,000 lbs. in 1989 to 360,000 lbs in 1997. California sheephead are also an important recreational species in Southern California. Surveys conducted in 1998 revealed that the size distributions of both males and females have shifted towards smaller fish since the advent of the live fish fishery, which targets small fish and lands mostly young females. This type of harvesting on a hermaphroditic species such as sheephead is likely to have effects on not only population densities and individual sizes, but also on sex ratios and the social system. A comprehensive stock assessment during 2004 identified a need for improved information on changes in age, growth, and sex-ratios over time to reduce uncertainty in the estimates of the level of catch that the stock can safely support. This study takes the first step to address those data needs.

Jennifer Caselle **7/15/2005-9/30/2005** **$18,200**
Libe Washburn
US Department of Commerce, NCND6021-5-00015

Maintenance of PISCO-CINMS Moorings in the Channel Islands National Marine Sanctuary

To provide data on water mass movements six SEA stations were established in 2004 by the Channel Islands National Marine Sanctuary (CINMS) around the Channel Islands and customized to address the information needs of individual areas. The instrumentation at all stations includes thermistor strings and Acoustic Doppler Current Profilers (ADCPs), oxygen sensors, and/or other equipment as required. The instruments were placed to supplement an existing array of moorings along the west coast, either filling gap areas or augmenting areas for the purpose of providing important information on water temperature and movement within sanctuaries. The UCSB Principal Investigator will assist CINMS to maintain this series of oceanographic instruments in the sanctuary. Maintenance requires multiple research cruises to download data from the instruments. In addition to downloading data and maintaining the oceanographic instruments, the PI will provide data and reports of her findings to CINMS.

Jennifer Caselle **7/1/2005-6/30/2008** **$132,140**
USDI - National Park Service, J8C07050004

Establish Baseline Ecological Conditions of Newly Established Marine Reserves at the Channel Islands

The State of California has recently approved a network of marine reserves that closes over 20% of Channel Islands National Park (CINP) waters to harvest. Both commercial and recreational interests have exploited fish, invertebrates and algae for many years; and there is evidence these activities have had large-scale impacts on marine ecosystems. Traditional fisheries management (season, bag, and size limits, permits) has failed to adequately protect marine resources. Establishment of no-harvest zones is a needed action for restoring ecosystem health. This is the largest network of marine reserves in the U.S. and provides the best opportunity to demonstrate the conservation value of no-harvest zones. This project expands the CINP's existing kelp forest monitoring program through establishment of up to sixteen new fixed sites and will monitor existing sites to ensure adequate inside/outside reserve baseline data to properly evaluate the effectiveness of the new marine reserves. The project will be conducted in cooperation with UCSB's Partnership for Integrated Studies for Coastal Oceans (PISCO) subtidal monitoring program to collect fish abundance and size estimates at the monitoring locations.

James Childress **8/15/2003-7/31/2006** **$248,007**
National Science Foundation, NSF OCE-0240982

Collaborative Research: Site Evaluations and Background Studies of Interactions Among Fluid Chemistry, Physiology, and Community Ecology for Ridge 2000 Lau Basin Integrated Studies

Two cruises to the East Lau Spreading Center (ELSC) are proposed to evaluate sites for selection as the Integrated Study Site (ISS) bull's eye for the Ridge 2000 program and to carry out studies necessary for further interdisciplinary research in this area. In addition to exploration and biological mapping, the sites will be carefully evaluated in terms of the relation between the chemistry of the diffuse flow vents and the macrobiology. This is especially important to do at this time because the only available water chemistry data for this region is from high temperature vents and indicates that Zn is very high and sulfide and methane are very low; this is not consistent with the abundant communities of sulfide and perhaps methane-oxidizing symbioses reported in diffuse flow. This work is complementary to, and will follow upon, the first two major ISS evaluation cruises outlined in the Implementation Plan for the site.

Carrie Culver **9/16/2003-8/31/2005** **$14,531**
US Fish & Wildlife Service, 113323J013

Assessing the Potential for Chinese Mitten Crab Predation on Eggs and Larvae of Salmonids

The Chinese mitten crab, Eriocheir sinensis, is a relatively new inhabitant of the San Francisco Bay and associated watersheds. A catadromous species, it lives primarily in freshwater, but requires estuarine conditions to reproduce. Prior to introduction, large predatory decapods were virtually non-existent in the freshwater areas now inhabited by mitten crabs. Importantly, many of these areas represent spawning habitat for several threatened and endangered species, including salmonids. In fact, large numbers of mitten crabs have been sighted in Adobe and Coyote Creeks in areas with spawning pools of steelhead and salmon. While mitten crabs are known to consume both animal and plant matter, becoming more carnivorous as they grow, it is unknown whether this species preys upon the eggs and/or larvae of fishes. Limited laboratory observations indicate that mitten crabs readily eat 'bait" salmon eggs. Further, crabs burrowing into gravel in laboratory aquaria have been observed to push the gravel around with their bodies and limbs, and to pick up individual pieces of gravel. Taken together, this suggests that mitten crabs could potentially disturb salmonid redds and/or prey upon demersal fish eggs/larvae, indicating the need to evaluate the palatability and detectability of salmonid eggs and larvae to mitten crabs. The goal of this project is to assess whether salmonids may be at risk to predation by E. sinensis.

Carrie Culver **9/21/2004-2/28/2006** **$18,581**
Jenifer Dugan
US Fish & Wildlife Service, 113324G006

Early Detection, Monitoring and Year Class Strength of the Chinese Mitten Crab, Eriocheir sinensis: Evaluating Recruitment Dynamics

The Chinese mitten crab, Eriocheir sinensis, is formally recognized as a harmful aquatic species by the National Aquatic Nuisance Species Task Force. A successful invader of the San Francisco Estuary (SFE), it has caused numerous economic and ecological impacts. A National Management Plan (NMP) has been prepared (Aquatic Nuisance Species Task Force 2002). However, as stated within this plan, current management of E. sinensis is hindered by the lack of biological information for the SFE mitten crab population. Most notably, there is a lack of basic information on population dynamics, and specifically recruitment dynamics. This information is needed not only for the evaluation of control measures, but also for the development of early detection and monitoring strategies.

Ellen Damschen **11/1/2005-10/31/2007** **$10,000**
Steven Gaines
National Science Foundation, SB060070

Biological Informatics Postdoctoral Fellowship

The purpose of this project is to conduct a first test of large-scale habitat configuration effects on species diversity and composition over time in kelp forests using rare long-term datasets from the Santa Barbara Channel. The investigator seeks to determine the effects of the spatial arrangement of habitat in kelp forests on community composition and species abundances and distributions in order to provide a differential tool that can be used to assess the importance of connectivity and

patch shape for species with different life history traits at two different scales. Objectives include: determining if the degree of patchiness at two different spatial scales has increased over time due to human-induced impacts (e.g., urchins, pollution, climate variability); quantifying suitable habitat for kelp and determining if the area, isolation, and shape of available substrate affects kelp colonization and turnover; and determining if kelp forest patchiness affects the distribution and abundance of marine species and whether life history traits (reproductive mode, planktonic larval duration, vagility) can predict species responses.

Daniel Dawson **7/12/2002-11/30/2006** **$50,000**
US Department of Agriculture, USDA02DG11050464-022

Fuel Reduction, Product Utilization, and Low-Impact Forest Management in an Ecological Reserve at the Urban/Wildland Interface

Valentine Eastern Sierra Reserve, an ecological reserve and research station owned and operated by the University of California, is located at the urban/wildland interface between the town of Mammoth Lakes and the Inyo National Forest. Wildfire has been suppressed on the Reserve for approximately 150 years. Research shows that fire average recurrence intervals before that time were as frequent as nine years. Very high loading of fuel has accumulated, and the forest is in a very unhealthy condition with excessive stand density. The University has been engaged in a low level of forest management and fuel reduction since 1997 and has employed as a consultant Dr. John Tappeiner, former Chief Silvaculturist of Region Five of the USFS. Dr. Tappeiner has identified a desired future condition for the forest and outlined the management steps necessary to achieve it. Reserve personnel will work with him to prepare a Timber Harvest Plan to meet the requirements of the CA Forest Practices Act. The project will require significant reduction in stand density and methods to remove stems and slash from the forest without compromising the ecological integrity of the Reserve.

Tom Dudley **12/15/2005-12/14/2006** **$152,500**
US Department of Agriculture, 2006-35302-16641

Regional Targeting of Biological Control Agents Against Saltcedar (Tamarix spp.) in North America

This research is designed to enhance the effectiveness of biological control of saltcedar (Tamarix spp.) where this noxious weed infests floodplain ecosystems throughout the western U.S. An approved biological control agent from north-central Asia (Chrysomelidae: Diorhabda elongata from 44.1°N) has been released in experimental sites in eight western states, but establishment in most has been weak or absent. Poor establishment appears to be related to developmental asynchrony with environmental conditions, especially photoperiod, and secondarily to host plant genotype, across the wide range of latitudes where it has been tested. A second biotype or genetic form of Diorhabda from the Mediterranean region (35.1°N) has now been released at four sites, with moderate to poor establishment. Eight biotypes of Diorhabda are currently maintained from other latitudes in Eurasia and northern Africa, and these have been tested to ensure safety for subsequent release. However, before widespread releases of these insects can take place, the responses of the geographical biotypes to field conditions must be tested, including host genotype, climate, and especially photoperiod, across a representative range of infested ecosystems. The PI will conduct field tests across three North-South latitudinal gradients in Pacific western, arid interior and mid-continent locations, and will simultaneously characterize the full range of developmental responses of the Diorhabda biotypes to photoperiod and temperature under controlled conditions.

Tom Dudley **11/30/2005-9/30/2010** **$100,000**
US Fish & Wildlife Service, 81440-5-G021

Biological Control of Invasive Giant Reed (Arundo donax) in the Santa Clara River Watershed

Giant reed (Arundo donax) may be the most destructive invasive plant infesting southern California riparian areas, including the Santa Clara River. Because traditional control methods are very costly and incur substantial collateral damage, the PI seeks to develop biological control as a cost-effective and environmentally benign means to reduce Arundo infestations using imported natural

enemies that specialize on these plants in their Eurasian regions of origin. The ultimate objective of this project is to suppress the growth and reduce the abundance of Arundo in infested riparian ecosystems, thereby eliminating competition with native woody and understory species and facilitating ecological recovery of the Santa Clara River ecosystem and riparian associated wildlife. This ecosystem provides an excellent test location, but the program is directed towards subsequent implementation throughout southern California and other infested ecosystems of North America. The overall objective is to identify and evaluate herbivorous insects and plant-infecting fungi with the following specific goals: 1) quantify level of damage to the target plant, including plant mortality; 2) verify that agents do not feed on nor infect native and economically important plants; 3) evaluate potential for large-scale rearing, transport and introduction into infested field locations.

Jenifer Dugan **7/1/2005-6/30/2006** **$15,558**
California Department of Fish and Game, P0575002

Investigation of the Depuration of Petroleum Hydrocarbons by Sand Crabs

An average of 75% of the world's open coast shorelines are sandy beaches. This high prevalence means that sandy beaches are likely to receive the majority of contamination from a spill or other impact associated with coastal and offshore oil and gas activities. The sand crab, Emerita analoga, occurs intertidally on almost every type and length of ocean beach and is often the dominant macrofaunal species. This species has been shown to exhibit sensitive and plastic life history responses to environmental variation and anthropogenic impacts. Populations of E. anologa have been used as bioindicators and are bioaccumulators of metals and hydrocarbons. The main study objective of this project is to determine the sand crab's ability to depurate petroleum hydrocarbons and to determine the relative half life (T1/2) of PAHs in sand crabs. This information will enhance the understanding and interpretation of tissue burdens of petroleum hydrocarbons in this widespread intertidal species.

Jenifer Dugan **12/1/2005-10/31/2006** **$5,978**
Shoreline Preservation Fund - Associated Students UCSB, Fall 05-07

Investigating the Ecological Impacts of Coastal Armoring on Sandy Beaches

The ecological effects of seawalls on sandy beaches are little studied and poorly understood. As a consequence of this lack of knowledge, potential ecological impacts of seawalls are not generally considered in decisions regarding seawalls. As sea level rises and coastal erosion accelerates, the need to understand the ecological consequences of coastal armoring on sandy beach ecosystems is increasingly urgent. Results from the PI's ongoing SPF project provide compelling evidence that seawalls are associated with measurable and significant ecological impacts to sandy beaches. This project will continue the investigation of the ecological effects of seawalls on sandy beaches located between Gaviota and Hope Ranch on the coast of Santa Barbara County.

Jenifer Dugan **6/1/2005-1/31/2006** **$6,000**
Shoreline Preservation Fund - Associated Students UCSB, Spring05-12

Investigating the Ecological Impacts of Coastal Armoring on Sandy Beaches

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Jenifer Dugan **7/1/2004-10/31/2005** **$44,796**
SRS Technologies, ISD-04-PO-00 792

Assessing Habitat and Prey Resources for Western Snowy Plovers on Exposed Sandy Beaches of Vandenberg Air Force Base

Sandy beaches comprise three-quarters of the world's shorelines, including much of the California coast. Exposed sandy beaches compose 43% of the mainland coast of Santa Barbara County and are thus likely to receive the majority of contamination from a spill, leak, or other impact associated with human activities. Recently, the primary sites affected by a number of significant oil spills in central and southern California have been sandy beaches (Avila Beach, Guadalupe Dunes, Surf Beach and Huntington Beach). Despite their importance as a major component of the coast, recipients of ocean and land-based pollutants, and ecological, recreational and economic resources, beaches are the least understood and studied intertidal habitat on the California coast. The PI will produce a detailed description of the intertidal and supralittoral sandy beach habitat used by Western Snowy Plover for nesting and rearing chicks on Vandenberg Air Force Base exposed sandy beaches. The resulting report will include recommendations for incorporating prey and habitat measurements into the snowy plover monitoring program for VAFB.

Jenifer Dugan **2/16/2006-12/31/2006** **$15,000**
SRS Technologies, MSD-06-PR-0980

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Jenifer Dugan **4/1/2006-6/30/2006** **$9,999**
UC Sea Grant, R/CZ-PD121-F-1/1

Balancing Human Health Needs with Sustainable Harvest of Marine Resources for Biomedical Use: The Case of the Giant Keyhole Limpet

This study represents the first step in a proactive approach to a unique resource management issue: sustainable harvest of a marine animal that is the only source of a natural product important to the pharmaceutical industry. Basic information on the life history and population biology of this species does not exist and is critically needed for development of an effective management program that addresses the need for a sustainable harvest for biomedical use. The Investigators will gather and analyze basic information on the distribution, abundance and size structure of an important and potentially valuable marine species, Megathura crenulata, in a variety of habitats, both natural and artificial. They will also investigate key aspects of the reproductive biology of M. crenulata from selected habitats. This study will provide resource managers with information that will aid in the development of strategies for sustainable use and management of a marine species that is the only known source of potentially valuable biomedical products for human health, yet has life history characteristics that confer high vulnerability to overfishing. The study results will also support the pharmaceutical industry by providing information critically needed to achieve continued availability of a natural product important for development and commercialization of several promising pharmaceutical drugs with the potential to improve human health.

Jenifer Dugan **7/11/2003-10/31/2005** **$23,852**
Stephen Schroeter
John Dixon
USDC - National Oceanic & Atmospheric Administration, DG133C-03-SE-0826

Comparison of the Sandy Beach Community at Sites Contaminated by Petroleum Hydrocarbons and at Matched Control Sites

Sandy beaches comprise approximately three-quarters of the world's shorelines, including much of the California coast. They are thus likely to receive the majority of contamination from a spill, leak or other impact associated with oil and gas activities. Recently, the primary sites affected by a number of significant oil spills in central and southern California have been sandy beaches (Avila Beach, Guadalupe Dunes, Surf Beach and Huntington Beach). The ecological importance of sandy beaches is generally unappreciated, probably because of the lack of vegetative cover and the cryptic nature of the invertebrate community. This community is predominantly comprised of insects, crustaceans, polychaetes, and bivalve molluscs, which dwell beneath the surface or emerge at night, and hence sandy beaches can appear uninhabited to most visitors. On the other hand, invertebrates that are evident, such as insects like flies, are generally viewed as pests by beach goers.

Jenifer Dugan **9/15/2005-9/14/2006** **$5,000**
USDI - Minerals Management Service, 0205P025828

Development of Response Protocols for Oil Spills in Sandy Intertidal Habitats

The investigator will collaborate with agencies and other scientists to develop protocols for rapid baseline assessments that can be used in responding to oil spills on sandy beaches. These protocols will be suitable for use before oil arrives to a shoreline and will assist in assessment of injury to shorelines. The research involves review of existing information on sandy beach sampling protocols. The PI will identify a set of protocols that are potentially adaptable for rapid assessment use, as well as areas of uncertainty, data gaps and research needs for this effort. Finally, a set of potentially useful methods for the design of protocol tests will be prioritized, with a resulting subset for use in assessing the quality of habitat and diversity of resources on sandy beaches immediately preceding an oil spill.

Jenifer Dugan **9/6/2000-6/30/2006** **$259,724**
USDI - Minerals Management Service, Task 17610 MMS-31063

Joint UCSB-MMS OCS Student Internship Program

The purpose is to develop a sustained student internship program involving the joint cooperation of the MMS-Pacific Outer Continental Shelf (POCS) regional office, the UC MMS Coastal Marine Institute, and the Environmental Studies Program at UC Santa Barbara. This program provides the MMS-POCS regional office with qualified student interns who have a demonstrated interest in POCS-identified issues and offers the students an opportunity for work experience in the processes by which the MMS-POCS office manages offshore resources. Overall objectives are to increase the number of students exposed directly to CMI-funded research projects, to generally strengthen discourse between the UC and MMS, to provide students with a forum for presenting and discussing their research interests as they relate to the interests of MMS, and to keep the MMS-POCS staff abreast of marine research at UCSB and the progress of CMI projects, as well as to expose them to topics of particular interest.

Jessica Dutton **7/1/2004-6/30/2006** **$50,000**
Gretchen Hofmann
UC Toxic Substances Research and Teaching Program, SB040104

Interspecific Stress Expression in a Native/Invasive Pair: Independent and Additive Effects of Temperature and Chemical Exposure in the Invasive Mussel Mytilus galloprovincialis and its native Cogener Mytilus trossulus

Chemical pollution has become a significant characteristic shaping many coastal habitats and communities and likely exerts a selective force upon organisms therein by redefining the parameters of physiological stress for those areas. It has been suggested that invasive organisms may be successful at infiltrating new environments in some part due to relatively robust stress tolerance capabilities. This suggestion can be tested by comparing the relative physiological responses to cumulative environmental stressors in a native and invasive species pair, the bay mussels Mytilus trossulus and M. galloprovincialis respectively. By examining field and laboratory relationships

between contaminant exposure, biological uptake, thermotolerance capabilities and physiological stress in the two species, this study will elucidate some of the physiological differences that may have helped M. galloprovincialis successfully invade the west coast of the United States and elsewhere. This research should contribute to our understanding about the role of environmental pollution in biological invasions, and will also reveal much about the relative merits of the two study organisms as sentinel species for monitoring purposes.

John Engle **10/1/2002-9/30/2005** **$47,726**
AMEC Environmental and Energy Services Co., Inc., AMEC 01-32S-71160

Rocky Intertidal Monitoring in San Diego County: Cardiff and La Jolla

The investigator's objectives are: 1) to identify, quantify and determine the condition and trend over time of key rocky intertidal resources at Cardiff Reef and compare findings to a control site at La Jolla and two sites on Point Loma separately monitored for the U.S. Navy; 2) to assist AMEC in determining effects (beneficial or detrimental) in relationship to AMEC Beach Replenishment Project, 3) to maintain permanent monitoring sites at Cardiff and La Jolla in order to help assess and reduce human impacts and to document long-term climatic changes, 4) to increase understanding of population dynamics of important rocky intertidal species by comparing key species abundance changes among plots, seasons, years, and sites throughout central and southern California; 5) to provide relevant information to resource agencies that will lead to more effective management of rocky intertidal ecosystems.

John Engle **5/30/2002-4/30/2007** **$160,957**
UC Santa Cruz, UCSC 14350102CA85144

Coordination of Database Development, Protocol Standardization, and Regional Activities Between Minerals Management Service and Others in the Multi-Agency Rocky Intertidal Monitoring Network

The UCSB portion of the multi-campus Minerals Management Service (MMS) program, "Shoreline Assessment of Changes in the Rocky Intertidal in the Southern California Bight," consists of coordination of database development and maintenance, protocol standardization, and other regional activities between MMS and the additional agency members of the Multi-Agency Rocky Intertidal Network (MARINE). The program includes principal investigators from UC Santa Cruz, UC Los Angeles, UC Santa Barbara, and California State University, Fullerton. The primary Cooperative Agreement is arranged between MMS and UCSC, with subcontracts extended to the other California institutions.

John Engle **6/15/1997-9/30/2005** **$150,000**
US Department of the Navy, NAV N68711-97LT70034

Rocky Intertidal Monitoring of San Diego County Intertidal Reefs at SPAWAR, Point Loma

The objectives of this project are to: 1) determine the conditions and trends over time of key rocky intertidal resources at Cardiff Reef and compare findings to three control sites at La Jolla and Point Loma; 2) assist the Navy in determining possible effects from the Navy Beach Replenishment Project; 3) maintain permanent monitoring sites at Cardiff, La Jolla, and Point Loma in order to help assess and reduce human impacts and to document long-term climatic changes; 4) increase understanding of population dynamics of important rocky intertidal species by comparing key species abundance changes among plots, seasons, years and sites throughout central and southern California; 5) provide relevant information to resource agencies that will lead to more effective management of rocky intertidal ecosystems. To date, periodic surveys carried out prior to beach replenishment have revealed seasonal, El Niño, and La Niña patterns in key species abundances.

Kathleen Foltz **9/1/2004-8/31/2006** **$250,000**
National Science Foundation, IOB-0415581

Understanding the Fertilization Signalsome

The activation of the quiescent egg during fertilization is the remarkable first step in the development of a new organism. Despite a long history of descriptions of the process, surprisingly little is known about the molecular details of fertilization in any system. In the eggs of all multicellular animals studied to date, a rise in intracellular calcium plays a key role in egg activation. The PI will conduct experiments designed to test hypotheses about the molecular mechanisms of the very early events of egg activation to examine how the rise in calcium is mediated and what triggers opening of calcium gates in the egg's endoplasmic reticulum. These studies are conducted on echinoderms (sea urchin and starfish), the best-understood model system currently in place for dissecting the egg activation pathway. Eggs (especially the highly synchronous echinoderm eggs) offer an exciting example of digital signaling, based on protein-protein interactions, that toggle the cell from "off" to "on" in seconds. Understanding the details of fertilization will provide insight into the general phenomenon of signal transduction as well.

Steven Gaines **6/20/2003-12/31/2007** **360,000**
Andrew W. Mellon Foundation, SB030115

Linking Community Ecology and Biogeography: The Causes of Large-scale Variation in Marine Ecosystems

This continuation of previous research funded by the Mellon Foundation will focus on the biogeography of species interactions. Three complementary types of studies will examine the issues of how multispecies interactions are altered by oceanographic and geographic processes. 1. New models of species interactions targeted specifically at the large life history variation in the ocean: predator prey, competition, facilitation, parasitism and disease. 2. Coordinated experiments on the dynamics and consequences of species interactions at geographical scales, with repeated experiments at strategic locations to test hypotheses derived from modeling efforts. 3. Geographical sampling of the abundance and dynamics of key interacting pairs to examine if the large scale patterns are consistent with model and experimental predictions. These types of studies are especially crucial to make any thoughtful advances in the design of marine reserve networks as effective means of ecosystem wide management.

Steven Gaines **1/1/2006-6/30/2007** **$163,707**
California Department of Fish and Game, P0570008

GIS and Analytical Support for the Marine Life Protection Act

The purpose of this project is to enable the Department of Fish and Game (Department) to meet the requirements of the Marine Life Protection Act (MLPA) by providing support for the Master Plan Team and a Regional Constituent Working Group, in the development of recommendations for a range of alternatives, and a preferred alternative for a network component of Marine Protected Areas (MPAs). The Department requires contracted services to provide scientific consultation, analyses and support for development of the draft Master Plan through the Regional Working Group Process; logistical support for the Master Plan Team; now called the Science Advisory Team (SAT); and map, document and data preparation. The UCSB research team will provide broad scientific and technical consultation, analyses and support focused on marine resources, habitats, and biological and physical processes and factors relating to possible MPA design and citing alternatives generated during the Working Group Process and subsequent to that until a preferred alternative of Central Coast MPAs is adopted by the Commission. UCSB will also provide logistical and communications support for the SAT to facilitate its advisory role to the Regional Working Groups and the Department. Finally, services will be provided to support hardware and software systems used to host the MLPA Initiative database, web-maps and decision support tools.

Steven Gaines **2/15/2002-8/31/2006** **$892,340**
Carol Blanchette
Christopher Jones
Mark Schildhauer
Matthew B. Jones
National Science Foundation, NSF DBI01-31178

Capturing Data in the Field: An Application Framework for Easily Creating Custom Data and Metadata Entry Forms on Handheld and Desktop Computers

The investigators will develop a set of software tools that will enable researchers to easily and powerfully configure custom data capture applications for use on handheld devices in the field, and desktop PCs in the lab. These applications will simultaneously enable researchers to provide critical, structured metadata necessary for their work to participate in a distributed "Knowledge Network for Biocomplexity," while also providing immediate benefit in terms of permitting greater ease, accuracy and efficiency in capturing original data in the field. This work is fully compatible with approaches involved in the Knowledge Network for Biocomplexity, while significantly extending the scope of those efforts by attempting to address informatics issues at their source: the point of data capture in the field. These tools should have broad applicability throughout the discipline, with potential ramifications to any context where researchers need to rapidly and easily develop customized data collection forms for handheld computers, with the added benefit that the resultant data sets will adhere to existing standards for metadata documentation and sound data set design.

Steven Gaines **6/1/2004-5/31/2007** **$26,172**
National Science Foundation, OISE-0402589

International: Dissertation Enhancement: Marine Population Connectivity Across the US/ Mexican Border: A Genetic Approach to Dispersal Dynamics in Kelp Bass

As fisheries around the world continue to crash, there is an urgent need to better understand the population dynamics of marine species. Empirical knowledge of population dynamics in the sea is basic at best, largely due to the challenge of studying the pelagic larval phase that provides the link between generations and across locations. The question of the scale and variability of larval dispersal, and consequently the degree of connectivity among populations, remains largely unanswered. Successful fisheries management will depend on knowing accurate scales of population connectivity and the effects of flow dynamics on these scales through time and space. While efforts to incorporate complex flow and realistic propagule dispersion into analytical models of connectivity are progressing rapidly, empirical approaches to measuring marine larval dispersal patterns lag behind. This thesis project takes a genetic approach called genotype assignment (GA) to estimate dispersal patterns in the kelp bass Paralabrax clathratus. GA is a statistical clustering technique that can identify source populations of individuals based on multilocus genotype data.

Steven Gaines **1/1/2005-3/31/2007** **$3,634,539**
Robert Warner
Libe Washburn
Gretchen Hofmann
Oregon State University, F0395A-C

Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)

The Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) is a collaboration of scientists at four universities - Oregon State University, University of California at Santa Cruz, University of California at Santa Barbara, and Stanford University - with the goals of understanding the dynamics of the ocean ecosystem along the U.S. west coast, producing a new generation of scientists trained in interdisciplinary collaborative approaches, and sharing knowledge for science-based decisions regarding coastal and marine management and stewardship. Over the next five years, PISCO will address major scientific, technological, and cultural challenges to provide the information and tools that are essential for effective management and conservation of the ocean. Ultimately, PISCO will help society to enjoy the many benefits of intact, functioning marine ecosystems, including abundant ocean wildlife, sustainable commercial and recreational fisheries, and vibrant coastal economies.

Steven Gaines **5/1/2006-5/1/2009** **$2,000,000**
Christopher Costello
O. James Reichman
John Melack
Paul G. Allen Charitable Foundation, 8637

Sustainable Fisheries Project

Confidence in our ability to manage ocean fisheries is at an all-time low. Over-fishing has been determined to be the most important alteration of the oceans in the past millennium. The range of causes for the declines in US marine fisheries is large and diverse, but the global breadth of the problem points to a widespread failure of management systems as the critical root of the problem. Fishery dynamics result from the interplay among physical oceanography, biological interactions, economic activities, and regulatory decisions. Yet, the standard management framework for fisheries meshes poorly with this inherent complexity. One of the largest problems is that market incentives create behaviors that are typically at odds with sustainable practices. Open access to fisheries favors overcapitalization and a race to fish that serves neither fish nor fishermen well. In many cases, more effective management strategies involving dedicated access privileges are known, but the pathway to implementation is unclear. In collaboration with Environmental Defense, three entities at the University of California, Santa Barbara will catalyze the reforem of fisheries by coupling ecological analysis, economic models, and investment tools to help align positive ecological outcomes with fishermen's incentives. A Sustainable Fisheries Fund will be developed to support reform efforts. The UCSB entities include the Donald Bren School of Environmental Science and Management, the Marine Science Institute, and the National Center for Ecological Analysis and Synthesis. The project will implement these tools and strategies with significant investment from public and private sources.

Steven Gaines **12/1/2005-4/30/2007** **$326,372**
Resources Legacy Fund Foundation, 20050137M

MLPA Initiative Evaluation Tool

The purpose of this project is to develop a decision support tool for use by the Science Advisory Team for the Marine Life Protection Act (MLPA) Initiative, a public-private partnership between the Resources Agency, the Department of Fish and Game and the Resources Legacy Fund Foundation.

Steven Gaines **9/1/2003-8/31/2006** **$150,000**
The Pew Charitable Trusts, SB030106

A New Conceptual Framework for Marine Reserve Networks

Even when legislation mandates a science-based process in policy-making, science frequently gets marginalized. Two problems commonly limit the role of science: 1) existing science often does not support clear answers, and even when it does, 2) scientists are often unwilling to be advocates for the science. If the underlying science is poorly developed, science will either be silent altogether on key issues, or scientists will interpret the limited information in conflicting ways. In either case, science is unlikely to play any substantive role in decision-making. In addition, even where science supports clear choices, the message is often not communicated forcefully and effectively. Scientists scrupulously guard their perceived objectivity. As a result, their fear of being tarnished with the advocate label often leaves the science to advocate for itself. The investigator's approach is to reduce these bottlenecks to the effective integration of conservation science into policy decisions. His strategy, developed as a result of his involvement with the Channel Islands marine reserve process in California, includes measures to: anticipate key questions, respond opportunistically to new challenges, promote collaborative efforts, share the science, and advocate for science.

Steven Gaines **7/1/2005-6/30/2006** **$193,615**
UC Office of the President, 05 T CEQI 08 0076

Population Connectivity of Coastal Fishery Species across the California-Mexico International Border

This project focuses on understanding the interconnections between populations of fishery species on either side of the international border with Mexico. Despite the fact that California is moving quickly toward promoting sustainable harvest through ecosystem-based management approaches in its own waters, there has been little consideration of the role of other regions in supplying individuals. Fish and invertebrates do not recognize international borders. Past research suggests that many southern California species peak in abundance south of the Mexican border, and indirect evidence suggests that ocean currents may cause a significant number of marine communities in

California to depend on larval re-seeding from Baja, Mexico. Without consideration of the role of cross-border connectivity, the State of California's efforts to create sustainable harvests will be misinformed and likely unsuccessful. In order to understand the extent of larval exchange between California and Mexico, the PI will use new advances in genetic technology on a suite of model species to determine the rates and direction of gene flow across the international border, the spatial scales of larval dispersal along the coastline, and, when possible, the source locations of individuals recruiting to populations in California. Synthesis of these results will enable the research group to test and quantify the hypothesized dependence of California on breeding populations in Mexico for new recruits. The research covers a broad taxonomic assemblage of five fish and invertebrate fishery species having similar biogeographic and life history traits that suggest population connectivity across the international border. These species also represent a host of other sub-tropically associated species in California, thereby extending the implications of the results to cover a wide array of species of economic and conservation importance to California.

Steven Gaines **7/1/2005-6/30/2006** **$10,000**
US Geological Survey, USGS 0527WS001

Channel Islands Field Station Marine Ecology Cooperative Agreement, Task 1

This contract from the USGS Biological Resources Division provides a Field Station at UCSB for research on marine species and their ecosystems. The UCSB investigator will direct studies on problems affecting marine ecosystem patterns and processes in the Channel Islands and along the Pacific Coast of California.

Steve Gaines **5/1/2005-4/30/2010** **$3,825,495**
USDC - National Oceanic & Atmospheric Administration, NA05NOS4291158

Ocean Science Education Building, Phase I

As a collaboration between the Channel Islands National Marine Sanctuary (CINMS) and the University of California, Santa Barbara (UCSB) the Ocean Science Education Center will be a state-of-the-art educational facility that connects invited participants to the CINMS and the Marine Science Institute at UCSB through compelling, hands-on programming. The facility will function as both an Outreach Center for Teaching Ocean Science (OCTOS) and the primary administrative office for operation of the sanctuary (CINMS). The combination will be a unique learning center that brings together science process, environmental policy, and the human connection by focusing on the special marine ecosystem of the Channel Islands. A goal of the project is for the building to be designed and constructed to a gold LEED standard, serving as a demonstration for sustainable design.

Jeffrey Goddard **9/1/2002-8/31/2005** **$130,177**
Carol Blanchette
UC Davis, SA6608

Impacts and Control of an Invasive Seaweed in California Marine Protected Areas

Accidentally introduced with oysters in the 1940's, Sargassum muticum is now the most conspicuous and abundant non-indigenous species on the outer Pacific coast of North America. It is especially abundant in tidepools and shallow subtidal zone in southern California. The investigators will: 1) experimentally investigate the ecological impacts of this large, canopy-forming brown alga on native tidepool biota in two popular intertidal Marine Protected Areas in southern California, and 2) study the efficacy of reducing its abundance and mitigating its impacts in these reserves. Using a randomized block experimental design, with replicated control and removal plots in the field, the investigators will test the hypothesis that removal of S. muticum results in increases in the abundance and species richness of native tidepool biota. They will also determine if manual removal of the alga, two or three times per year and timed to fall between the peak growing season of the alga and the onset of its sexual reproduction, keeps S. muticum suppressed to ecologically insignificant levels.

Jeffrey Goddard **11/1/2005-10/31/2006** **$1,500**
UC MEXUS, SG 05/10-07

Developmental mode in benthic opisthobranch molluscs from the eastern tropical Pacific

Compared to the northeast Pacific Ocean, few data exist on the early life histories and mode of development of opisthobranch molluscs, or sea slugs, from the eastern tropical Pacific. As part of a basin-wide, biogeographic comparison of developmental mode in this taxon from the Pacific Ocean, the PI and Mexican collaborator will document egg size and mode of development in shallow-water, benthic opisthobranchs from Bahia de Banderas on the tropical Pacific coast of Mexico.

Jeffrey Goddard **6/22/2004-12/22/2006** **$50,000**
Milton Love
USDI - Minerals Management Service, 1435-01-04-CA-34806

Benthic Invertebrate Communities on Shell Mounds Beneath Oil and Gas Platforms in the Santa Barbara Channel and Santa Maria Basin

The Minerals Management Service (MMS) defines decommissioning as the process of ending oil, gas, or sulfur operations and returning the lease or pipeline right-of-way to a condition that meets regulatory requirements. As part of this process MMS conducts detailed environmental reviews of any proposed decommissioning projects to evaluate the impacts from platform removal on local and regional invertebrate populations. Assessing habitat quality bears upon platform decommissioning issues, as questions about habitat and the ecological role of Pacific OCS platforms are still unresolved. For example, removing platforms also removes useful habitat, kills numerous associated shellfish, and may have adverse impacts on regional populations of some species on the Pacific OCS. The primary goal of this study is to quantitatively investigate and characterize the macro-invertebrate community on shell mounds under currently operating platforms. The research may be able to detect geographic, bathymetric and temporal variability in abundance and composition of the invertebrate communities.

Benjamin Halpern **4/1/2006-12/31/2006** **$5,000**
Steven Gaines
The Nature Conservancy, CR00016

Threat Analysis for Marine Ecosystems of the North Pacific

The UCSB PIs will provide a threats analysis for marine ecosystems in the Nature Conservancy's Pacific Region from Alaska to Baja, Mexico and assist in organizing a workshop to receive expert input on these threats, and strategies to address them. The Nature Conservancy is in the process of identifying priorities for marine conservation around the globe over the next ten years. Part of this work involves identifying the major threats that affect marine ecosystems and habitats with marine realms (e.g., temperate N. Pacific, polar N. Pacific) and Major Habitat Types or biomes (e.g., continental shelves, bays, estuaries and coastal waters). Specifically, the UCSB investigators will pull out the threats assessment and rankings for marine ecosystems of the Temperate and Polar realms in the two major biomes (Coastal Waters, Continental Shelves) of TNC's Pacific Region. This assessment will cover the geographical area from Alaska to Baja, Mexico. The information/report will include a brief narrative describing the most threatened marine ecosystems and the highest ranking threats.

Benjamin Halpern **4/1/2005-8/1/2006** **$53,405**
Sandy Andelman
The Nature Conservancy, SB050084

Predicting Community-level Responses to Marine Reserve Protection: The Causes of Food Web Stability

The Nature Conservancy is providing additional support for Dr. Benjamin Halpern, recently appointed Program Manager for the Packard Foundation-funded project on "Ecosystem-based Management of Coastal-Marine Systems," housed at the National Center for Ecological Analysis and Synthesis (NCEAS). This award enhances four distinct projects that are all directly or closely related to Dr. Halpern's post-doctoral research project, including funding for graduate and undergraduate

student interns, as well as incidental costs for data access and travel expenses. These projects have the potential for broad impact on marine conservation and marine ecology.

Rachel Haymon **5/1/2004-4/30/2007** **$229,028**
Ken Macdonald
National Science Foundation, 0324668

Collaborative Research: Hydrothermal System Response to Magma Supply and Crustal Thickness Gradients along the Galapagos Spreading Center, 89.5°-94° W

A field experiment is proposed along the Galapagos Spreading Center (GSC) to investigate the response of the hydrothermal-geological-biological system along the ridge crest to large, hotspot-induced, along-strike gradients in magma supply and crustal thickness/structure. Unlike the East Pacific Rise (EPR) and other mid-ocean ridges (MOR's) where variations in magma supply along strike are much debated, the GSC is known to exhibit increases in magma supply and crustal thickness toward the center of the Galapagos mantle plume (GMP) influence at 91.5°W. The GSC is thus an ideal natural experiment for which the observations have yet to be made, on how magma supply and crustal thickness affect the nature, abundance, and distribution of ridge crest hydrothermal activity, and interactions between hydrothermal, volcanic, tectonic, and biological processes.

Rachel Haymon **8/1/2004-1/31/2006** **$101,302**
Patricia Holden
National Science Foundation, MCB 0406999

SGER: Developing Metal-tagged DNA Probes for High Resolution Imaging of Microbial Phylotype Distributions and Nanoscale Mineral/Microbe Associations in Environmental Samples

Environmental electron microscopy (ESEM) is a powerful means of imaging morphologically-intact microbes and examining their nano-scale spatial relationships to one another, to substrates, and to associated minerals. However, use of electron microscopy for such purposes has been restricted to indiscriminate imaging of microbe morphology, with no ability to distinguish between different phylotypes, or to zoom out and observe the overall abundance, distribution and spatial relationships of microbes throughout the larger sample. A means of visually distinguishing targeted microbes in ESEM images must be invented to fully exploit the potential of electron microscopy for learning about in situ microbial activity in the environment. The investigators seek to develop a new technique involving metal-tagged DNA probes that will emit X-rays of uniquely-identifiable spectra when targeted microbes are excited by an electron beam. Detection of the probe spectra will allow unequivocal identification of the host phylotypes, and will permit the distributions and spatial relationships of the targeted phylotypes to be mapped at the micro-to-nano-scale, using any conventional ESEM equipped with an x-ray energy dispersive spectrometer (EDS) and/or cathodoluminescence detector system.

Rachel Haymon **5/1/2004-4/30/2006** **$367,143**
Ken Macdonald
USDC - National Oceanic & Atmospheric Administration, NA04OAR600049

Exploring Hydrothermal System Response to Magma Supply & Crustal Thickness Gradients Along the Galapagos Spreading Center, 89.5°-94°W

A field experiment is proposed along the Galapagos Spreading Center (GSC) to explore the response of the hydrothermal-geological-biological system along the ridge crest to large, hotspot-induced, along-strike gradients in magma supply and crustal thickness/structure. Unlike the East Pacific Rise (EPR) and other mid-ocean ridges (MOR's) where variations in magma supply along strike are much debated, the GSC is known to exhibit increases in magma supply and crustal thickness/structure toward the center of the Galapagos mantle plume (GMP) influence at 91.5°W. However, almost no hydrothermal exploration of the GSC has been done. The GSC is thus an ideal natural experiment, for which the observations have yet to be made, on how magma supply and crustal thickness affect the nature, abundance, and distribution of ridge crest hydrothermal activity, and interactions between hydrothermal, volcanic, tectonic, and biological processes.

Sarah Henkel **9/19/2005-9/18/2006** **$14,984**
Gretchen Hofmann
US Environmental Protection Agency, FP-91654401

2005 EPA Science to Achieve Results (STAR) Fellowship for Graduate Environmental Study Molecular Techniques for Predicting Invasion Potential: Comparisons Among Native and Invasive Kelp Species

Kelps, an important group of seaweeds, are significant members of marine communities, holding scenic, recreational, economic, and environmental value. This research focuses on the invasive Asian kelp, Undaria pinnatifida, and how it is capable of spreading. Invasive species can disrupt food webs and have economic impacts. The fellow will examine how temperature tolerance play a role in invasions and range expansions. An established measure of temperature tolerance is the production of heat shock proteins (Hsps). This project will study Hsps and how they are involved in invasion and spread. Knowledge of the potential for Undaria to spread is important for prevention as well as control of this invader.

David Herbst **7/1/2005-9/30/2006** **$31,810**
California Department of Fish and Game, P0580088

Stream Condition Inventory and Macroinvertebrate Bioassessment of Stream-Reaches in Grazed and Presently Ungrazed Portions of the Golden Trout Wilderness

The U.S. Forest Service has teamed with CalTrout/Orvis and the California Department of Fish and Game to support this independent and objective study to assess stream condition and trend and their links to grazing in the Golden Trout Wilderness. The objectives are 1) To compare grazed and ungrazed areas to determine if there is a difference in "rate of change toward improved riparian habitat conditions" in the riparian meadow environment and in the stream/aquatic environment; 2) To compare grazed and ungrazed areas to determine if there is a difference in "rate of change in erosion features"; and 3) Based on 1 and 2, to determine whether maintaining grazing on the rested allotments could have achieved adequate progress toward the desired conditions.

David Herbst **1/15/2004-3/31/2006** **$175,000**
California Regional Water Quality Control Board, 03-149-160-0

Bioindicators of Water and Habitat Quality in Streams of the Lahontan Region, Eastern Sierra

The California Regional Water Quality Control Board, Lahontan Region (RWQCB), is the State agency responsible for protection of water quality within the Lahontan Region of California. Its jurisdiction extends from the Oregon border to the northern Mojave desert, including all of California east of the Sierra crest. The RWQCB desires to establish baseline (or "reference") biological conditions within its jurisdiction in order to judge the integrity of aquatic communities. The UCSB investigator's objectives are to provide baseline and trend monitoring information to assist the RWQCB in determining the ambient quality of the Region's waters. The project will consist of: 1) collection of data on instream assemblages of benthic macroinvertebrates and algae throughout the Lahontan Region, including data on the geomorphic features and associated physical habitat of stream systems; and 2) compilation and evaluation of existing data to facilitate the development and/or refinement of indices of biological integrity.

David Herbst **3/1/2004-3/31/2006** **$75,000**
California Regional Water Quality Control Board, 03-173-256-0

Evaluation of the Biological Effects of Sediment Inputs Along the Middle Truckee River

The California Regional Water Quality Control Board, Lahontan Region (RWQCB), is the State agency responsible for protection of water quality within the Lahontan Region of California. The RWQCB desires to assess the biological conditions within the Truckee River watershed in order to judge the integrity of aquatic communities and verify their impairment due to excessive sedimentation as part of the Truckee River total maximum daily load (TMDL). The objectives of this project are to provide baseline and trend monitoring information to assist the RWQCB in determining the ambient quality

of the Truckee River's waters and the degree of sediment impairment. The investigator will develop a study plan to determine whether sedimentation in the Truckee River is violating numeric or narrative standards set for the protection of beneficial uses. He will also conduct field investigations established in the study plan, which will include collection of data on the geomorphic features, physical habitat, and in-stream assemblages of benthic macroinvertebrates.

David Herbst **10/15/2004-3/31/2007** **$160,000**
California Regional Water Quality Control Board, 04-157-256-0

Bioindicators of Water and Habitat Quality in Streams of the Lahontan Region-Eastern Sierra

The objectives of this project are to provide baseline and trend monitoring information to assist the California Regional Water Quality Control Board in determining the ambient quality of the Lahontan Region's waters. The work consists on: 1) collecting data on instream assemblages of benthic macroinvertebrates and algae throughout the Lahontan Region, including data on the geomorphic features and associated physical habitat of stream systems; 2) compiling and evaluating existing data to facilitate the development and/or refinement of impairment thresholds, tolerance values, and indices of biological integrity; and 3) providing technical assistance regarding bioassessment.

David Herbst **12/1/2005-3/31/2009** **$384,000**
California Regional Water Quality Control Board, 05-179-160-0

Assessment of the Influence of Sediment on Benthic Stream Communities and Development of Guidance for Sediment TMDLs: Proposed Research Outline for TMDL Study

Sediment is one of the most prevalent, non-point source pollutants impacting water quality in streams nationwide and in California. Statewide, 30.5 percent of stream miles listed as impaired under the Clean Water Act in 2002 were listed for sediment, and sediment was cited more than any other pollutant impairing streams. Assessing, managing, and restoring water bodies affected by a non-point source pollutant such as sediment is one of the most difficult challenges faced by researchers and water quality managers. The Principal Investigator will develop and refine tools to assist Regional Water Boards throughout the State of California in developing TMDLs for sediment. His work will consist of: a) characterizing benthic communities and instream physical habitat in watersheds representing a range of sediment loading, including those with excessive sedimentation from anthropogenic sources and those representing a minimally-disturbed or "reference" condition; b) conducting sediment dose experiments on benthic communities using stream mesocosms; c) conducting sediment dose experiments on selected macroinvertebrate taxa using laboratory microcosms; and d) integrating the findings to create new tools to assist the Regional Water Boards in developing sediment TMDLs.

David Herbst **5/1/2006-3/31/2009** **$420,111**
California Regional Water Quality Control Board, 05-280-160-0

Bioassessment Comparability within Watershed Networks: Spatial and Temporal Components of Variation, and Development of Reference Site Selection Criteria

The objectives of this project are to develop and refine tools to assist the Regional Water Quality Control Board, Lahontan Region (RWQCB) and the State Water Resources Control Board (SWRCB) in assessing the quality of wadeable streams and rivers. The project will consist of: 1) characterizing benthic communities and instream physical habitat at selected stream reaches, and developing/refining tools for the application of bioassessments; 2) integrating historic bioassessment data into a format compatible with the SWRCB's Surface Water Ambient Monitoring Program (SWAMP) database; 3) working with SWAMP staff to promote consistency in bioassessment methods and to develop and refine quality assurance procedures for bioassessment in California; and 4) preparing results (manuscripts) for submittal to peer-reviewed scientific journals.

David Herbst **7/7/2004-6/30/2006** **$10,000**
California Trout, SB050057

Stream Condition Inventory, Golden Trout Wilderness

The U.S. Forest Service has teamed with CalTrout/Orvis and the California Department of Fish and Game to support this independent and objective study to assess stream condition and trend and their links to grazing in the Golden Trout Wilderness. The objectives are 1) To compare grazed and ungrazed areas to determine if there is a difference in "rate of change toward improved riparian habitat conditions" in the riparian meadow environment and in the stream/aquatic environment; 2) To compare grazed and ungrazed areas to determine if there is a difference in "rate of change in erosion features"; and 3) Based on 1 and 2, to determine whether maintaining grazing on the rested allotments could have achieved adequate progress toward the desired conditions.

David Herbst **9/14/2005-9/14/2006** **$120,000**
Scott Cooper
US Department of Agriculture, 05-JV-11272164-082

Aquatic Invertebrate Research for Kings River Experimental Watershed

Headwater streams provide the strongest connection between the landscape and networks of flowing water. This is where flows originate and where the interface of earth and water, and biogeochemical processes influence the entire watershed. The objective of this research study is to set a multi-year baseline for future studies of integrated watershed effects of fire and logging practices in the Kings River Experimental Watershed (Sierra National Forest). This component of that baseline is to establish annual, seasonal, and habitat-specific conditions describing the diversity and structure of benthic invertebrate communities in ten separate headwater catchments that will serve as treatment and control groups for future project activities, and for two additional study sites below confluences of the treatment headwater drainages where the integrative changes associated with the upstream watershed may be discerned. This continues the development of a data set that the investigators have established over the period from 1999 to 2004.

David Herbst **7/1/2004-6/30/2006** **$33,118**
US Forest Service, 04-CR-11052004-151

Stream Condition Inventory and Macroinvertebrate Bioassessment of Stream-Reaches in Grazed and Presently Ungrazed Portions of the Golden Trout Wilderness

The purpose of this project is to carry out an expanded Modified Stream Condition Inventory (MSCI) protocol ("Riley" protocol plus macroinvertebrate sampling) in order to acquire sufficient stream condition information to 1) independently assess the validity of the February, 2001 decision to vacate the Whitney and Templeton grazing allotments in the Golden Trout Wilderness (GTW), and 2) develop a statistically rigorous set of trend data that may be used to follow grazing impacts on GTW streams over the long-term.

Gretchen Hofmann **5/1/2005-4/30/2007** **$421,032**
National Science Foundation, ANT-0440799

Towards an Understanding of Protein Homeostatis in Cold-adapted Antarctic Fish

The central objective of this project is to examine the process of protein homeostasis in the cells of Antarctic notothenioid fishes. Prior results suggested that proteins in Antarctic fish may be subject to a great deal of misfolding at the subzero temperatures typical of Antarctic coastal waters. The two main observations that will define this new set of experiments are: 1) the observation that a normally stress-inducible molecular chaperone, Hsp70, has been recruited into constitutive expression, and 2) in pilot experiments, high levels of ubiquitinated proteins have been measured in tissue of two Antarctic species. The planned experiments will continue with a comparative approach using temperate New Zealand notothenioid fishes to highlight the differences in Antarctic fish physiology. Specific aims include use of ubiquitin conjugate analysis to measure the levels of damaged proteins in cells of Antarctic fishes; estimation of the efficiency of protein synthesis in cold-adapted Antarctic fish cells by measuring the levels of defective ribosomal products (DRiPs); measurement of relative 26S proteasome activity in cells of Antarctic fishes; and assessment of the nature of cold-adapted gene expression in Antarctic fish as compared to their temperate New Zealand relatives.

Gretchen Hofmann **7/15/2004-6/30/2007** **$368,534**
National Science Foundation, OCE-0425107

Finding the Genes that Matter: Profiling Gene Expression in Strongylocentrotid Sea Urchins with Different Biogeographic and Temperature Distributions

The goal of this project is: 1) to test the hypothesis that temperature contributes to setting species distribution patterns in marine ecosystems and 2) to employ genomic approaches and other molecular techniques to assess changes in gene expression in congeneric sea urchins that are adapted to different temperatures and have different biogeographical distributions in nature. The project uses four congeneric species of temperate sea urchin (genus Strongylocentrotus) as study organisms: S. purpuratus, S. Droebachiensis, S. franciscanus, and S. pallidus. Gene expression profiles will be assessed in order to address how the differentially thermally adapted sea urchin species respond to ecologically relevant temperatures at the genomic level. The strategy for the genomics approach entails using DNA macroarrays to screen for differentially expressed genes that will then be analyzed using other genomics techniques -- DNA microarrays and real time PCR.

Patricia Holden **6/15/2004-6/30/2007** **$338,938**
City of Santa Barbara, 21429

DNA-Based Source Tracking of Human Fecal Material: A Proposal to the City of Santa Barbara

The overarching goal of this research is to determine the presence and potential origins of human waste in creaks, extending into the surf zone at the coastal ocean, in Santa Barbara. The geographical focus of this study will be in three areas: 1) old Mission creak from Bohnett Park into the new Mission Creek concretized channel, 2) mid and lower Mission Creek extending to the ocean and including the lagoon, 3) lower Arroyo Burro Creek with an emphasis on lagoon and beach processes. The work will be conducted in two phases. Phase I will determine the efficacy of two DNA-based tests for discerning human from animal fecal material in environmental matrices. Phase II will apply the demonstrated assays to understanding the origins and fates of human fecal material in the study areas.

Patricia Holden **9/1/2003-8/31/2006** **$100,000**
UC Irvine, UCI-2003-1374

Dynamics of Point and Non-point Source Fecal Pollution from an Urban Watershed in Southern California

A growing number of the nation's rivers, estuaries, and coastlines are impaired for fecal indicator bacteria (FIB). This problem is particularly acute in southern California, where the shedding of FIB and pathogens from urbanized watersheds routinely triggers swimming advisories at coastal and inland freshwater beaches, and the closure of shellfish harvesting areas in estuarine and coastal systems. Identification and mitigation of FIB pollution is complicated by the many human and non-human non-point sources of these organisms, and the complex and interrelated physicochemical, transport and ecological processes that control their spatial and temporal distributions in watersheds. This project funds field measurements and modeling studies aimed at understanding how storms affect FIB sources, ecology, and transport within several sub-drainages of the Santa Ana River watershed in southern California.

Patricia Holden **11/15/2004-11/14/2006** **$164,578**
US Department of Energy, DE-FG02-05ER63949

Stabilization of Plutonium in Subsurface Environments via Microbial Reduction and Biofilm Formation

Actinide contamination of subsurface sediments and groundwaters at DOE sites that have varying geochemistry and hydrology is a long-term problem. The investigator's hypothesis is that plutonium (Pu) solubility, speciation and resultant (im)mobilization are susceptible to both metal reduction and biofilm formation by common, well-studied subsurface bacteria. To prove this hypothesis, the PI will study enzymatic metal reduction, bacterial accumulation, and mineral sorption/desorption processes by examining the Pu-bacteria and Pu-mineral-bacteria interactions. Because Pu has

complicated geochemistry and a range of oxidation states that are relevant to subsurface and vadose environments, this research will focus on both anaerobic and aerobic mechanisms. The objective of the project is to understand how biotransformation and biogeochemical processes known to affect the behavior of major redox-active transition metals, Fe and Mn, can affect the mobility of Pu in the environment. Results will fill significant gaps in the scientific basis for monitored natural attenuation and in situ stabilization of widespread and problematic radionuclide contamination.

Patricia Holden **7/1/2004-6/30/2007** **$332,099**
US Environmental Protection Agency, RD-83171201

Transformation of Biologically-Conjugated CdSe Quantum Dots Released into Water and Biofilms

Semiconductor nanocrystals (quantum dots) differ in important ways from bulk semiconductor materials. Their increased band gap means that they function as strong oxidizing and/or reducing agents, and their small size allows them to pass into living cells. Conjugation of biomolecules to the crystal surface can alter any or all of these properties. In preliminary experiments, the investigators have observed that nucleobase-conjugated CdSe quantum dots were actively taken up by soil and water bacteria (for example, Bacillus subtilis and Escherichia coli). Effects on microbial viability attributed to the presence of the quantum dots included slower doubling times, heavy metal sequestration, and "blebbing" of metals into the environment. The PIs aim to quantify these effects using a variety of biologically-conjugated quantum dots and an assortment of microbial species, monitoring the process of quantum dot uptake and breakdown and characterizing the breakdown products that result from bacterial metabolism of these particles.

Kristina Hufford **1/1/2002-7/31/2005** **$150,000**
Susan Mazer
US Department of the Interior - National Park Service, USDI SB020091

Ecological and Genetic Variation Among Channel Island and Mainland Native Grass Populations

Islands have long been recognized as natural laboratories for ecology and evolution. Researchers have focused on the isolation of island ecosystems to test theories of adaptive speciation among large groups of taxa and rare or endemic organisms. However, the adaptive evolution of organisms to island habitats may occur at a much more subtle level ? within a single species common to both island and mainland sites. The investigators will examine the ecological and genetic variation of populations of three native grass species on the California Channel Islands. They will compare data collected at the Channel Islands National Park with data collected from representative mainland sites in Santa Barbara County. A unique combination of genetic analyses and ecological field studies will allow them to characterize local adaptation within populations of a single species. As a result, this research will provide new insights in ecological genetics and the island biogeography of plant populations.

Robert Jellison **5/1/2005-12/31/2006** **$54,315**
David Herbst
California Department of Fish and Game, P0460003

Biological Stressor Identification at Hot Creek Fish Hatchery

The investigators will assist the California Department of Fish and Game (DFG) to develop a workplan to investigate impacts of Hot Creek Hatchery discharge on downstream water quality. The UCSB PI will lead the research team of two DFG scientists and two UCSB scientists. Based on review of the bioassessment survey reports, the team will perform the following tasks: 1) description of biological impairment; 2) listing of candidate causes; 3) workplan to address the data gaps and how to fill them; 4) draft characterization of causes and final written report.

Robert Jellison **1/15/1997-6/30/2008** **$1,397,427**
John Melack
Los Angeles Department of Water and Power, LADWP 8062

Monitoring of Limnology and Plankton in Mono Lake

Mono Lake is a large, hypersaline, highly productive alkaline lake lying just east of the Sierra Nevada. In addition to its recreational, scenic, and water resource values, it contains large populations of an endemic brine shrimp and the alkali fly, which are important food sources for migrating birds. Although saline lakes are common throughout the world and provide important ecological resources for many species, they are much less studied than freshwater ecosystems. Limnological monitoring conducted from 1982-1996 represents one of the longest continuous studies of any hypersaline lake. Rapid lake level rise in 1995 resulted in the onset of meromixis (persistent salinity stratification) and disruption of internal nutrient cycles. This monitoring program will assess whether long-term changes are occurring and if the hypothesized benefits of higher lake levels will take place.

Robert Jellison **10/1/1999-9/30/2005** **$166,784**
National Science Foundation, NSF MCB99-77901

Collaborative Research: Microbial Observatory at an Alkaline, Hypersaline, Meromictic Lake (Mono Lake, California)

The primary goal of this project is to examine the distributions of Mono Lake microbes and to understand the response of microbial assemblages to the gradients of physical and chemical variables in relation to temporal changes driven by hydrodynamics. The specific objectives are to: 1) Identify and characterize the microbial assemblages in the unique Mono Lake ecosystem. 2) Determine the spatial and temporal variation of the Mono Lake microbial assemblage, particularly in reference to evolving meromixis. 3) Determine the response of the microbial community to physical processes, especially short-term and small-scale variation in mixing (for example, enhanced vertical diffusion as a result of boundary mixing or localized gravitational circulation). 4) Provide a mechanistic understanding of the interactions between the physical/chemical structure and microbial assemblages as the basis for predictive (long-term) modeling of the relationship between microbial processes, lake biogeochemistry and primary production.

James Kennett **2/15/2003-1/31/2007** **$330,000**
National Science Foundation, NSF OCE-0242041

Abrupt Climatic Transitions: Surface to Deep-water Response from High-resolution Sediment Records, Santa Barbara, California

Understanding mechanisms behind abrupt climate change during the late Quaternary remains a major challenge in Earth Sciences. The oceans clearly have played a major role in such change, although specific components of the ocean system have responded and contributed differently. While differences in timing between these responses appear to be small (as brief as decades), the sequencing of change is key in understanding processes and forcing mechanisms of climate change. Unfortunately, few areas in the world contain records of sufficient temporal resolution to resolve such change on the short time scales at which these remarkable climatic shifts occurred. One such area is Santa Barbara Basin, providing one of the highest resolution marine records of late Quaternary climate change at the required decadal resolution.

James Kennett **3/1/2003-2/28/2006** **$111,093**
National Science Foundation, NSF OPP02-29898

The Middle Miocene Antarctic Climate Transition: Investigating Magnitude, Phasing, and Processes Involving Cryosphere Expansion and Global Cooling

Understanding mechanisms forcing abrupt climate change is a major challenge in Earth Sciences. Middle Miocene (~15 Ma) geologic records describe significant global ocean/atmosphere cooling coincident with Antarctic cryosphere expansion and a lack of appreciable Northern Hemisphere ice sheets. This suggests that Antarctic climate and cryosphere evolution played a central role in late Cenozoic climate development. Given the complexity of traditional proxies (e.g., $\partial 18O$), fundamental questions exist concerning the magnitude, phasing, and processes driving mid-Miocene ice volume and temperature change. The primary objectives of this mid-Miocene investigation are to better understand: 1) magnitude and phasing of global cooling and Antarctic cryosphere expansion across

this interval; 2) processes forcing Antarctic climate/cryosphere evolution at this time; and 3) effects of an expanding, increasingly stable Antarctic cryosphere on climate feedbacks at orbital periods. This research will provide an unprecedented opportunity to examine the magnitude, phasing, and processes influencing middle Miocene Antarctic cryosphere expansion and global cooling at orbital time scales. The studies will focus the view of Cenozoic climate evolution, including processes and feedbacks influencing Earth's systems across abrupt climate transitions.

James Kennett **8/1/2003-7/31/2006** **$215,980**
David Lea
National Science Foundation, OCE-0320723

Acquisition of an Automated Light Gas Stable Isotope Mass Spectrometer for Dedicated Carbonate Analysis

Stable isotope variations in both marine and terrestrial carbonates are the backbone of paleoclimatic and paleoceanographic research. Oxygen isotopic variations track ocean and atmosphere temperatures, sea level/glacial history, and other environmental parameters. Carbon isotopic variations track biogeochemical cycles, land-sea reservoir changes, and CO2 and CH4 exchange between the ocean and atmosphere. Stable isotopic stratigraphy is also central to global correlation. A major question in the earth and ocean sciences today is the character and cause of climate change and abrupt warmings in the recent geological past. UCSB has established an enviable reputation for research in this area over the past 15 years. This grant provides a major upgrade of stable isotope instrumentation to modern standards through the acquisition of a Finnigan MAT 253 coupled to a "Kiel" automatic carbonate preparation device, with 37% matching support from the campus.

James Kennett **10/1/2003-9/30/2006** **$450,826**
US Department of Energy, DE-FG02-03ER63696

Effects of Oceanic Disposal of Carbon Dioxide on Benthic Microfauna: Foraminfera as Indicators of Dissolution and Ecosystem Health

Carbon dioxide (CO2) sequestration is currently being considered as a mechanism for reducing the release of carbon dioxide to the atmosphere. Because direct infection of CO2 at the seafloor provides certain advantages to other disposal venues, a crucial part of investigating oceanic CO2 sequestration is to determine the biological and geochemical effects on the benthic realm. Work is ongoing to determine the effects of dissolving carbon dioxide hydrate on benthic megafauna. However, little work has been conducted to quantify the effects of CO2 sequestration on microorganisms in surface sediments. The investigator will conduct a number of studies on foraminifera, a well-known group of diverse protists that are typically abundant, and sometimes dominant, in marine sediments. Many foraminifera precipitate shells composed of calcium carbonate, making them an ideal indicator to assess the effects of dissolving CO2 hydrate, which increases pCO2 levels and also decreases pH in the surrounding waters. Because of their shell composition, significant proportions of foraminifera are dependent on a stable, relatively high pH. Foraminifera live both epifaunally at the sediment/water interface as well as burrowing infaunally, and thus can be used to determine the extent of environmental change both on and within the sediments.

Roland Knapp **12/1/2002-11/30/2005** **$99,601**
California State University - Sacramento, 506411A

Airborne Agricultural Contaminants, Disease, and Amphibian Declines: Using Landscape-Scale Patterns to Evaluate the Severity of an Emerging Environmental Problem

The investigator will work closely with Dr. Davidson at CSUS to develop the pesticide use database, combine the pesticide use information with his existing database of lake-specific habitat information, amphibian presence/absence, and amphibian disease presence/absence, and develop statistical models to evaluate the influence of upwind pesticide use on the distribution of amphibians and chytridiomycosis. The UCSB investigator's expertise with database management, generalized additive models, and classification and regression trees (CART) make him uniquely qualified to carry out the tasks associated with analyzing pesticide effects on amphibians.

Roland Knapp **6/1/2002-5/31/2006** **$345,154**
UC Berkeley, MCSA3624

Amphibian Disease Dynamics in a Fragmented Landscape

The UCSB investigator will be primarily responsible for two aspects of the overall research project awarded to Dr. Briggs at UCB: 1) conducting field surveys of mountain yellow-legged from (Rana muscosa) populations to describe the pattern of spread by chytrid fungus and the effect of chytridiomycosis on frog population dynamics and age structure, and 2) building a statistical model to predict the landscape-scale distribution of chytrid fungus infections as a function of habitat variables and contaminant concentrations. These aspects of chytrid fungus infections remain poorly understood but are critical to predicting the dynamics of this disease. To conduct field surveys, the UCSB investigator will lead a three-person crew into remote backcountry locations, assist with and oversee data collection, ensure compliance with a quality-control protocol, and maintain crew safety. He will also be responsible for entry of these data into a database, and for statistical analysis of collected data. He will use a series of statistical techniques, including regression trees, generalized additive models, and autologistic regression to describe the factors associated with chytrid infections and to develop a predictive model of these infections.

Roland Knapp **7/1/2005-6/30/2008** **$66,616**
USDI - National Park Service, J8C07050005

Reintroduce Yellow-legged Frogs to Fishless Lakes in Yosemite National Park

Yosemite National Park recently proposed reintroductions of the declining mountain yellow-legged frog (Rana muscosa) into lakes in six basins. Eight lakes were chosen for reintroduction based on the results of a recent survey of amphibian populations in all lentic water bodies in the park. These lakes currently lack R. muscosa and nonnative trout populations, contain suitable habitat for R. muscosa, and have remnant R. muscosa populations within 5 km that are large enough to serve as source populations for the reintroductions. The lack of R. muscosa at the reintroduction sites is likely a consequence of historic populations going extinct, perhaps because of trout introductions or disease outbreaks. The effect of predation by introduced trout in causing the extinction of R. muscosa populations in the Sierra Nevada is well-documented. The amphibian disease, chytridiomycosis, is caused by the fungal pathogen, Batrachochytrium dendrobatidis, and was recently implicated as a major cause of R. muscosa population extinctions in the southern Sierra Nevada. Recent evidence indicates that B. dendrobatidis is widespread in R. muscosa populations in Yosemite National Park. The objective of this research is to: 1) determine the presence/absence of B. dendrobatidis in all proposed R. muscosa source populations and in alternative source populations located nearby, 2) use source populations free of B. dendrobatidis to conduct as many of the eight originally-proposed reintroductions as possible, and 3) monitor population sizes and disease status of the R. muscosa populations for at least two years following reintroduction.

Roland Knapp **3/1/2004-12/31/2005** **$100,000**
USDI - National Park Service, NPD J8C07040002

Amphibian Resurvey of Select Lakes in the San Joaquin and Upper Kings River Drainages

Mountain yellow-legged frogs (Rana muscosa) were once the common frog of the upper elevations of the Sierra Nevada, but now they appear to be declining precipitously from their historic abundance, and they are in danger of becoming extinct. Many different causes have been proposed for amphibian declines: increases in UV-B radiation, acidic deposition, pesticides, introduced diseases, global warming, human disturbance, and introduced predators. To date, the best-documented cause of decline for mountain yellow-legged frogs is predation by introduced trout. In recent years, however, significant population losses were caused by the chytrid fungus, Batrachochytrium dendrobatidis, and other diseases. In addition, patterns of population declines and limited toxicological data suggest that pesticide drift may be contributing to their decline, especially in the Kaweah River drainage where the mountain yellow-legged frog is now believed extirpated. While introduced trout, disease, and pesticides may all have independent effects on amphibian populations, these stressors may also act synergistically.

Roland Knapp **9/1/2005-8/31/2006** **$10,000**
Utah State University, 051861001

Evaluation of Reference Site Classification Schemes, Probability-based Survey Designs, Biological Indicators, Biotic Tolerance Values, and the Comparability of Different Sampling Methods for Western Lakes and Ponds

The products obtained from this project will provide a sound empirical basis on which state and federal agencies in the western United States and elsewhere can build effective biological monitoring and assessment programs. This is a collaborative effort between Utah State University; aquatic biologists working for the states of Utah, California, and Washington; and the Bureau of Land Management. The research address five questions critical to establishing scientifically defensible programs of biological assessment in lake ecosystems: 1) Which environmental factors are most useful in defining reference conditions for western lakes, and how can these factors be used to classify or model natural differences in biotic potential among lakes? 2) What probabilistic sampling design can most effectively be applied to western lakes? 3) How effective are three general types of assemblage-wide biological indicators (multimetric indices, RIVPACS, and biotic indices based on tolerances) in assessing the biological integrity of western lakes? 4) Can stressor-specific tolerance values for benthic lake taxa assist in diagnosing causes of biotic degradation? 5) How comparable are the data obtained from different methods commonly used to sample benthic invertebrate assemblages in lakes and ponds?

Armand Kuris **6/1/2002-5/31/2007** **$2,229,400**
Kevin Lafferty
National Science Foundation, NSF EF-0224565

Anthropogenic Effects on Host-Trematode Dynamics

Disease interacts with the environment in a variety of ways. This is particularly true for diseases with complex life cycles. A basic understanding of the way that parasites with complex life cycles interact with man-made changes to the environment will help to anticipate future changes in such diseases. This project will use a variety of experimental, observational and theoretical approaches to develop a comprehensive and synthetic understanding of the interactions between man-made environmental change, parasite communities, and the extent to which these changes affect host communities. Salt marshes are a useful model ecosystem to address the role of diseases, since these wetlands are subject to a wide range of man-made impacts and support a diverse community of trematode worm parasites. Examples of changes that can affect parasite communities include losses to biodiversity, pollution, introduced species and climate change. The effects of these impacts are not likely to be the same for all diseases. Because some parasitic diseases can alter the community of hosts that they infect (such as by altering the flow of energy through an ecosystem or by changing predator-prey relationships) there may be complex feedback between changes in the environment, diseases and ecosystems.

Armand Kuris **12/1/2005-6/30/2006** **$9,999**
Kevin Lafferty
UC Sea Grant, P/CZ-119PD-F-1/1

Large-Scale Survey of a Potentially Inexpensive Ecological Indicator

The objective is to quantify the diversity and abundance of the California horn snail trematode community in 35 California coastal wetlands, from Drake's Estero to Tijuana Estuary. This will provide baseline data to use the trematodes as ecological indicators to assess wetland condition. The PIs will perform analysis on the data, comparing the trematode communities to wetland condition (e.g., amount of surrounding development and management history). By providing baseline data for most California estuarine wetlands, it will be possible to use these data for benchmarks and comparisons to assess the several important restoration and remediation projects that are presently being initiated. This technology adds a significant and quantifiable component to other related assessment technologies because it very directly addresses the trophic functioning of these ecosystems in response to perturbations including pollution and impact of exotic species.

Lyndal Laughrin **3/1/2005-9/15/2006** **$5,000**
Susan Swarbrick
Martin V. & Martha K. Smith Foundation, 05002

Solving Invasive Plant Problems Through Habitat Restoration: A Teacher-Student Workshop

A teacher-student workshop held on Santa Cruz Island at UCSB's Santa Cruz Island Reserve (SCIR) field station will focus on the problems of invasive exotic plant species on the California Channel Islands. The ability to target and solve major ecological problems is rarely addressed directly by high school science teachers in California schools. Many leading scientists now consider the spread of exotic species into natural ecosystems to be the "number one" threat faced by natural environments in Mediterranean regions. The workshop will give teachers and students from Ventura high schools the opportunity to study the issues related to the spread of exotic plants and to learn effective methods for addressing the problems in a combination of classroom activities and hands-on field training. Teachers and students will participate in restoration activities that will demonstrate the implementation of a variety of techniques utilized in the fast-growing field of environmental restoration.

David Lea **7/15/2003-6/30/2007** **$275,732**
National Science Foundation, NSF OCE-0317611

High Resolution Mg/Ca-Based Sea Surface Temperature Records from Cariaco Basin Ocean Drilling Program Hole 1002C

The objective of this research is to generate high resolution Mg/CA-based sea surface temperature (SST) records from Cariaco Basin sediments spanning the last 450 thousand years (ky) before present (BP). The Cariaco Basin is well known as a repository of tropical paleoclimate records (Peterson et al., 2000b). Its location on the northern Venezuelan shelf, within the region of influence of the intertropical convergence zone, the high sedimentation rate of the basin (0.3 to >1 mm/y), the excellent preservation of carbonate microfossils, and the occurrence of annually laminated, unbioturbated sequences for the Holocene as well as long periodic intervals over the last half million years, all contribute to making the Cariaco Basin one of the premier tropical climate archives in the oceans. Results from this study promise to advance understanding of the climate impact of the tropics on millennial time scales, with relevance to understanding global climate change on both glacial - interglacial time scales as well as on human time scales.

David Lea **6/15/2005-5/31/2008** **$304,003**
National Science Foundation, OCE-0502609

Testing the Tropical Greenhouse Forcing Hypothesis Using a Halmahera Proxy SST Record

This project will test a new hypothesis: tropical ocean temperature variability over the last several hundred thousand years is dominantly driven by changes in greenhouse forcing (the tropical greenhouse forcing hypothesis). This hypothesis will be tested by developing a new proxy sea surface temperature (SST) record from a site in the western equatorial Pacific warm pool lying just east of Halmahera, Indonesia. A high sedimentation rate core (~15 cm/ky) from this site taken by collaborators from Tongji University in Shanghai, China will be targeted for development of a ~30-140 y resolution proxy SST record. SSTs will be reconstructed using the Mg content of the surface-dwelling planktonic foraminifera Globigerinoides ruber, a methodology that has been validated in many different settings and timescales throughout the tropics. Results from this study will advance independent determinations of climate sensitivity from paleoclimatic data. Climate sensitivity is considered the most significant uncertainty in global climate change predictions.

Ira Leifer **4/1/2004-8/31/2006** **$80,000**
American Chemical Society, PRF 40726-AC8

A Turbine Seep-Tent Network to Study Hydrocarbon Migration

Hydrocarbon migration in a fracture network presents an extremely challenging problem with significant implications to issues such as reservoir recharge and seep contribution to global climate. Since non-destructive, in-situ studies are difficult, great uncertainties remain. Marine seeps provide

a unique opportunity to study this migration process as the seabed is a transecting surface through the network, and measuring gas flux is simpler as bubbles locate seepage. Close to UCSB lies one of the most active seep fields in the world. Thanks to numerous current and past research projects, a historical picture of seepage has been built up over the last decade. Deployment of a 40-unit turbine-seep tent network will measure spatio-temporal variations in seep flux in two disparate active seepage areas. Turbines are spun by rising bubbles; measuring flux and calibration showed insensitivity to bubble size and a fast (0.25s) response. Data analysis will discriminate between factors controlling hydrocarbon flux, including temperature, hydrostatic (tides, swell, barometric), and tar in the fractures. Deployment at two separate seeps will test the hypothesis that seeps respond to small earthquakes. Also tested is whether larger seeps are less oily, a conclusion based on a limited data set from the Gulf of Mexico. This research will also allow discrimination between the mechanisms behind ejections and blowouts.

Ira Leifer **8/1/2005-7/31/2006** **$7,000**
Cal State Lands Commission, C2005-016

Quantifying the Amount and Composition of Seepage from the Playa Del Rey Freshwater Marsh

The project goal is to determine the seep gas emissions from the Ballona Freshwater Marsh. Seepage has been observed at two sites in six to eight feet of water. Seepage rates will be measured with two turbine seep tents. If flow rates are too low to be measured by the turbines, then turbine tents will be capped with a collar and jar, and the time rate of filling will be measured. Flow rates will be measured for a full day to confirm that seepage rates are representative. A third tent will be placed on the marsh bed in an area of no seepage and a background bubble flux measured. Gas samples will be collected from the tents for analysis by Zymax. Chemical analyses specified will include BTEX, H2S, CO and CO2, He, H2, Ar, O2, N2, and the n-alkanes 1-5. Del C13 for CO2, CH4, and ethane will also be performed and Del D for CH4.

Ira Leifer **4/1/2006-9/30/2007** **$200,000**
Bruce Luyendyk
Cal State Lands Commission, C2005-041

UCSB Coal Oil Point Seep Studies

This research study will quantify aspects of natural marine oil and gas seepage from the Coal Oil Point seep field with respect to spatial and temporal emission rates. Specifically, this study will provide the spatial distribution of gas seepage fluxes and estimates of oil seepage as well as provide initial baseline data for studies that address seasonal and inter-annual variability. The study also develops approaches to allow cost benefit analysis of mitigation strategies based on field data. Results of this study are key towards the larger goal of developing appropriate and cost-effective mitigation strategies. A multi-pronged approach includes seasonal and inter-annual sonar seepage mapping studies; turbine tent deployment and flux monitoring; sea-surface oil slick capture study, seabed oil-tent deployment and flux monitoring; and oil slick trajectory study.

Ira Leifer **10/1/2003-6/30/2006** **$86,157**
California Department of Fish and Game, P0375021

Natural and Human Oil and Gas Seepage at Summerland: Assessing Risks with Potential Mitigation Strategies

This research to sample the oil-gas emissions from the onshore seep involves testing of several different approaches. The seepage arises from a bowl-shaped depression on a tar mound and is located at about 0 ft tidal height. The main sampling difficulty is that most oil collection approaches will leave an unknown quantity of oil on the tar mound, leading to great uncertainty and estimates only being lower estimates. Thus a bubble tube method is proposed. Basically, a clear acrylic tube ~ 12" to 18" in diameter is placed into a clay ring base that surrounds the mound and seals it. The tube is filled with water, and the upper 5 cm is lined with stainless to prevent oil from adhering to the acrylic. The gas is collected from an inverted funnel connected to a syringe, while the oil can be sampled without concern that it will be lost on walls. Video can also observe the bubble/oil droplets through the clear side walls.

Ira Leifer **12/10/2004-3/31/2006** **$4,680**
Shoreline Preservation Fund - Associated Students UCSB, FALL4-04

Determining Variations and Sources of Tar Accumulation at COPR

The purpose of this project is to locate some of the sources of tar in the Santa Barbara Channel and to identify the factors controlling the spatial and temporal variations of tar distribution on Coal Oil Point. The research includes the collection and mass determination of tarballs, weekly tarball counts, and oil spill modeling. This research will be conducted for six months by UC Santa Barbara undergraduate interns who will also help educate the local community as to the many sources of tar and the environmental factors that control the variability of its distribution. These environmental factors include tides, currents, swell, wind, storm activity, and kelp harvesting. The interns will be responsible for developing a public brochure and CD rom of the results to be distributed to the local community. In addition, the interns and the PI will make in-class presentations and invite local schools and organizations to participate in the research at the beach. Ultimately, this research will allow further protection of the endangered Snowy Plover habitat located on the Coal Oil Point Reserve (COPR) by developing a method in which tar accumulation can be predicted.

Ira Leifer **3/1/2005-2/28/2006** **$10,000**
Bruce Luyendyk
James Boles
Jordan Clark
J. Ohlmann
David Valentine
Libe Washburn
UC Sea Grant, 20050962

Responding to an Extreme Storm Driven Increase in Oil and Gas Seepage from Natural Seeps along the California Coast

This study seeks to document quantitatively the increase in oil seepage after the massive rains that pummeled Southern California. To quantify gas emissions, a sonar survey will be conducted, calibrated with a direct flux measurement buoy in select areas of seepage. To quantify oil emissions, a series of boom deployments and oil collection studies will be done in select areas of seepage. The oil to gas ratios measured will be used to scale the field gas emissions to the field oil emissions. To study the relationship between aquifer recharge and seepage, pressure data series in wells will be obtained, and fluid samples escaping from seeps at the seabed will be analyzed for salinity and terrestrial hydrocarbons. To understand the fate of the oil, numerical models will be run for the study days and compared with aerial surveys.

Hunter Lenihan **9/16/2002-9/30/2005** **$112,348**
Andrew Brooks
USDI - Minerals Management Service, Task 85340 MMS-31063

Relative Importance of POCS Oil Platforms on the Population Dynamics of Two Reef Fishes in the Eastern Santa Barbara Channel

In October 2000, MMS sponsored the Select Scientific Advisory Committee on Decommissioning in an effort to gather, evaluate, and synthesize all available scientific data on the ecological role played by Pacific Outer Continental Shelf (POCS) oil platforms. The committee identified the lack of studies comparing the ecological performance of local populations on natural reefs with those on platforms through an assessment of demographic rates as the critical information gap that must be addressed before the larger question concerning the ecological role played by POCS platforms can be answered. As large, physically complex structures occupying the entire water column, platforms attract a myriad of marine species in high abundances. It is unclear how much POCS oil platforms contribute to population abundances and biomass at the larger, more ecologically pertinent regional scale relative to natural reef habitat. This uncertainty about the relative contributions of POCS platforms to the overall regional biota is the fundamental question facing officials charged with deciding the fate of decommissioned platforms. The investigators will address this critical question by comparing

estimates of the demographic rates measured in populations of fishes found on POCS oil platforms with those measured in populations residing on nearby, natural rocky reefs.

Jonathan Levine **10/21/2004-10/20/2009** **$625,000**
David and Lucile Packard Foundation, 2004-27672

Understanding Biological Invasions from Introduction through Impact

Biological invasions are a leading threat to natural ecosystems and cost the American economy tens of billions of dollars annually. At the same time, invasions can be regarded as large scale perturbations to ecological communities, providing unique opportunities to understand how these systems are structured. This project will undertake a research program applying principles of population, community, and ecosystem ecology to understand the factors controlling the success and impacts of biological invasions. The research couples mathematical models with field experiments to understand such fundamental questions as how many new invaders can be expected over the coming decades, and what factors regulate the impact of invaders once they have established. By examining key questions at the introduction, establishment, spread, and impact stages, this research aggressively pursues a rigorous understanding of the entire invasion process.

Jonathan Levine **8/1/2005-7/31/2008** **$214,734**
US Department of Agriculture, 2005-35320-16273

Plant-soil feedbacks and the regulations of native shrub recolonization of exotic grasslands

The goal of this project is to understand how plant-soil feedbacks regulate plant invasion dynamics in natural ecosystems. Research will be conducted on Santa Cruz Island, California, where livestock grazing coupled with the introduction of European annual grasses in the early part of the last century converted habitats from native coastal sage scrub to non-native grasslands. Although grazing has been removed, native coastal sage scrub species such as Eriogonum arborescens and Artemisia californica have not recolonized into areas dominated by exotic annual grasses, such as Avena fatua. The PI will investigate how native shrub effects on a) nutrient cycling and b) how soil biota differ from the dominant exotic grass. He will assess how these differences affect native shrub and exotic grass performance. Finally, he will address how plant-soil feedbacks combine with competitive interactions to influence shrub reinvasion of exotic annual grasslands on the islands.

Milton Love **6/1/2001-12/31/2006** **$1,015,396**
California Artificial Reef Enhancement, SB020084

The Ecological Role of Natural Reefs and Oil and Gas Production Platforms on Rocky Reef Fishes in Southern California

In response to a recognized need for the development of scientific understanding of the biology and ecology of fish assemblages living around offshore oil/gas platforms, the PI is involved in a regional approach to research addressing questions about how fishery productivity at the platforms and natural reefs has contributed to key reef fish populations in southern California. A major focus is on determining the relative habitat values of oil/gas platforms and reefs and how ocean influences affect survival and recruitment in the study area. MMS is using the results for environmental assessments associated with oil/gas exploration on existing offshore leases and platform decommissioning in the Santa Barbara Channel and Santa Maria Basin (e.g., oil spill risk assessments and effects of habitat modifications). Other federal, state and private agencies are using the data to assist in decision-making on issues pertaining to fishery management, conservation biology, marine refuges, and artificial reefs. The study addresses the relative contribution of Platforms in supplying hard substrate to reef fish populations, length of time fishes reside at offshore platforms, comparison of daily growth rates of rockfishes from platforms and natural reefs, habitat value of offshore platforms, description of associated biological communities, and role of oil/gas pipelines as fish habitat.

Milton Love **8/27/2003-9/30/2006** **$215,139**
US Geological Survey, 03WRAG0037

Rocky Reef Fish and Trophic Interactions Associated with Offshore Oil and Gas Platforms in Southern California

The goal of this research is to develop information to understand how offshore oil/gas platforms contribute to regional fish populations and fishery productivity in the Santa Maria Basin and Santa Barbara Channel. The study involves broad scale sampling at numerous oil/gas platforms and natural reefs in the Southern California Bight, in cooperation with researchers and resource managers of the National Oceanic and Atmospheric Administration's National Ocean Service (Channel Island Marine Sanctuary), NOAA Fisheries, California Sea Grant Program, Minerals Management Service, California Department of Fish and Game and various other state agencies involved in fisheries management and conservation biology Although the coordination and cooperation of research effort has been great, there continues to be a need for greater compilation and integration of biological and physical data to develop process understanding and comparisons of fishery productivity at natural reefs and man-made structures. An important task for this research team is the completion of an inventory of all of the marine fishes occurring between the Alaskan - Canadian border in the southeastern Beaufort Sea and Cabo San Lucas, southern Baja California..

Milton Love **8/5/2005-8/4/2009** **$500,000**
USDI - Minerals Management Service, 1435-01-05-CA-39315

Reproductive Ecology and Body Burden of Resident Fish Prior to Decommissioning

The primary goal of this study is to fill gaps in information about the reproductive ecology and body burden of resident fish prior to decommissioning. This goal will be met through three separate work tasks or phases. The first phase will determine whether otolith or "ear bone" microchemistry can identify intrinsic markers associated with juvenile rockfish and adult flatfish residing at platforms. Unique signatures of elements (including heavy metals) incorporated in otoliths potentially can be used to measure the extent to which platforms function as nurseries, particularly for rockfishes, and contribute to the replenishment of regional populations in natural areas. If once a platform "fingerprint" is identified, otolith microchemistry can also be useful for identifying adult fish that have moved between platforms and natural areas. The second phase is a survey of levels of heavy metal contaminants present in fishes from platforms and natural areas. The results will begin to establish the relative importance of such contaminants at platforms given the background load in the regional populations.

Milton Love **8/3/2005-9/30/2006** **$520,000**
USDI - Minerals Management Service, 1435-01-05-CA-39322

Fish Assemblages Associated with Platforms and Natural Reefs in Areas Where Data Are Non-Existent or Limited

The MMS defines decommissioning as the process of ending oil, gas, or sulfur operations and returning the lease or pipeline right-of-way to a condition that meets regulation requirements. The MMS works to ensure that wells are plugged to prevent pollution; that pipelines are decommissioned and sometimes removed to prevent seepage of hydrocarbons and to resolve conflicts with other uses of the OCS; and that all sites are cleared of obstructions to minimize use conflicts. The MMS will conduct detailed environmental reviews of any proposed decommissioning projects to evaluate the impacts from platform removal on regional fish populations. When a platform is disassembled, habitat is removed, and numerous fishes and invertebrates are killed. However, the impacts of platform removal on regional populations of coastal organisms are not yet known, particularly on the economically important rockfish species, on the Pacific OCS. Assessment of the effects of platform activities and of the habitat created by the structure of platforms on marine populations greatly bears upon decommissioning issues, as questions about Essential Fish Habitat and the ecological role of Pacific OCS platforms are still unresolved. In order to understand the environmental consequences of decommissioning platforms on local and regional fish populations, there is a need to know the importance of platforms as fish habitat when compared to adjacent natural reefs. The UCSB PI will conduct research aimed at collecting data necessary for making the comparisons, including: 1)

density and size structure of the fishes inhabiting both platforms and natural reefs, and 2) location, area and number of natural reefs.

Milton Love **6/2/2004-6/1/2006** **$250,000**
USDI - Minerals Management Service, MMS 1435-0104CA-35031

Assessing the Fate of Juvenile Rockfishes at Offshore Platforms and Natural Reefs in the Santa Barbara Channel

In some years, juvenile rockfishes recruit to some oil/gas production platforms in the Santa Barbara Channel/Santa Maria Basin region in astounding numbers, and the survivorship and growth of fishes residing around these structures are traceable over time as demonstrated in previous MMS-funded research. Given the role of platforms as nursery habitats, it is important to assess the fate of juvenile rockfishes that settle on platforms and natural reefs, and to understand what processes affect the temporal and spatial variability of recruitment. This study, the first of its kind, is aimed at 1) directly linking ocean current patterns to the timing of delivery of juvenile rockfishes settling on offshore platforms; and 2) estimating the proportion of these juvenile fishes that, if the platforms did not exist, would have been transported to natural reef habitat.

Sally MacIntyre **8/1/2001-7/31/2006** **$439,956**
National Science Foundation, NSF DEB 0108572

Turbulent Mixing: Effects on Resource Supply and Primary Production in Lakes

The long term goal is to develop a predictive understanding of how physical forcings in lakes affect and control ecosystem function. Knowledge of hydrodynamic processes in lakes has increased dramatically in the last decade, and linking these processes to biological ones on the same temporal and spatial scales is essential for fully understanding controls of ecosystem function. Previous studies have correlated turbulence production with the destabilization of basin scale internal waves due to wind forcing and have linked turbulence production to lake size and bathymetry. This knowledge will be used in the current work to design experiments on spatial/temporal variation of turbulent mixing and its consequences for nutrient fluxes, primary productivity, and spatial heterogeneity of community structure in lakes ranging from 0.1 to 100 km2. The PI will conduct experiments on time scales relevant to changes in bacterial and phytoplankton physiology and growth over several seasons to determine the effect of natural variability on responses. New insights at the process level will allow scientists to make better predictions of changes in lacustrine ecosystems due to physical forcing. Extrapolation based on the new understandings of the relation of turbulent mixing to the internal wave field will allow predictions to longer time scales and to other lakes.

Sally MacIntyre **5/1/2003-4/30/2007** **$299,064**
National Science Foundation, OCE 0235238

Collaborative Research: Physical Limnology for the Parasite Ecologist

How infectious diseases influence population dynamics and community interactions is an understudied aspect of aquatic ecology. This research focuses on the ecological interaction between a common microparasitic fungus and its Daphnia host species, and the consequences to coexisting zooplankton and their phytoplankton prey. The collaborators will merge three disciplines (community ecology, physical limnology and epidemiological modeling) in explaining spatial and temporal patterns of host-parasite dynamics. Comparative and manipulative experiments will be conducted in parallel with modeling to couple physical mixing with host-parasite population dynamics in a broad set of lakes. The coupling of ecological and physical-mixing processes is a generally important goal since most aquatic microparasites, unlike their animal hosts, do not swim. Hence, sinking and resuspension of parasite spores from the sediment may limit horizontal transmission and spread of diseases in lakes and oceans.

Eric Matthys **6/23/2003-6/22/2005** **$349,947**
David Chapman
Advanced Technology Institute, 2003-619 (Task 1)

Development of a Bioengineering-based Technology for the Reduction of Hull Drag and Fouling

The investigators will conduct a study of the feasibility of using marine organisms to generate in-situ production of natural drag-reducing compounds on the surface of ship hulls, as well as to inhibit the formation of secondary macrofoulers. Both effects will reduce the drag experienced by the ship, resulting in higher speeds or reduced energy usage. This work will be conducted through a series of bioengineering experiments aimed at 1) optimizing and characterizing the organisms, 2) measuring their drag-reducing behavior, and 3) evaluating their anti-fouling characteristics.

Susan Mau **5/1/2006-4/30/2008** **$33,900**
David Valentine
University of Kiel, MOIF-CT-2006-02164

The Role of Water Column Methane Oxidation in the Global Carbon Budget - Marine CH4 Oxidation

The release of large amounts of the greenhouse gas methane from shallow marine gas reservoirs and dissociating gas hydrates at continental margins is discussed to have advanced warming episodes in Earth's history. However, methane emitted at the seafloor is consumed partly in the ocean by microbial oxidation reducing the portion reaching the atmosphere. It is the main purpose of this project to quantify the fraction of CH4 oxidised in the water column in relation to the amount discharging, dispersed in the water column and escaping into the atmosphere at different seep settings. In the outgoing phase, Dr. Susan Mau will learn the 14C/3H-tracer technique including the synthesis of the tracers at the University of California, Santa Barbara, to measure oxidation rates of CH4 in the water column. This will allow integrated investigation of several vent sites situated in 10-100 m water depth in the Santa Barbara Basin. The area is ideally suited as it is one of the most active areas of natural marine hydrocarbon seepage in the world. The comparison of the results from distinct settings will provide new insight to the buffer system of the ocean with regard to hydrocarbon seepage. This is of great value for the assessment of the climatological response of a sudden release of CH4 from shallow marine gas resources and gas hydrates.

William McClintock **7/1/2005-7/31/2006** **$36,231**
Steven Gaines
Resources Legacy Fund Foundation, 2005-0072M

Hardware and Support Enhancements to the Marine Life Protection Act Initiative Geographic Information System

According to the separate memorandum of understanding between the Resources Agency, the Department of Fish and Game and Resources Legacy Fund Foundation (RLFF), RLFF has agreed to fund GIS hardware and support enhancements for the Marine Life Protection Act (MLPA) Initiative, a public-private partnership.

Michael McGinnis **6/1/2005-3/31/2006** **$4,537**
Shoreline Preservation Fund - Associated Students UCSB, Spring05-04

Coastal Marine Processes and Management: A Profile of the Southern California Marine Ecosystem

UCSB undergraduate interns will be involved with developing four PowerPoint presentations that describe the ecology and human uses of the coastal marine ecosystems of southern California. The focus is to conduct a review of the natural history of the Southern California Bight, located between Point Sal (in central California) and Punta Banda (south of Ensenada, Baja California, Mexico). The presentations will: 1) characterize the general ecology of the coastal marine ecosystems of the south coast, 2) describe the multiple use (such as fishing and diving) impacts to the marine ecosystem, 3) depict the natural history of coastal development and planning activities in the south coast, 4) describe the history of offshore oil and gas development in the region, and 5) characterize recent policy and management initiatives to protect and preserve the coastal marine ecosystems. The PowerPoint presentations will be included in the Ocean and Coastal Policy Center's webpage so that members of the UCSB community and region will have access to the presentations.

John Melack **12/1/2005-10/31/2006** **$2,237**
Shoreline Preservation Fund - Associated Students UCSB, Fall 05-11

The Creation of Adaptive Monitoring for Estuarine Ecosystems: Monitoring of the Devereux Slough, Coal Oil Point Reserve

The ultimate goal of this project is to help bridge the gap between good ecological science and estuarine management by using a specific location to create effective long term monitoring. To do this, the researcher will continue to develop a long term monitoring protocol at Devereux Slough (Coal Oil Point Reserve - COPR) that will be applicable for other Californian estuaries. Initiation of this monitoring long term will help alert COPR managers to ecosystem changes and the management issues that should be addressed at Devereux. The unique feature of this research is the testing of current estuarine monitoring protocols at a single location to determine the successes and pitfalls of these programs, and to help in the development of an economically and time efficient monitoring regime. The result of this project will be the creation of a detailed monitoring manual for long term standardized research at Devereux Slough that incorporates the use of undergraduate interns to help in field collection, data entry and analysis. Students will gain hands-on experience with fish and invertebrate surveying, bathymetric mapping, habitat restoration analysis, bird monitoring and water quality sampling.

John Melack **9/1/2001-8/31/2006** **$200,000**
UC Davis, UCD 005230

Western Center for Estuarine Ecosystem Indicator Research

As part of the Western Center for Estuarine Ecosystem Research, the PI is responsible for flying high-resolution videography over selected targets for comparisons with indicators of ecological health. The measurements at UCSB will be coordinated with field studies conducted under the EPA Center program.

John Melack **7/1/2004-6/30/2006** **$58,000**
Craig Carlson
UC Water Resources Center, SB050002

Nutrient Deposition and Alteration of Food Web Structure in High Sierran Lakes: Response by Microbial Communities

High-elevation lakes of the Sierra Nevada, once considered isolated from human impacts, are increasingly experiencing the effects of population expansion. Nutrient loading, the result of increasing atmospheric deposition, and the stocking of non-native trout, halted in National Parks but continuing on Forest Service lands, are major anthropogenic impacts to these remote ecosystems. The ecological impacts of both trout stocking and atmospheric pollutants have been studied in high-elevation lakes of the Sierra for nearly two decades, and have been shown to impose significant and lasting impacts at a regional scale, including eradication of endangered species, alterations to algal productivity, and changes in zooplankton population dynamics. Connecting these shifts to ecosystem function and biogeochemical cycling is necessary for understanding and predicting ecological impacts in these lakes, yet this has not yet been a focus, despite the documented sensitivity of alpine lake ecosystems to even minor changes in water chemistry or nutrient availability. This research seeks to investigate potential ecosystem impacts of eutropication and trout introductions by examining the role of microbes in the structure and function of Sierran lakes.

John Melack **7/1/2005-10/28/2006** **$90,000**
USDI - National Park Service, H8C0703001

Assessment of Coastal Water Resources and Watershed Conditions in and Adjacent to Channel Islands National Park and Cabrillo National Monument

The UCSB research team will work closely with personnel from the National Park Service, Channel Islands National Park and Cabrillo National Monument, Channel Islands National Marine Sanctuary (CINMS/NOAA), California Department of Fish & Game, Channel Islands Marine Protective Areas

(MPA), USGS, and the University of California, to identify sources of data and other information regarding the status of coastal water resources in Channel Islands National Park and Cabrillo National Monument. Reports for each park will be generated to assess the state of knowledge regarding the condition of coastal water resources in these Parks; describe important habitats and biological resources; identify current and imminent threats from human activities; and offer recommendations for continuing studies.

Paige Miller **6/1/2005-5/31/2007** **$10,000**
National Science Foundation, 0409561

NSF Minority Postdoctoral Fellowship

Theory on the evolution of sex chromosomes has focused on XY systems, neglecting ZW systems despite their importance in nature and the fundamental differences between the two systems, which may have profound evolutionary consequences. The ZW sex determination system fundamentally differs from the XY in two ways: A) in ZW systems, there is colinear transmission of both the W chromosome and the cytoplasmic DNA, and B) both sex chromosomes reside in females, thus potentially affecting the early development of offspring via maternal ettect genes. This project investigates the consequences of the unique characteristics of a ZW system via three major approaches: 1) The development of theory concerning the genetic conflict that arises during the evolution of a ZW sex determination system, 2) The creation of a new female limited sex chromosome (neo-W) in a line of Drosophila melanogaster, and monitoring of subsequent sex-specific fitness changes, and 3) A genomic comparison of the distribution (X vs. autosomes) of maternal effect genes in G. domesticus (chicken) ZQ genome with the XY systems of D. melanogaster (fly), C. elegans (nematode), and H. sapiens (mammal).

Aileen Morse **1/27/2006-11/30/2009** **$56,046**
University of Queensland, SB060101

Coral Reef Targeted Research and Capacity Building for Management

Coral reefs worldwide are suffering degradation from a number of disparate natural and man-induced causes. Tackling the root-causes of degradation through effective coastal management measures is likely the best way both to reduce further damage and to allow reefs to return to viable healthy states. Nevertheless, there can also be opportunities for direct intervention to actively restore injured coral reefs. As part of an international research effort, the UCSB investigator seeks to answer the following question: Does the use of "larval flypapers" to effect controlled settlement and metamorphosis of larvae of selected coral species in a lab-based hatchery facility contribute to enhanced growth and survival of recruits out-planted to the field for purposes of restoration? The research objectives are as follows: 1) To design a low-cost land-based hatchery operated at local level to provide reliable sources of coral larvae, and for the intermediate grow-out of young coral polyps for use in restoration/remediation projects. 2) To investigate the success of collecting gametes from individual coral colonies from nearby healthy sites for rearing under hatchery conditions to provide a supply of young recruits for out-planting into damaged areas. 3) To investigate what is likely to be the most cost-effective size to out-plant juveniles to field. 4) To investigate the effect on reef restoration of out-planting young polyps, derived from hatchery-produced larvae that have been newly settled on "larval flypapers" onto standardized artificial modules (SMs) and natural reef substrate.

Daniel Morse **1/1/2006-12/31/2006** **$20,000**
Camille & Henry Dreyfus Foundation, SG-06-046

Environmental Chemical Signals Bring New Life to Coral Reefs: Development of New Interdisciplinary Teaching and Public Education

This project involves the development, presentation and assessment of an innovative instructional vehicle, and the associated syllabi and materials, for the academic and public teaching of a new interdisciplinary paradigm placing environmental chemistry at the center of marine resource biology and conservation. The principal investigator's discoveries over the past two decades have helped lead to the emergence and acceptance of this new paradigm in research, but because academic

teaching and public education have not yet achieved this integration, both students and the general public are, for the most part, completely unaware of the essential roles that environmental signals and their recognition play in the control of life and ecosystems in the marine environment (and indeed, on the planet as a whole). This project addresses the educational gap by developing and assessing the efficacy of a new undergraduate course and an ancillary public education program that present as their central focus: 1) the critical role that environmental chemistry plays in the control of marine resource biology, and 2) the essentiality of environmental chemistry in modern approaches to marine environmental conservation.

Daniel Morse **8/1/2005-8/31/2006** **$215,970**
Marine Biological Laboratory, 27343

Biomolecular Mechanism, Cloning, Sequencing and Analysis of Adaptive Reflectin cDNAs and Proteins

The dynamically adaptive optical properties of cephalopod skin are driven by unique biomolecular mechanisms that change skin color, reflectance and texture. While the mechanisms responsible for the changes in color and texture are largely understood, it is the dynamic changes in reflectance that are most poorly understood. Our specific focus in this 12-month Phase-One project is to clone and sequence the cDNAs coding for the dynamically adaptive reflectin proteins from squid (genus Loligo), and determine from the deduced sequences, molecular models and experimental analyses of the adaptive reflectin proteins the molecular domains and mechanisms that govern the dynamically adaptive changes in reflectance.

Daniel Morse **8/18/2004-8/23/2006** **$3,500**
Oak Ridge National Laboratory, 4000034927

CNMS RS 2003-04S: Scaffolding of Biosynthetic Enzyme Systems to Nanostructured Electrodics for Controlled Synthesis of Inorganic Materials

This project, conducted by graduate student Meredith Murr, is aimed at understanding the catalytic and structure-directing mechanisms of the silicatein filament in order to develop biologically inspired new routes to materials synthesis. Siliceous marine sponges have developed unique biomolecular machinery for the well-controlled supramolecular assembly of silicon-based biomaterials. In particular, the needle-like glass structures, or spicules, of the marine sponge Tethya aurantia are composed of a central (axial) protein filament surrounded by well-ordered silica nanoparticles. To begin to elucidate the determinants of specificity, self-assembly and templating, the molecular details of the filament surface are required. Studies will be conducted to help determine how the filament is able to stabilize the formation of ordered inorganic products. The results could lead to the design of biologically-inspired catalytic templates that can mimic the desirable properties of the silicatein filament.

Daniel Morse **7/28/2003-9/30/2005** **$156,540**
Oak Ridge National Laboratory, ORNL 4000025240

Silicateins and Carbon Nanotubes

With a precision of nanostructural control that exceeds present human capabilities, biological systems fabricate a remarkable diversity of 3-dimensionally organized silica-based materials. In contrast to the conditions of industrial manufacture, these biological syntheses occur under mild physiological conditions of low temperatures, ambient pressures and near-neutral pH. Analyses of the proteins, genes and molecular mechanisms governing the formation of these composites have revealed a unique mechanism of synthesis with a potential for practical applicability. The PI's research team recently discovered and characterized a new family of proteins occluded in a biologically produced silica, that they named silicateins (for silica proteins). The researchers will extend their expression and display studies with the silicatein molecule by coupling silicatein or its biomimetics to carbon nanotubes (CNTs), for use of the resulting conjugates as catalytic, structure-directing templates for the directed nanofabrication of functional nanostructured composites. A first target will be the synthesis of coherently organized CNT-silsesquioxane composites with improved fluorescence and energy-transfer properties.

Daniel Morse **8/19/2002-8/18/2006** **$2,656,750**
Paul Hansma
Galen Stucky
J. Herbert Waite
Princeton University, 00000532

Synthetic Self-Healing Structural Materials

This research will develop generic, robust rules and design tools governing synthesis and performance of self-healing structural materials, based on exemplars from biological systems that combine some of the desirable properties of Kevlar and silicones. New routes to synthesis of these multifunctional materials will be developed, together with a robust and generalizable understanding of the fundamental physics and design principles underlying their assembly and behavior. Practical uses include self-healing fibers, solids, armors and protectants, coatings, resins, adhesives and packaging materials. Robust and generalizable rules and design tools governing the physical properties and synthesis of self-healing structural materials should find wide application in extensions to predictive property design in other multifunctional materials as well. This project aims to develop fundamental design principles and new routes to synthesis for manufacture of self-healing fibers, resins, solids and composites based on lessons extracted from the biological protein models. The UCSB team will develop, test and optimize synthetic analogs of the natural self-healing proteins and protein-based composites on which their approaches are based, and then translate the results of these studies to second generation synthetic materials that are thermally robust, resilient, processible and economically manufacturable.

Daniel Morse **2/25/2006-10/31/2006** **$49,943**
UC Lawrence Livermore National Laboratory, B558555

Purification and Mechanism of Action of APB Mineralization-Controlling Protein

The formation of calcium carbonate by marine organisms is one of the primary examples of biomineralization. DOE has a strong interest in understanding the physical and chemical controls on calcium carbonate formation because its deposition sequesters large volumes of carbon and impacts sea water chemistry on a global scale. Currently, LLNL has a DOE Office of Basic Energy Sciences funded project to understand the physical controls on the growth of calcium carbonate due to its interaction with peptides, proteins and other biomolecules associated with carbonate formation by marine organisms. Specifically, the project deliverables call for molecular scale investigations of calcite growth in the presence of proteins extracted from the mineralizing portions of Abalone shell, particularly two acidic proteins known as AP8-_ and AP8-_. The UC Santa Barbara PI is the world's leading expert in extracting, purifying and identifying proteins from Abalone and is a leading expert on the more general subject of biomineral formation. In the proposed project, UCSB will extract and purify AP8-_ and AP8-__ proteins. Solutions of these proteins will be provided to LLNL for atomic force microscopy measurements of calcite growth kinetics. The resulting data will be analyzed by both the LLNL and UCSB investigators in order to determine the mechanisms of modification induced by the proteins.

Daniel Morse **3/1/2005-2/28/2006** **$94,093**
UC Sea Grant, R/MP-95-F-2/3

Marine Bio-Nanotechnology: High-Performance Materials from Sponge Silicatein

The objectives are: 1) to complete the project's characterization of the molecular mechanisms by which the silicatein proteins previously isolated from a common California marine sponge control the synthesis and nanostructures of titanium dioxide (for the efficient conversion of solar energy to electricity); 2) in collaboration with industrial partners from DuPont, Dow-Corning and Amgen, to apply the results of these studies to optimize nanostructural control of the resulting titanium dioxide made by the sponge proteins and their synthetic ("biomimetic") counterparts and to optimize the performance of the resulting titanium dioxide nanocrystals for more efficient photovoltaic conversion of solar energy to electricity; 3) in collaboration with the industrial partners, to extend these results to develop innovative methods for the economically efficient nanofabrication and improved

performance of other semiconductors for advanced microelectronic, optoelectronic and medical applications required for the next generation of computers, communications devices, chemical and biological sensors, energy transducers, "smart" medical implants and biochips; and 4) to provide training in the unique interdisciplinary approach of this project, combining new developments in marine biotechnology, advanced instrumentation and materials engineering, to produce high-performance nano-structured materials.

Craig Nicholson **8/1/2005-7/31/2006** **$70,045**
Christopher Sorlien
National Science Foundation, EAR-0439859

Accommodating Oblique Plate Motion in the California Continental Borderland: The Interaction Between Rotating and Non-Rotating Domains

Understanding continental structure and the dynamics of plate boundary deformation is a major initiative in earth science. This project is part of a coordinated effort to conduct integrated, multi-disciplinary studies of the crust and mantle structure and evolving plate boundary deformation both onshore in southern California and offshore in the California Continental Borderland. The Borderland was the locus of Pacific-North America plate motion for about 70% of its displacement history, and recent GPS data suggest that up to 20% of current plate motion is still located offshore. This project will make use of extensive grids of existing high-quality industry multi-channel seismic (MCS) data that have recently become available to investigate the crustal deformation and tectonic evolution of the offshore portion of the PAC-NAM plate boundary. A prime objective is to document how the crustal architecture accommodates plate boundary transpression, differential rotation, spatial variations in fault slip and the termination of faults. Project results will be incorporated into regional community fault, structure and velocity models for southern California that form the basis for estimating earthquake hazards, interpreting geodetic strain data, understanding plate boundary evolution, and other aspects of continental deformation, including fault interaction and fault system dynamics.

Craig Nicholson **4/1/2004-9/30/2006** **$273,819**
James Kennett
Christopher Sorlien
National Science Foundation, OCE 0350573

A Test for Extending the High-Resolution Climate History Back to ~450ka: The Interface Between Climate, Tectonics, and Sea-level Change in Santa Barbara Basin

The ODP Site 893 in Santa Barbara Basin provides one of the highest-resolution climatic and paleo-climatic archives of the late Quaternary being studied from the world's oceans. Oxygen istotopic and microfossil results reveal a remarkable correlation of climate change between Santa Barbara Basin and the Greenland Ice Sheet during the last 70 ka, suggesting synchronous climate changes linked through the atmosphere. The investigators will interpret data collected in 2002, use a 3D model to precisely locate favorable sites for piston coring and select sites to sample the extreme climate transition from Oxygen Isotope Stage -12 to 11, and OIS-6 to 5e to ground-truth the seismic correlation from Site 893. Based on the PIs' experience with Site 893, each core will provide crucial high-resolution windows into how global climate changed during these older time periods, and critical insights into the behavior of late-Quaternary climate change at decadal to millennial to orbital scales. The new data will also help evaluate the nature and speed of earlier climate transitions, and thus provide better understanding of the causes of abrupt global climate warming.

Craig Nicholson **2/1/2004-1/31/2006** **$50,000**
University of Southern California, 083262

Continuing to Build and Evaluate the SCEC 3D Community Fault Model

The purpose of this project is to continue to develop useful digital databases of subsurface information, and to use these data to provide digital 3D structural representations of active fault surfaces for input into the SCEC 3D Community Fault Model (CFM). This includes developing

digital 3D fault surfaces and down-dip projections of seismogenic faults based on subsurface well data, seismic reflection data and relocated seismicity, developing alternative fault models that include non-planar fault geometry, as well as testing and evaluating the existing CFM for fault continuity, consistency and compatibility to accommodate finite strain.

Roger Nisbet **9/1/2001-8/31/2005** **$330,000**
National Science Foundation, NSF DEB 0108450

QEIB: Modeling Population Dynamics and Trophic Interactions in Systems with Unidirectional Flow

Many populations, communities, and ecosystems persist in environments where some or all life stages disperse in media with a strong directional bias. Examples include plants with windborne seeds, aquatic organisms in streams, rivers and estuaries, and marine organisms with larval dispersal influenced by ocean currents. The overall objective of this project is to develop a modeling framework describing consumer-resource interactions in such systems. Although many of the results will have wider application, the primary emphasis is on mechanisms that are important in stream ecology. Typically, stream systems are characterized by high spatial and temporal heterogeneity on many scales, by continuous inputs of nutrients and detritus, and by the presence of distinct populations in the benthos and the drift. Thus the primary aims will be to better understand the factors determining population persistence and distribution in the face of transport processes with a strong unidirectional bias, and to model mechanisms determining the spatial and temporal scales of response to environmental heterogeneity.

Roger Nisbet **3/1/2001-2/28/2006** **$1,939,130**
Andrew Brooks
Bruce Kendall
Patricia Holden
Kevin Lafferty
Erik Muller
Henry Page
Allan Stewart-Oaten
UC Davis, UCD R-82867601

Western Center for Estuarine Ecosystem Indicator Research

The overriding aim of this project is to develop indicators of wetland ecosystem health that are both simple aggregations of data as well as more complex expressions of overall ecosystem health. A second objective is to develop indicators of biotic integrity for plant, fish, and invertebrate communities using model organisms. The third goal is to develop indicators of toxicant-induced stress and bioavailability for wetland biota. These objectives address significant management goals along the entire California Coast. The components of this integrated program include Ecosystem Indicators, Biological Responses to Contaminants, Biogeochemistry and Bioavailability, and Remote Sensing. UCSB's investigators will make contributions in ecological modeling and statistical analyses, field research, and laboratory studies of microbial communities. The purpose of the modeling and statistical analyses is to integrate information from the many individual studies and derive new indicators of integrity and sustainability of wetlands. Field research will include studies of fish and invertebrates in coastal wetlands, stable isotope studies, and investigations of the utility of indicators based on trematodes. The microbial studies will yield information on sources of coastal pathogens and on the dynamics of microbial communities.

Todd Oakley **1/1/2004-12/31/2005** **$271,300**
Nikolaos Schizas
National Science Foundation, 0316330

A Multi-Gene Phylogeny of Maxillopod Crustaceans to Facilitate Comparative Study of Eye Evolution

As benefactors of a detailed stratigraphic record, riotous diversity, and cosmopolitan distribution, the Maxillopoda (ostracods, copepods, barnacles, and others) have enormous potential to provide

information about evolution, biodiversity, ecology and global change. However, a major obstacle to utilizing this potential is the lack of reliable phylogenetic hypotheses for the group. This project has two major goals: 1) to provide a large-scale molecular phylogeny of maxillopod crustaceans and; 2) to use the phylogeny to test hypotheses about maxillopod eye evolution. A selected team of researchers and collaborators with complementary expertise in the major maxillopod groups will sample a taxonomically diverse array of about 100 maxillopod species that is nearly comprehensive at the level of family to order. They will obtain DNA sequence from four different nuclear genes that will allow not only resolution of maxillopod relationships, but also integration with other studies in arthropod phylogeny. With regard to maxillopod eye evolution, a preliminary phylogeny based on extensive preliminary strongly supports independent origins of compound eyes in both myodocopid ostracods and branchiuran fish lice. The PI's will examine statistically the alternative hypothesis that compound eyes were lost multiple times rather than gained.

Todd Oakley **10/1/2004-9/30/2005** **$37,200**
National Science Foundation, DGE 0411712

Post Doctoral Research Fellowship

Because of their tremendous diversity, widespread distribution, superb fossil record, and ancient origin, the Ostracoda (Crustacea) have enormous potential for understanding evolution, ecology, and global change. Ostracods may be the commonest of metazoan fossils, with a record dating back 500 million years with thousands of species described, making them especially suited for assessing methods of divergence time estimation, which is vitally important for understanding patterns and rates of evolution and the impacts of geological and environmental changes on biodiversity through time. This is a collaborative project between Estonian paleiontologist Oive Tinn and American molecular evolutionist Todd Oakley. The project draws on the expertise of both to address important questions at the interface of paleontology and molecular evolution, using tools of bioinformatics and Ostracoda as the group of study. Specific goals are: 1) To create an online, integrated database of first fossil appearances and molecular data; 2) To integrate molecular and morphological data for phylogenetic analysis; and 3) To test the ancient origin of Ostracoda hypothesis.

John Orrock **12/15/2004-5/31/2007** **$43,571**
O. James Reichman
National Science Foundation, DEB-0502069

SGER: Does Manipulation of Top Predators Lead to Rapid Shifts in the Structure of Ecological Communities?

The role of predation in affecting the structure of natural communities is a central question in ecology. However, rarely do systems exist where food webs are amenable to large-scale experimental manipulation, and food webs are often too complex to explicitly track all participants. This project capitalizes upon the planned reintroduction of the Island Fox (Urocyon littoralis) to San Miguel Island to determine if top predators lead to rapid shifts in island plant communities by affecting rodent consumers (i.e., a trophic cascade). Evaluating the effect of top predators requires either long-term data from systems with and without top predators or systems where the timing of predator manipulation is known. This study combines both, using long-term data from systems with and without predators as well as experimental data from a system where the duration of predator removal is known. This unique combination of contemporary and historical data makes it possible to rigorously evaluate the role of top predators in insular food webs as well as evaluate how quickly top predators lead to shifts in ecological communities.

Gail Osherenko **3/1/2005-2/28/2007** **$42,211**
Keith Clarke
USC Sea Grant, 101571

California's Coastal Zone Management Program: Retaining Agricultural Land in the Face of Urban Growth

Nearly all of California's coastal communities are facing a serious shortage of housing for low- and moderate- income workers and looking to remaining agricultural land and open space for land to

build high density housing developments. The California Coastal Act, promulgated in 1976 to protect the beauty of the Coast, is now being tested in a new time of housing shortages and astronomical price increases. The Act identifies retention of important farm- and rangeland as one of the top three priorities for land use in the coastal zone, yet the rate of population growth in coastal communities coupled with patterns of development that foster sprawl threaten conversion of agricultural land both within and outside the coastal zone. Even when planners promote "smart growth" alternatives to sprawl, remaining agricultural land in and close to urban areas provides tempting sites for location of development. California employs a complex of economic, regulatory and legal tools to protect agricultural land: regulatory restrictions (command and control mechanisms), tax incentives, and purchase of property rights. This project examines and evaluates the role of each of these policy instruments in preventing the conversion of agricultural land. The researcher and graduate student will explore the interplay among the three approaches to agricultural land retention.

Christopher Osovitz **7/1/2005-6/30/2007** **$12,000**
Gretchen Hofmann
UC Mexus, SB060030

Investigating the role of physiological tolerances in setting marine species' biogeographic boundaries

This is a dissertation project investigating the physiological underpinnings of the biogeographic ranges of two sea urchin species whose southern range boundaries are located near Punta Eugenia, Baja MX. The purple sea urchin (Strongylocentrotus purpuratus), the red sea urchin (S. franciscanus) and many other marine species share this point as a southern range boundary. It is widely thought that this point is a thermal barrier for these species because a relatively large thermal cline exists there. Since physiological thermal tolerances are thought to limit species ranges at such locations, many studies suggest that species' distributions may shift pole-ward in response to global ocean warming. However, these hypotheses are largely based on hypothetical data, and physiological states of marine species near their southern range boundaries have rarely been investigated. In order to investigate this phenomenon, the investigator will compare gene expression among natural populations of S. purpuratus and S. franciscanus from the center of their biogeographic range (Oregon, USA) toward their southern range boundary (Punta Eugenia, Baja, Mexico). This project will aim to answer two questions: 1) What are the general trends of S. purpuratus' gene expression along the southern portion of its biogeographic range? 2) Does S. purpuratus' sister species S. franciscanus utilize similar differential expression trends across its biogeographic range? Using this twofold approach will allow the PI to make conclusions regarding a species' general physiological response to environmental variation (#1) as well as specific responses to what extent such responses are universal to other species (#2). Such an endeavor would benefit understanding of marine community structure as well as offer insight to species responses to future climate change.

Henry Page **10/1/2005-9/30/2006** **$30,456**
Stephen Schroeter
Jenifer Dugan
Channel Islands National Marine Sanctuary Foundation, SB060087

Variation in Larval Supply Inside and Outside of a Marine Protected Area Within the Channel Islands National Marine Sanctuary

The overall project goals are to improve understanding of factors regulating populations of commercially, recreationally, and ecologically important invertebrate species inside and outside of a Marine Protected Area (MPA) on Santa Cruz Island. Specifically, the investigators will: 1) test whether the larval supply of selected invertebrates differs inside and outside of an MPA on Santa Cruz Island, 2) investigate relationships between larval supply and the density of adults, 3) examine how larval supply varies among selected taxa, 4) involve stakeholders in research within the Channel Islands National Marine Sanctuary, and 5) provide preliminary data that can be used to generate a more comprehensive proposal to improve understanding of factors regulating benthic populations within MPAs.

Henry Page **9/16/2002-9/30/2005** **$156,515**
Jenifer Dugan
Milton Love
Hunter Lenihan
USDI - Minerals Management Service, Task 85339 MMS-31063

Ecological Performance and Trophic Links: Comparisons Among Platforms and Natural Reefs for Selected Fish and their Prey

The overall objective of this research is to provide decision-makers with information on the quality of offshore platforms as reef habitat. Specifically, the investigators will: 1) explore whether indices of ecological performance (e.g., size, individual growth, production) of a model fish and its invertebrate prey differ between a platform and a natural reef over time; 2) test whether the performance (nutritional condition, growth) of a model fish differs among offshore platforms and natural reefs located in different regions of the Santa Barbara Channel at one time; 3) examine depth fidelity, territoriality, foraging activity budgets, and mortality of a model fish as a means of linking prey and predator performance; and 4) acquire data that can be integrated into models, such as ECOPATH, to describe the flow of energy and material among trophic levels on platforms and natural reefs.

Robert Petty **6/18/2004-7/31/2005** **$9,995**
UC Lawrence Livermore National Laboratory, B539972

Determining the Contribution of Riverine, In-Delta and Aqueduct Sources of Organic Carbon to Loads in the State Water Project Using AMS Carbon Dating and Stable Isotope Characteristics

The UCSB Principal Investigator will analyze samples from PIs at the Department of Water Resources and Lawrence Livermore National Laboratories for environmentally stable Delta isotopes. Radioactive and stable isotope results will be used in a mixing analysis employing principal components and end member mixing to determine if: 1) Delta island peat is a significant source of C loading to the SWP, 2) C inputs from Delta island peat vary through time depending on seasonal and hydrologic conditions, and 3) Using these techniques, can managers and scientists separate the effects of conversion of Delta agricultural lands to wetlands and reservoirs from other ongoing landuse changes such as increasing urbanization.

Barbara Prézelin **7/1/2003-3/31/2006** **$274,563**
UC Santa Cruz, 03-T-CEQI-07-0062

Toxic Phytoplankton Along the California Coast: A 500-Mile Perspective

This project is based on results from an earlier, individual award to Dr. Mary Silver at UC Santa Cruz that focused on toxic phytoplankton in central California (the Monterey Bay region). The results showed that toxic algal blooms are relatively common in the study area, with multiple events annually for two major toxin-producing groups of microalgae. During that project, the incidence of algal-related poisonings of marine mammals has increased dramatically along the entire coast. The current study sets up the first large-scale analysis of populations of the two major toxin-producing phytoplankton taxa along the California coastline. The PI's seek to determine the abundance of domoic acid (DA) -producing diatoms of the genus Pseudo-nitzschia and the saxitoxin (STX) -producing dinoflagellate, Alexandrium. This 3-campus project will simultaneously measure the toxins associated with the populations, a large-scale assessment never attempted previously.

Langdon Quetin **10/15/2002-9/30/2006** **$392,520**
Robin Ross
Virginia Institute of Marine Science, 518606/1247

LTER: Palmer Antarctica LTER: Climate Change, Ecosystem Migration and Teleconnections in an Ice-Dominated Environment

The UCSB investigators are responsible for the Zooplankton and Micronekton component of the PAL LTER study of the pelagic ecosystem west of the Antarctic Peninsula. The work consists of three major areas, core data sets, process experiments, and synthesis and modeling. The core data sets constitute the time series that is the legacy of the LTER, and that allows the investigators to

test hypotheses about processes that occur on time scales of decades. UCSB's investigators are responsible for: 1) collection of core data sets during the spring and summer season, primarily during the annual research cruise in January/February; and 2) documentation of data collection methods, quality control/quality assurance of the core data sets, and placement of the core data sets and documentation into the PAL LTER database within two years of collection. Shorter-term process studies on such questions as grazing rates of larval krill on surfaces or factors driving the documented seasonal decrease in biomass of krill in the area will be undertaken in one- or two-year sequences. They will also participate in synthetic and modeling activities, including continuation of the EOF analysis begun during the 1996-2002 period of the project, and analysis of the abundance and distribution of the five major macro-zooplankton species in the PAL LTER study region with the ten-year time series.

Daniel Reed **4/1/2000-3/31/2007** **$4,990,912**
Scott Cooper
Steven Gaines
Sally Holbrook
John Melack
National Science Foundation, NSF OCE 9982105

LTER: Land/Ocean Interactions and the Dynamics of Kelp Forest Communities

This LTER (Long-Term Ecological Research) site in the Santa Barbara region is focused on ecological systems at the land/ocean-margin. The location is typical of many semi-arid regions in that it includes a large number of watersheds with episodic stream flow that vary in size and land use. The focal coastal ecosystem of this research will be giant kelp (Macrocystis pyrifera) forests, which are extremely important to the ecology and economy of coastal areas along the west coast of North and South America. Kelp forests occur on shallow coastal reefs and are affected in both positive and negative ways by land and the open ocean through the movement of water carrying constituents (e.g., sediments, nutrients, larvae, pollutants) from these different sources. Kelp forests have a unique trophic structure in which producers (macroalgae) and consumers (sessile invertebrates that filter plankton) compete for space. Competition between macroalgae and sessile invertebrates can be mediated by the relative supply of nutrients and particulate organic matter to the reef.

Daniel Reed **1/1/2004-12/31/2005** **$1,732,070**
Stephen Schroeter
Henry Page
Mark Steele
Simpson and Simpson Business and Personnel Services, Inc., SB040045

San Onofre Nuclear Generating Station Mitigation Project Monitoring Program

In 1974, the California Coastal Commission (CCC) issued a permit to Southern California Edison (SCE) for Units 2 and 3 of the San Onofre Nuclear Generating Station (SONGS). Conditions of the permit require monitoring the impacts of the operation of Units 2 and 3 on the marine environment offshore from San Onofre, mitigation of any adverse impacts, restoration of a southern California wetland, installation of fish barrier devices at the power plant, construction of an artificial reef to replace lost kelp bed resources, and support for a marine fish hatchery. SCE is also required to fund a monitoring program of the mitigation effort to be carried out by appropriate and independent scientific and technical personnel and consultants under the direction of the Executive Director of the CCC. Working closely with the CCC, the UCSB PIs will provide oversight and consultation to SCE on the planning of the wetland restoration project including: pre-restoration monitoring at appropriate reference sites; monitoring of the experimental phase of the artificial reef project; analysis of data on fish impingement at SONGS Units 2 & 3l; assessment of SCE's compliance to the behavioral barriers mitigation requirement; a data management system for all project-related data; supervision of technical staff, contractors and consultants; preparation of quarterly reports for the CCC on the status of the mitigation projects; organization of annual public workshops to discuss the findings and status of the SONGS mitigation program; and preparation of a work program and budget for the coming year.

Daniel Reed **11/1/2004-1/31/2007** **$40,352**
UC Davis, UCD 013981-02

Mechanical Consequences of Flexibility for Benthic Marine Organisms

The UCSB investigator will oversee field technicians who will conduct monitoring of kelp survivorship in the field. The technicians will also deploy and retrieve a physical instrument used to record wave heights at the core field site of the study, and will carry out morphological measurements and measurements of holdfast strength on kelp plants collected in the Santa Barbara area. The field technicians will also assist the UC Davis investigator during periodic visits to UCSB in deploying devices for determining drag coefficients of kelps and in deploying sensors that directly measure wave forces imposed on these organisms in nature.

Daniel Reed **7/1/2004-8/31/2006** **$354,967**
Sally MacIntyre
Mark Brzezinski
Sally Holbrook
UC Office of the President, UCOP 012856-01

Ecosystem Functioning in Giant Kelp Forests: Linking Hydrodynamics to an Essential Forage Species and its Benthos

Giant kelp (Macrocystis pyrifera) is heavily harvested and is a critical forage species for numerous other marine organisms, many of strong commercial value to fisheries. The subtidal forests formed by this kelp may also have the capacity to function as natural filters to improve coastal water quality. However, despite the clear economic and ecological importance of giant kelp forests, their relationship to surrounding waters and the linked responses of organisms within the community to forest-flow processes have not been explored in any detail. The investigators aim to examine mechanistically 1) the degree of connection of this vital system to its surrounding waters, 2) rates of consumption or production of waterborne subsidies by kelp forests, 3) the interplay of nutrients, light, and flow in determining kelp growth, and 4) the implications of forest-flow interactions for benthic inhabitants of the forest. The experimental efforts will employ extensive flow measurements, geochemical and biochemical analyses, and traditional ecological methods in exploiting a breadth of expertise in hydrodynamics, marine ecology, biological oceanography, and algal physiology. As such, this work will address pressing problems in coastal water quality, it will increase knowledge of the ecosystem role of a critical forage species, and it will outline the nature of cascading ecological processes that impact fisheries.

Daniel Reed **3/15/2006-6/30/2006** **$5,000**
Carol Blanchette
Steven Gaines
Allison Whitmer
UC Sea Grant, R/W-1200PR-F-1/1

Rapid Response Support for the 7th International Temperate Reef Symposium

The primary objectives of the Seventh International Temperate Reef Symposium (7th IRS) are: 1) to promote the exchange of information among academic scientists, resource managers, government agencies and the interested public on topical issues pertaining to the ecology and management of shallow rocky reefs in temperate regions throughout the world, and 2) to train the next generation of scientists in effective reef conservation and management, and educate them on the virtues of international collaborations. The 7th ITRS will be held at UC Santa Barbara June 26-July 1, 2006. This funding from UC Sea Grant will provide partial lodging costs for 25 graduate students to attend the symposium.

Daniel Reed **4/10/2006-7/1/2006** **10,000**
USDI - Minerals Management Service, 0106PO39729

Sponsorship of 7th International Temperate Reef Symposium

The primary objectives of the Seventh International Temperate Reef Symposium (7th IRS) are: 1) to

promote the exchange of information among academic scientists, resource managers, government agencies and the interested public on topical issues pertaining to the ecology and management of shallow rocky reefs in temperate regions throughout the world, and 2) to train the next generation of scientists in effective reef conservation and management, and educate them on the virtues of international collaborations. The 7th ITRS will be held at UC Santa Barbara June 26-July 1, 2006. This funding from the Minerals Management Service will provide participant costs for foreign scientists to attend the symposium.

O. James Reichman **9/1/2001-12/31/2006** **$450,000**
Andrew W. Mellon Foundation, MELLON SB020119

Postdoctoral Training in the Management of Environmental Information: A Proposal to the Andrew W. Mellon Foundation

Despite many years and dollars spent in pursuit of useful information about the environment, even the simplest forms of communication between providers and users of the information is extremely difficult, to the extent that scientists may be limited by the inability to access the vast amounts of information that exists. Inaccessibility is particularly true for ecological information. Within the universe of information, ecological data may be as dispersed and heterogeneous as any of interest to scientists and other users. Understanding complex ecological and environmental issues requires information across many scales and disciplines, from the molecular level to whole organisms and from genetics to global change. Contemporary ecological research commonly relies on integrating data as diverse as climatological records, spatial distributions of individuals, changes in biodiversity over space and time, responses of species to experimental manipulations, genetic structure of populations, patterns of human alterations of ecosystems, and much more. The scope of information needed to understand ecological systems is enormous. This project will support three postdoctoral associates in ecology and computer science at the National Center for Ecological Analysis and Synthesis to work on informatics research on the cutting-edge elements of the Center's efforts to imbue the community of information users with a capability for sharing information.

O. James Reichman **1/1/2003-12/31/2006** **$700,000**
Andrew W. Mellon Foundation, SB030058

Production Implementation of the Knowledge Network for Biocomplexity

Information is the raw material of knowledge and understanding. The research enterprise is designed to generate information - data - and facilitate its incorporation into higher order understanding and true knowledge of the systems under consideration. The geometric increase in information, and its availability in machine form, has made the amount of data accessible overwhelming; unfortunately it has not led to a commensurate increase in knowledge in most fields. This is particularly true for ecological information, which is important for advancing the basic understanding of natural systems. Within the universe of information, ecological data may be as dispersed and heterogeneous as any of interest to scientists and other users. Understanding complex ecological interactions involves both the biotic and abiotic realms, and commonly relies on integrating data as diverse as climatological records, spatial distributions of individuals, changes in biodiversity over space and time, responses of species to experimental manipulations, genetic structure of populations, patterns and processes of ecosystem functioning, and much more. Research at the National Center for Ecological Analysis and Synthesis (NCEAS) has revealed both the need for, and the power of, more generic access to data to address ecological questions.

O. James Reichman **3/23/2005-3/31/2007** **$300,000**
Andrew W. Mellon Foundation, SB050085

Deploying Information Management Tools and Increasing Analytical Capabilities of Scientists Through the National Center for Ecological Analysis and Synthesis

The National Center for Ecological Analysis and Synthesis (NCEAS) was established to use existing data to address important ecological questions. Accordingly, its research and training activities (including Working Groups, Postdoctoral Associates, and Center Fellows, totaling more than 3,500 individuals in 10 years) focus on the acquisition and access to distributed and heterogeneous

ecological information. NCEAS has been engaged in extensive research projects to develop generic data access tools for ecology and allied disciplines. Concurrently, the Andrew W. Mellon Foundation has provided unique support to help deploy the tools, a crucial activity that is not supported by more traditional entities. With this support, the Principal Investigators have discovered that a distinctive opportunity exists at NCEAS to develop informatics tools and train hundreds of scientists in their use. Specifically, while at the Center, scientists are fully engaged in accessing, integrating, and sharing information to conduct their projects and thus are primed to employ new informatics tools. This award from the Andrew W. Mellon Foundation provides support for one person for informatics training and three analytically adept postdoctoral associates to significantly strengthen informatics training for hundreds of scientists who visit the Center each year.

O. James Reichman **4/23/2004-9/30/2005** **$5,000**
Center for Invasive Plant Management, GC257-04-Z1138

Do Native Consumers and Patch Shape Affect the Dominance of Invasive Plants?

Consumers may play a critical role in the success or failure of invasive plants. For example, a common theme in the biological control of invasive plants is that they can be controlled by introducing consumers from their original range. However, this focus has largely neglected the possibility that invasive plants may dominate native plants by affecting native consumers. The principal investigator tests a novel mechanism by which invasive plants maintain their dominance of 9.2 million hectares of California grassland: by promoting large consumer populations and changing consumer activity patterns, invasive plants suppress native species. The PI will collect baseline data that are necessary to secure funding to conduct a multi-year study on the role of consumers and patch shape in affecting the dominance of California grasslands by invasive plant species. This work brings elements of community and spatial ecology to bear on invasive plant management, components that have traditionally received little attention. Moreover, long-term studies that focus on the role of native consumers in affecting invasive and native plants are virtually nonexistent.

O. James Reichman **4/1/2004-3/31/2006** **$200,647**
David and Lucile Packard Foundation, 2004-26832

Request for Support of Planning Activities to Develop Scientific Knowledge in Support of Ecosystem-based Management in Coastal Marine Systems

As an initial step in the development of a science strategy focused on Ecosystem-based Management for Sustainable Coastal-marine Systems, the National Center for Ecological Analysis and Synthesis (NCEAS) seeks to develop a program aimed at producing the scientific knowledge necessary for sustainable management of coastal-marine systems. This project provides for the organization and first meeting of the Advisory Committee, and for a distributed graduate seminar that will synthesize information and critically evaluate ecosystem-based management efforts from the last decade.

O. James Reichman **6/20/2004-6/20/2007** **$1,275,830**
David and Lucile Packard Foundation, 2004-27169

Knowledge and Capacity-Building to Support Ecosystem-Based Management for Sustainable Coastal-Marine Systems

This is a partnership between the National Center for Ecological Analysis and Synthesis (NCEAS) at UC Santa Barbara and the Packard Foundation that focuses the attention of innovative scientists of the highest caliber on generating the knowledge needed to support an ecosystem-based approach to managing coastal-marine systems. Coastal systems are heterogeneous and dynamic. They also are frequently chaotic, corruptible by invasion of exotic species, and strongly influenced by both nearby and remote processes, including human activities. The current global population and associated activities of more than 6 billion people are generating unprecedented rates of change in these systems. Thus they cannot be managed successfully by existing approaches. In this context, perhaps the greatest challenge for today's scientific, conservation, and policy communities is to develop ways to ensure new knowledge is relevant and of high quality. A related challenge involves delivering this information in a timely fashion and making the results accessible to managers and decision makers so that scientific information is considered in making environmental policy.

O. James Reichman **1/1/2006-6/30/2006** **$44,250**
David and Lucile Packard Foundation, 2006-29539

Search to Hire a Director for the NCEAS EBM Research Program

This award provides support for the National Center for Ecological Analysis and Synthesis (NCEAS) to employ a search firm to identify appropriate candidates and secure the appointment of a Director for its Ecosystem-Based Management of Coastal Marine Systems program. The program will apply distinctive approaches to develop knowledge about Ecosystem-Based Management (EBM) and make that knowledge available to appropriate users including scientists, resources managers, and stakeholders. The program is part of a major research thrust to develop means to understand and wisely manage natural resources of coastal areas. The margins of continents and islands are some of the most diverse and ecologically important regions of the biosphere. Concurrently, coasts are the regions most heavily impacted by humans -- for example, more than 50% of the population in the U.S. lives in states bordering coastal areas. Further adding to the complexity is that coasts are affected by both the marine and the terrestrial realms. Thus, the distinctive features of the saline, aquatic environment interact with all aspects of land-based watersheds. The Packard Foundation, with its strong interest in marine systems, has developed a focus on EBM. Whereas traditional management approaches usually involve one or a few species and/or local geographic areas, EBM recognized that organisms of interest interact with many aspects of their physical and biotic environment, including human-dominated systems (economic, social, political). This is a rapidly expanding approach and will dramatically improve the way natural systems are both viewed and managed.

O. James Reichman **3/15/2005-2/29/2008** **$204,908**
John Orrock
National Science Foundation, DEB-0444217

CRB: The Role of Apparent Competition and Patch Geometry in Mediating the Invasion and Restoration of Grassland Communities

Biological invasions are a leading cause of extinction that imperil the structure and function of ecological communities. Consumers can play an integral role in the outcome of invasions, as evidenced by classical biological control whereby exotic plants are controlled by the introduction of exotic consumers. However, the role of native consumers in affecting biological invasions remains unclear. This project evaluates an untested hypothesis with direct implications for biological invasions: exotic plants can subsidize native consumers, leading to stronger impacts of native consumers on native plants (i.e. apparent competition). Furthermore, this study examines how differences in resources and protective cover between native and exotic patches of vegetation affect the spatial extent of apparent competition by influencing consumer behavior. When consumer incursions limit the spatial extent and pattern of apparent competition, the size and shape of native patches determines what areas, if any, are free of apparent competition. By measuring consumer abundance, activity, and impact in patches of varying geometry, a second untested hypothesis is examined: differences in native and exotic habitats alter consumer behavior, changing the spatial extent of apparent competition and setting geometric thresholds at which patches of native plants are too small or too narrow to persist.

O. James Reichman **8/1/2000-7/31/2006** **$16,664,400**
National Science Foundation, NSF DEB 0072909

National Center for Ecological Analysis and Synthesis

The Center for Ecological Analysis and Synthesis is located in downtown Santa Barbara. The Center provides an outstanding physical and intellectual setting for visiting scientists who conduct collaborative research on major fundamental and applied problems in ecology. The Center's high performance computing facilities and skilled technical staff enable resident and remote researchers to tackle complex and computationally challenging problems. The results of the Center's research, both data and publications, are disseminated widely to the scientific community, as well as to other user groups, such as resource managers and policy makers.

O. James Reichman **2/1/2003-1/31/2007** **$364,197**
Joshua Schimel
National Science Foundation, NSF DEB 0235624

CRB: The Role of Seed Limitation, Resource Competition, and Community Complementarity in Invasions and Restorations

One of the largest and most persistent conversions of a native plant community worldwide is the invasion of 9.2 million ha of native perennial grassland in California by exotic annual grasses and forbs from the Mediterranean region. In addition to the loss of native plant biodiversity, this invasion has potentially altered basic ecosystem processes through increased nitrate leaching, altered fire regimes, and decreased carbon storage. The conversion of native plant communities may also have affected the value of this land for agriculture by decreasing the quality of summer grazing. Invasions by exotic species are one of the most serious threats to global biodiversity and restoration is a critical tool to mitigate existing biodiversity losses. Clearly the ability to predict the outcome of invasions and restorations would be a great asset to global conservation efforts while providing important information for the basic understanding of basic ecological processes. Currently, there is little general theory on restoration, while invasion theory is quite well developed. Although these processes may seem dissimilar, predicting the outcome of restoration and invasion both involve understanding the conditions under which small populations establish and spread in the face of competition from abundant, resident competitors, and thus can be interpreted within the context of competition and invasion ecology.

O. James Reichman **10/1/2002-9/30/2006** **$2,588,829**
Mark Schildhauer
Matthew B. Jones
National Science Foundation, NSF EF-0225676

ITR Collaborative Research: Enabling the Science Environment for Ecological Knowledge

Continuing advances in computation and communication are transforming the scientific process. Biodiversity research, like the fields of molecular, structural and proteomic biology, is re-inventing itself with new technology applications, and is evolving into an increasingly predictive and integrative science focused on important research and policy issues. This international ITR collaboration takes on key challenges for biodiversity researchers by modeling, designing and implementing the data discovery, integration and visualization components for a semantic web in environmental science. The initiative stands on the foundation of substantial and productive NSF investment in ecological and biodiversity informatics and it brings together four highly collaborative, forward-looking institutions in a partnership committed to inventing and supporting a global computing infrastructure for environmental biology. The project involves a multidisciplinary team of computer scientists, ecologists and technologists collaborating in complementary IT R&D and working group units.

O. James Reichman **10/1/2005-3/31/2006** **$20,000**
The Nature Conservancy, CR0002-64689

A Workshop on Global Climate Change and Adaptation of Conservation Priorities

Climate change is broadly recognized as a threat to global biodiversity. The Nature Conservancy, along with many major conservation NGOs, has recognized climate change as a threat to its conservation investments and the long-term success of its mission. The broad spectrum of responses to this threat have included efforts to change national energy policy, promote new technologies, manage carbon stocks through mitigation and sequestration, and to reduce greenhouse gas emissions through meaningful implementation of the Kyoto Protocol and other policy instruments. These activities are essential, but not sufficient responses if we are to maintain biodiversity in the face of certain climatic change to which we have already committed ourselves due to past and present industrial activities. Moreover, responses have not adequately provided an active role for land stewards, resource managers, and conservation planners. The goal of Climate Change Impacts and Adaptation Tools Workshop is to review and advance simple and effective methodologies for

incorporating climate change impacts into conservation planning assessments for more resilient and adaptable conservation blueprints. The vision for success of a climate methodology would be one that allows for explicit interpretation of direct and indirect ecological responses to the climate changes and provides guidance in strategic planning for an uncertain future.

O. James Reichman **9/1/2002-8/31/2006** **$323,734**
University of North Carolina, UNC-5-37135

An Information Infrastructure for Vegetation Science

This is a subcontract from an NSF award to Robert Peet at the University of North Carolina (UNC) entitled: "An Information Infrastructure for Vegetation Science ? Phase II." Scientific and technical computing personnel from UCSB's National Center for Ecological Analysis and Synthesis (NCEAS) will provide guidance for the technical design and development work related to the VegBank system that is part of UNC's project. Specifically, the products comprising the VegBank system will benefit from NCEAS resources including: 1) database design expertise, 2) database development knowledge, 3) interface design skills, 4) robust hardware and networking infrastructure, and 5) technical oversight within the framework of the NCEAS' scientific computing staff.

William Rice **2/1/2002-1/31/2007** **$600,000**
National Science Foundation, NSF DEB-0128780

Gender-Specific Fitness and Intersexual Developmental Conflict in a Drosophila Model System

Males and females express overlapping sets of genes. This shared hereditary material can be selected toward different gender-specific optima and produce sexually antagonistic selection. Intersexual genetic conflict occurs during development when an allele moves one sex toward its gender-specific optimal phenotype, but has the opposite effect in the other sex. A recent pilot experiment in the PI's lab using a Drosophila melanogaster model system, provides preliminary evidence that the genome of this species contains substantial sexually antagonistic fitness variation and suggests that a large fraction of the genome-wide genetic variation for fitness is divergently selected between sexes. Building on the pilot study, the investigator will quantify the extent to which the genome-wide standing genetic variation for fitness is concordantly vs. discordantly selected between the sexes.

William Rice **8/15/2001-7/31/2003** **$158,315**
UC Riverside, UCR SB020044

The Origin of Barriers to Fertilization and Their Role in Speciation: From Populations to Proteins

The UCSB investigator will clone a sample of fifty genomic haplotypes and assay these genomes for 1) their fitness (total, adult, juvenile, and sperm competition) when expressed in males, 2) their fitness (total, adult, and juvenile) when expressed in females, and 3) the harm to a male's mate (both through behavior and through seminal fluid) when these genomes are expressed in males. In collaboration with D. Howard and R. Harrison, the UCSB investigator will assay five pairs of populations which have adapted to the same laboratory environment for ~ 1,000 generations but that experienced independent intersexual coevolution (parallel populations). Males will be assayed with females from their population of origin (con-population females) and with females from the parallel population that was derived from the same ancestral population (hetero-population females). The PI will characterize both the defense phenotpye of the males (in the context of sperm competition) and the degree to which they harm their mates via seminal fluid proteins.

William Rice **8/1/2003-7/31/2006** **$303,906**
University of Washington, UW 806099

IRCEB: The Origin of Barriers to Fertilization and Their Role in Speciation: From Populations to Proteins

The UCSB investigator will clone a sample of fifty genomic haplotypes and assay these genomes for 1) their fitness (total, adult, juvenile, and sperm competition) when expressed in males, 2) their fitness (total, adult, and juvenile) when expressed in females, and 3) the harm to a male's mate (both through behavior and through seminal fluid) when these genomes are expressed in males.

In collaboration with D. Howard and R. Harrison, the UCSB investigator will assay five pairs of populations which have adapted to the same laboratory environment for ~ 1,000 generations but that experienced independent intersexual coevolution (parallel populations). Males will be assayed with females from their population of origin (con-population females) and with females from the parallel population that was derived from the same ancestral population (hetero-population females). The PI will characterize both the defense phenotype of the males (in the context of sperm competition) and the degree to which they harm their mates via seminal fluid proteins.

Robin Ross **1/1/2006-12/31/2008** **$241,951**
Langdon Quetin
National Science Foundation, ANT-0529087

Collaborative Research: US SO GLOBEC Synthesis and Modeling: Timing is Everything: The dynamic coupling among Phytoplankton, Ice, Ice Algae and Krill (PIIAK)

The annual advance and retreat of sea ice (from a summer minimum of approximately 4 million km2 to a winter maximum of 20 million km2) play a dominant role in the Southern Ocean (SO) ecosystem and have been called the largest seasonal process on Earth. The life history of Euphausia superba, Antarctic krill and a key species in the food web of the Southern Ocean ecosystem, is intricately involved with seasonal sea ice dynamics. Recent results from the U.S. SO GLOBEC field program as well as historical information on sea ice dynamics and Antarctic krill recruitment suggest a shift in the paradigm that all pack ice is equally good habitat (i.e., that sea ice varies in its habitat quality for larval krill). Through this data synthesis and modeling program, historical records of krill condition factor, larval growth, and recruitment will be linked to variability in sea ice dynamics via its coupling to phytoplankton incorporation and sea ice algal biomass. The project has two main goals: 1) Develop, refine, and link diagnostic datasets and models of phytoplankton decreases in the fall, phytoplankton biomass incorporation into sea ice, sea ice growth dynamics, sea ice algal production and biomass accumulation, and larval krill energetics, condition, and survival. 2) Hindcast variability (spatially within a season as well as interannually) in the quality of pack ice habitat and larval krill condition west of the Antarctic Peninsula (WAP) from present back to 1979 by linking mechanistic data sets and models in a two-dimensional model.

Robin Ross **8/1/2000-8/31/2005** **$534,132**
Langdon Quetin
National Science Foundation, NSF OPP99-09933

Winter Ecology of Larval Krill: Quantifying Their Interaction with the Pack Ice Habitat

Growth rates of larval and juvenile Antarctic krill (Euphausia superba), and community composition and productivity of the sea ice biota vary during winter. Thus temporal and microhabitat variability in productivity and composition of the sea ice communities will impact both food quantity and quality, and likely growth and survival of larval krill. The investigators will quantify the role of sea ice microbial communities in the energetics of larval and juvenile krill, and the contribution of sea ice biota to total primary production in winter. In addition, they will identify the biotic and abiotic characteristics of the pack ice habitat that influence distribution patterns in krill larvae; and they will measure the environmental conditions under which larval and juvenile krill decouple from the under-ice habitat. This is the first study to comprehensively address the temporal and spatial coupling of krill populations with the pack ice, and it will fill a major information gap about one of the important biological communities in the waters west of the Antarctic Peninsula.

Cristina Sandoval **1/1/2005-9/30/2005** **$9,625**
Susan Swarbrick
Shoreline Preservation Fund - Associated Students UCSB, Fall04-09

Buffer Protection and Restoration at Coal Oil Point Reserve

This is the final phase of the creation of a buffer zone along the northern boundary of Coal Oil Point Reserve (COPR). The buffer zone of restored habitat will function as a subtle barrier to discourage trespassing into protected areas and to direct pedestrians to the marked trailhead. Additionally, replacement of exotic weeds with native plants will increase the aesthetic and biological values of

the area. Student restoration interns and volunteers will work on both tasks, will participate in the propagation of native plants, and in doing so will learn ecological principles and restoration techniques. Volunteers from UCSB fraternities and sororities will be offered the opportunity to fulfill their community service requirements and promote student stewardship of COPR's natural resources. This project is part of a long-term restoration effort aimed at improving the quality of rare coastal habitats at COPR and, at the same time, providing educational opportunities for UCSB students. The removal of exotic species will enhance habitats that are vital to indigenous plant species and their associated fauna.

Cristina Sandoval **1/1/2006-6/30/2006** **$11,638**
Susan Swarbrick
Shoreline Preservation Fund - Associated Students UCSB, FALL05-10

Buffer protection and restoration at Coal Oil Point Reserve (Renewal)

This project will continue to create a buffer of restored coastal scrub habitat along the boundaries of Coal Oil Point Reserve. Specifically, the project will continue the restoration of the northern boundary, western boundary, the Pond Trail, and the east end of Devereux Slough.

Russell Schmitt **11/16/2004-11/1/2006** **$1,391,737**
Sally Holbrook
Gordon and Betty Moore Foundation, SB050036

Initial Instrumentation of the Moorea Coral Reef Long-Term Ecological Research Site

This award provides funds to purchase instruments and equipment associated with the newly-funded National Science Foundation Long-Term Ecological Research (LTER) Site at the Richard Gump South Pacific Research Station in Moorea, French Polynesia. A central goal of the LTER program is to advance understanding of ecological phenomena within and among ecosystems that occur over long periods of time and ranges of spatial scales. The research objectives of the Moorea LTER are to better understand key processes in coral reef ecosystems that 1) modulate ecosystem function, 2) shape community structure and diversity, and 3) determine abundance and dynamics of constituent populations. Such mechanistic understanding will allow more accurate predictions of how coral reef ecosystems will respond to environmental change. Coral reefs are among the most complex of biological phenomena. Because of their complexity, scientists have an incomplete understanding of the multitude of abiotic forcing functions and biotic processes that collectively determine their structure, function and dynamics. A number of perturbations are predicted to cause sweeping change in coral reef ecosystems, and indeed that coral reef ecosystems may collapse within the coming few decades, a period equivalent to the duration of an LTER site. While there are numerous coral reef monitoring programs, descriptive ecology alone cannot elucidate the mechanistic basis of change in these systems.

Russell Schmitt **7/1/2000-6/30/2006** **$700,121**
Sally Holbrook
National Science Foundation, NSF OCE 9910677

Abundance, Dynamics and Coexistence of Interacting Damselfishes: Quantifying the Contributions of Causal Processes Across Spatial Scales

This study focuses on the causes of variation in abundance of reef fishes whose local populations are linked via exchange of reproductive output. Research has shown that the size of a local population of these organisms is determined by several simultaneously-operating processes, and the key to understanding the relative importance of these processes is the interplay between larval supply and density-dependent interactions. It is now understood that a local population cannot be considered in isolation of other sub-populations or species, and multiple spatial scales must be examined to fully comprehend the dynamics of the system. Finally, several frameworks now exist that can allow evaluation of the contributions of various processes in setting local features (e.g., larval supply of potential competitors, habitat availability, food supply, predation pressure). These quantitative frameworks need to be applied to real systems to resolve several fundamental - and largely unanswered - questions for reef fishes, including the relative importance of the multiple

processes that affect local abundance and dynamics, the degree of variability in their importance, the determinants of relative abundance and coexistence of competitors, where and how population regulation occurs, and whether the dynamical behavior of the system as a whole differs from that predicted from dynamics at smaller spatial scales.

Russell Schmitt **9/1/2004-8/31/2009** **$1,765,452**
Sally Holbrook
National Science Foundation, OCE-0417412

LTER: Long-Term Dynamics of a Coral Reef Ecosystem

This award establishes a Long-Term Ecological Research (LTER) site focused on dynamics of coral reef ecosystems at the island of Moorea, French Polynesia, location of the University of California's Gump Research Station. Coral reefs are of great ecological importance, having the highest species diversity of any marine habitat and ranking near the top of all ecosystems with respect to annual total gross productivity. The communities are supported structurally by reef-building corals and trophically by efficient recycling. Unlike highly productive terrestrial ecosystems, the key biotic interaction underlying reef systems is the mutualistic relationship between hermatypic corals and photosynthetic zooxanthellae. Hermatypic corals are both functional autotrophs and herotrophs and derive carbon from multiple sources. In addition to biotic interactions, numerous other biological processes are influenced by a variety of abiotic events that can operate at spatial scales ranging from millimeters to hundreds of kilometers, and which can vary on short to long time scales. Both the scientific community and the public have tremendous interest in and concern about conservation of coral reef ecosystems. This project will greatly increase understanding of these systems, and as such, will inform government officials, resource managers and others charged with conservation and management of coral reefs.

Russell Schmitt **7/1/2001-6/30/2006** **$1,540,000**
UC Toxic Substances Research and Teaching Program, SB020063

Coastal Toxicology Component of the UC TSR &TP

The overall objective of the Coastal Toxicology Program is to help resolve pollution-related environmental problems in California's aquatic ecosystems. This is accomplished by facilitating faculty research on appropriate issues, and by providing students with research and training opportunities in environmental toxicology. The resolution of environmental problems requires interdisciplinary efforts and accordingly, the Coastal Toxicology Program is comprised of a network of UC scientists from the Santa Barbara, Santa Cruz, Davis and Los Angeles campuses as well as Scripps Institution of Oceanography, Bodega Marine Lab and Lawrence Berkeley Lab.

Russell Schmitt **10/1/2000-9/30/2005** **$802,291**
Jenifer Dugan
Steven Gaines
Scott Hodges
Robert Jacobs
Henry Page
Leslie Wilson
USDI - Minerals Management Service, MMS 14350100CA-31063,TO17609

Advancing Marine Biotechnology: Use of OCS Oil Platforms as Sustainable Sources of Marine Natural Products

The objective is to investigate the feasibility of using OCS oil platforms for the development of marine biotechnology, and specifically to explore the use of organisms growing on the platforms for development of pharmacological compounds. The study integrates research across three disciplinary areas: community and population ecology of reef organisms, population genetics and natal sources, and pharmacology with an emphasis on natural products identification and mechanisms of action. The long-term success of using OCS oil platforms for biotechnology development requires basic information derived from each of these areas. The community and population ecology focus involves surveying oil platforms for organisms with potential applications to biotechnology, particularly those

with pharmacological application, to determine the factors affecting growth and distribution of these organisms. The population genetics group will work to generate molecular-genetic markers for the accurate identification of species with potential applications to biotechnology, determine the degree of genetic diversity of organisms growing on platforms relative to natural reefs, and identify source populations for organisms growing there. The pharmacologists will examine organisms to identify novel compounds, particularly eicosanoids and coumarins, affecting inflammation, wound healing or cell division.

Russell Schmitt **7/1/2000-10/31/2006** **$749,029**
USDI - Minerals Management Service, Task 17600 MMS-31063

Coastal Marine Institute Program Management

The Coastal Marine Institute (CMI) Program Management provides administration and management for the program, serving as an interface between the University of California, the Minerals Management Service, and the State to ensure that objectives and interests of the agencies are translated into appropriate actions by the CMI. Program management includes administration of the annual study solicitation and review process, as well as overseeing contract management of all studies to assure that they are conducted in accordance with specifications delineated in the technical proposal.

Russell Schmitt **9/25/2001-9/30/2006** **$140,877**
USDI - Minerals Management Service, Task 18234 MMS-31063

Spatial and Temporal Variation in Recruitment to Rocky Shores: Relationship to Recovery Rates of Intertidal Communities (Flow-through to P. Raimondi - UCSC)

Intertidal communities are considered among the most vulnerable to impacts resulting from oil spills because most species are sessile and because oil is deposited on intertidal surfaces during ebb tides. In such communities, recovery following a catastrophic event will be largely dependent on recruitment of propagules to the affected area. The propagules of many organisms (e.g., mussels and barnacles) disperse widely (>10 kilometers) while others (e.g., many algal species, tunicates and bryozoans) disperse over relatively short distances (meters to 100's of meters). Therefore, the timing and spatial extent of dispersal will set constraints on when and where recovery will occur. Although there is a general appreciation of the importance of larval stages and recruitment to the population dynamics of marine species, researchers still lack an understanding of the level of variation of recruitment in space and time on the California coast. More importantly, there is almost no information on the variation in recovery rates (spatial variation) that occur along the coast of California and the degree to which variable recruitment affects local recovery.

Russell Schmitt **9/1/2002-8/31/2006** **$1,200,000**
Evelyn Hu
William M. Keck Foundation, SB030003

The Ecotechnology Initiative: Bioengineering Approaches to Restoration Bottlenecks

This is an Interdisciplinary Research Program in Ecotechnology that blends the investigators' unique strengths in ecology, marine science, and engineering to develop new techniques and technologies for the conservation of natural resources. Ecotechnology is a new, proactive approach to such critical conservation issues as restoration of degraded habitats, maintenance of biodiversity and enhancement of exploited populations. Restoration frequently is a necessary adjunct to other strategies used to protect natural resources, yet there is a lack of effective techniques to assist recovery of degraded marine habitats and species. Researchers are poised for major advances in the development of ecotechnological applications to conservation issues due to recent breakthroughs in the theoretical understanding of the ecological bottlenecks to restoration and dramatic advances in the development and miniaturization of technology that can be used to sense and manipulate systems at the nanometer or micron scale. This Program in Ecotechnology has the potential to catalyze a paradigm shift in the approach taken to environmental restoration.

Stephen Schroeter **3/1/2003-2/28/2007** **$55,957**
John Dixon
California Wildlife Foundation, SB030101, Task 1

Studies of Sea Urchins Settlement in Southern and Northern California

The patterns of settlement of red (Strongylocentrotus franciscanus) and purple (S. Purpuratus) sea urchins may have important impacts on the commercial fishery and provide an important fishery-independent measure of stock health. The investigators have monitored weekly to bi-weekly sea urchin settlement at multiple sites in southern and northern California since February 1990. Their studies to date have identified spatial and temporal patterns in sea urchin settlement (including the effects of periodic El Niño and Las Niñas) and have identified some of the likely mechanisms responsible for these patterns. The investigators' long-term and geographically extensive record of sea urchin settlement continues to provide the only integrated, fishery independent index of the condition of the breeding stock, since larval supply and settlement are a function of the effective breeding population.

Stephen Schroeter **1/1/2006-12/31/2007** **$1,617,689**
Daniel Reed
Henry Page
Simpson and Simpson Business and Personnel Services, Inc., SB060076

San Onofre Nuclear Generating Station Mitigation Project Monitoring Program

In 1974, the California Coastal Commission (CCC) issued a permit to Southern California Edison (SCE) for Units 2 and 3 of the San Onofre Nuclear Generating Station (SONGS). Conditions of the permit require monitoring the impacts of the operation of Units 2 and 3 on the marine environment offshore from San Onofre, and mitigation of any adverse impacts. As a result of the impact studies, the CCC added new conditions which require the permittee to 1) create or substantially restore at least 150 acres of southern California wetlands, 2) install fish barrier devices at the power plant, 3) construct a 300-acre kelp reef, and 4) partially fund the construction of an experimental white sea bass hatchery. This research program enables the UCSB principal investigators to assist the Commission in carrying out its oversight, monitoring and mitigation functions.

Stephen Schroeter **11/1/2005-6/30/2006** **$10,000**
UC Sea Grant, R/F-116PD-F-1/1

Elements of Quantitative Stock Assessment for Evaluating Alternative Management Strategies

This research addresses the issues of industry involvement in stock assessment and fisheries management which are currently of interest to various federal and state resource agencies in California and other states. It is built on a foundation of almost seventeen years of related research that has been conducted in cooperation with university researchers, members of the California Department of Fish & Game, and members of the California red sea urchin fishery. This project aims at producing practical results that can help in addressing the practical problems of assessing red sea urchin stocks and the impacts of fishing and fishery management practices on them. Specifically, the PI will: 1) provide a set of cost-effective field protocols for producing accurate and precise estimates of stocks, 2) initiate an experimental program to evaluate a suite of alternative management practices, including the use of marine protected areas (MPAs) on red sea urchin stocks, and 3) disseminate these results by working cooperatively with the Sea Grant advisory program.

Mark Steele **2/1/2005-1/31/2006** **$26,247**
Caribbean Marine Research Center (Perry Foundation Inc), CMRC-03-NRME-01-05C

Density Dependence in Exploited Marine Fish: An Experimental Test and Theoretical Exploration of the Implications for Fisheries Enhancement via Marine Protected Areas

This research aims to evaluate the utility of marine protected areas (MPAs) as tools for fisheries management. In light of worldwide overfishing, MPAs have been widely advocated as an alternative to traditional, population-based methods of fisheries management. It is unclear, however, whether

MPAs can be expected to enhance fisheries yields relative to traditional management techniques. Much of the uncertainty stems from a lack of information on what will happen to demographic rates (e.g., mortality, growth, fecundity, emigration) inside MPAs as populations build. If critical resources become limited as populations grow, then demographic rates will become density dependent. Density dependence in some demographic rates (e.g., emigration) will tend to make MPAs more effective, due to increased spillover; whereas density dependence in other rates (mortality, growth, fecundity) will tend to render them less effective than traditional management techniques, due to reduced larval export. Hence, it is critical to know which, if any, demographic rates of exploited species are density dependent. Currently, very little is known about this because empirical studies have generally focused on small, non-exploited species. Moreover, theoretical explorations of fisheries management via MPAs have inadequately incorporated density dependence, so it is difficult to predict how MPAs will affect fisheries. There is a clear need for more information on density dependence in MPAs in order to predict how they will affect fisheries.

Mark Steele **2/1/2004-9/30/2005** **$31,736**
Caribbean Marine Research Center (Perry Foundation Inc), CMRC-03-NRME-01-O4A

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This research aims to evaluate the utility of marine protected areas (MPAs) as tools for fisheries management. In light of worldwide overfishing, MPAs have been widely advocated as an alternative to traditional, population-based methods of fisheries management. It is unclear, however, whether MPAs can be expected to enhance fisheries yields relative to traditional management techniques. Much of the uncertainty stems from a lack of information on what will happen to demographic rates (e.g., mortality, growth, fecundity, emigration) inside MPAs as populations build. If critical resources become limited as populations grow, then demographic rates will become density dependent. Density dependence in some demographic rates (e.g., emigration) will tend to make MPAs more effective, due to increased spillover; whereas density dependence in other rates (mortality, growth, fecundity) will tend to render them less effective than traditional management techniques, due to reduced larval export. Hence, it is critical to know which, if any, demographic rates of exploited species are density dependent. Currently, very little is known about this because empirical studies have generally focused on small, non-exploited species. Moreover, theoretical explorations of fisheries management via MPAs have inadequately incorporated density dependence, so it is difficult to predict how MPAs will affect fisheries. There is a clear need for more information on density dependence in MPAs in order to predict how they will affect fisheries.

Mark Steele **10/1/2002-9/30/2006** **$120,264**
University of Rhode Island, 030603/532577

A Test for Shelter Limitation of Reef Fish Populations at Large Spatial Scales: An Integrated Empirical and Theoretical Approach

Overall, this project includes monitoring of reef fish population dynamics, a large-scale field experiment, and mathematical modeling of reef fish population dynamics. It includes three investigators: Dr. Graham Forrester, the principal investigator at the University of Rhode Island; Dr. Mark Steel, who was originally the co-PI at URI, but who has now moved to UC Santa Barbara where he will be the PI on the UCSB subcontract; and associate investigator Dr. Rick Vance who is the PI on the subcontract to UCLA. All three investigators collaborated on the prior award from NSF for which the present project is a renewal. The three investigators will collaborate in most aspects of the current award. At UCSB, Dr. Steele will be responsible for directing fieldwork, managing and analyzing data, preparing reports and publications. Dr. Steele will be involved with field research and will recruit and train UCSB students to analyze otolith growth increments and assist the research as necessary.

David Valentine **9/1/2004-8/31/2006** **$35,000**
American Chemical Society, ACS PRF 40643-G2

Microbial Alteration of Natural Gas in Marine Sediments and Waters

Natural hydrocarbon seeps continuously release massive quantities of oil and gas into the marine

environment worldwide. Seepage influences water, beach, and air quality, as well as marine and terrestrial life. Microbes live in and around seeps and survive by consuming oil, sulfides, and possibly gas. This activity provides a visible indication of subsurface hydrocarbons, generates biogeochemical "hotspots" in the coastal ocean, and alters the distribution of emitted hydrocarbons. The fate of marine petroleum has been the focus of considerable study. However, little is known about the importance and fate of gases, which make up the majority of emissions; there exist major gaps in knowledge, especially with regard to ethane and propane. The Principal Investigator hypothesizes that propane, and to a lesser extent ethane, are consumed in seep areas, and that this activity serves as a major control on the composition of released hydrocarbons and on seep biology. This study seeks to address the PI's hypotheses by directly quantifying rates of ethane and propane consumption for the first time, in concert with analyses of gas concentrations and stable isotope distributions.

David Valentine **4/15/2005-3/31/2007** **$257,949**
National Science Foundation, 0447395

CAREER: Microbial Geochemistry of Natural Marine Gas Seeps - A Research and Education Plan

This project integrates research and education focusing on the fate of methane seeping naturally into the marine environment - an issue of environmental and economic relevance. The primary research goal is to determine the impact of microbial methane oxidation on the flux of methane from the sediments to the ocean/atmosphere in areas of active gas seepage. Educational goals are: 1) to train graduate students in the integrated study of microbiology and geochemistry; 2) to educate undergraduate students in the marine sciences through year-long research projects, and through incorporation of results into general education courses; 3) to incorporate undergraduate students into ocean going research by including them as active participants in proposed cruises through a formal field studies course; and 4) to introduce K-12 students and teachers to the topic of marine hydrocarbons through participation in UCSB's Floating Lab outreach program.

David Valentine **8/31/2003-7/31/2006** **$299,670**
National Science Foundation, EAR-0311894

Collaborative Research: Hydrogen Isotope Biogeochemistry of Anoxic Environments - Field and Laboratory Studies

The goal of this project is to develop compound-specific hydrogen isotope analyses as a tool for process-oriented biogeochemical studies of anoxic environments. Analytical techniques are now well established, and the next major hurdle is to understand the biochemical controls on isotopic distributions in these environments. This study will seek such understanding through a combination of field and laboratory studies, implemented as a collaboration between PI's at Caltech and UC Santa Barbara. Research will focus on sulfate-reducing bacteria (SRB) due to their quantitative importance for carbon cycling in marine settings. The results of this research are potentially important for a wide range of scientific disciplines, including microbial ecology (novel approaches for quantifying the importance of interspecies hydrogen transfer in microbial communities), carbon cycling (isotopic mass-balance estimates of organic matter remineralization by anaerobic processes), organic geochemistry (identification of lipids produced by H2-consuming microbes), paleoclimatology (improved understanding of the preservation of organic D/H ratios during diagenesis), Earth system history (novel tools to study redox conditions of the geologic past) and biochemistry (methods for identifying the cellular location of hydrogenase enzymes).

David Valentine **10/1/2002-9/30/2005** **$83,071**
USDI - Minerals Management Service, Task 85338 MMS-31063

Weathering of Aromatic Compounds in the Coastal Marine Environment: Quantifying Rates of Microbial Metabolism

This research focuses on the environmental effects of offshore petroleum release, specifically on the microbial weathering of aromatic compounds released into the marine environment offshore Santa Barbara, California. In a general sense, the investigator seeks to develop techniques to measure the rates at which microbes consume aromatic compounds in the marine environment, while

simultaneously determining the breakdown products. Once developed, these techniques will be applied to study the microbial weathering of aromatics in oil slicks, in contaminated waters adjacent to natural seeps and in produced waters released from OCS platforms in the Santa Barbara area. This study will provide kinetic and structural information on the intermediates and products arising from the microbial weathering of aromatic compounds emitted from natural marine hydrocarbon seeps. Such information derived from a natural setting may provide a useful comparison when considering the quantity and composition of releases from the petroleum industry. The project will also provide kinetic and structural information on the weathering products of aromatic compounds in natural oil slicks. This study will yield information on the fate of aromatics in produced water released from OCS platforms and may improve at-sea oil weathering models, thereby contributing to more informed decision making.

J. Herbert Waite **6/1/2002-5/31/2006** **$360,000**
National Science Foundation, NSF CHE01-32443

Biochemistry of Algal Adhesives

The UCSB principal investigator is the only American participant in a multi-investigator project encompassing six university research teams and two biotech companies. The composite project, funded by the Research Directorate of the European Commission, seeks to isolate, characterize, mimic, and bulk-produce algal adhesive proteins with the ultimate aim of developing pharmaceutical adhesives and to mitigate fouling. The UCSB component is limited to the biochemical characterization of algal adhesive proteins from one or more of the following species: Enteromorphia, Gracilaria conferta, Ulva lactuca, and Fucus spiralis. There are four aims: 1) To determine the mass and shape of the native algal adhesive glycoproteins and their subunits. 2) To determine the range of chemical functionality in algal adhesive proteins. 3) To determine the primary sequence of the adhesive glycoproteins. 4) To isolate and characterize cross-link containing peptides. These investigations are dependent on EC partners for algal adhesive proteins, haloperoxidase and cDNA-deduced protein sequences.

J. Herbert Waite **7/11/2003-5/31/2007** **$2,483,600**
Galen Stucky
Francis Zok
Public Health Service, R01 DE014672

Biomimetic Blades: Mincing with Less Mineral

Tooth enamel and dentin are the premier materials in vertebrates for hardness and abrasion resistance. The superb properties of these materials are vital adaptations for proper ingestion nutrition and, when compromised through decay or injury, pose many fundamental and technical challenges to effective restoration. In polychaete worms such as Glycera and Nereis, the tooth-like jaws have a resistance to wear that is comparable to enamel; however, this is accomplished with a tenth as much mineralization (Glycera) or no mineralization at all (Nereis). The investigators believe that these mainly proteinaceous jaws offer important insights into the design of biocompatible wear-resistant materials. Based on preliminary studies they seek to demonstrate that specific proteins/polymers can be hardened and toughened by mineralization, metal ion chelation, or both. The aim is a state-of-the-art chemical, structural and mechanical characterization of the jaws using mass spectrometry, molecular biology, X-ray analysis and nanoindentation. Rigorous engineering principles will be applied to the analysis of jaws to distill a set of biomimetic rules regarding the relationship between structure and wear. Significant correlations between the chemical, microstructural and mechanical properties will be used to direct the preparation of His-containing copolymers into hard films containing Cu or Zn ions. The chief health benefits of this research will be insights about lightweight replacement materials with superior hardness and abrasion resistance.

J. Herbert Waite **3/1/2005-6/30/2006** **$157,038**
UC Sea Grant, R/MP-97B

Studies on the Rapid Self-assembly of Elastic Tensile Fibers From a Natural Protein Polymer Found in Marine Snails

The PI and collaborator are exploring the formation, molecular structure and mechanical function of elastic biomaterials from marine organisms that have novel and potentially useful mechanical properties. Their work specifically addresses one of the research priorities for New Marine Products identified in the California Sea Grant Strategic Plan, that is, to advance knowledge of the formation, structure and function of marine biomaterials. The diverse marine life in coastal waters offers great opportunity for discovery of novel biomaterials and new insights for materials design. As the culmination of millions of years of natural mechanical design these biomaterials represent a wealth of information yet to be exploited. The primary objective is to characterize the biochemical and biomechanical properties of a novel elastic protein that comprises the whelk egg capsule, the biosynthetic mechanisms involved in its formation and polymerization, and the molecular design that is responsible for the unusual elastic properties of this biopolymer. The results will allow the PIs to establish design criteria for future biomimetic materials research.

George Wardlaw **7/1/2004-6/30/2006** **$25,000**
David Valentine
UC Toxic Substances Research and Teaching Program, 2004G-37

Development of a Novel Biodegredation Index for Toxic Hydrocarbons in Contaminated Marine Sediments

Polycyclic aromatic hydrocarbons (PAHs), such as benzene, anthracene and benzo(a)pyrene are suspected to be cancer-causing agents to humans and other organisms. Oil and its derivatives contain a large proportion of PAHs. In some oils, the PAH concentration can reach 20%. Each year over 380 million gallons of petroleum enter the oceans throughout the world. The goal of this project is to understand and predict the chemical evolution of petroleum and specifically PAHs in petroleum-contaminated marine environments. Bioremediation techniques have employed a number of different organisms to clean oil-contaminated soils, beaches and coastal sediments. However, this has generally been carried out without an analytical method capable of tracking the disappearance of the most harmful oil fractions or the appearance of possibly more harmful toxins. Using new chromatographic technologies, the investigators seek to identify and quantify a suite of novel products and intermediates produced during petroleum biodegradation in anoxic sediments. Many such compounds may be more harmful than the original PAHs from which they were produced.

Robert Warner **4/1/2004-3/31/2007** **$268,137**
Steven Gaines
National Science Foundation, OCE-0351843

Collaborative Research: Tracking Larval Invertebrate Dispersal Trajectories Using Calcified Structures

Many marine species produce pelagic larvae that can be advected away from their natal source by oceanic currents. Predicting their destination has been one of the foremost challenges for marine biologists. The potential interactions among larval swimming behaviors, complex ocean circulation dynamics, and variability in pelagic duration make it difficult to predict the sources of larvae settling into adult habitat. Yet, identification of the natal source of incoming recruits has tremendous consequences for understanding population dynamics as well as for the design of effective marine reserve networks. Fish biologists have successfully exploited otoliths as environmentally induced natural tags to examine exchange among fish populations in some systems. Despite pressing needs to also understand the dispersal trajectories of invertebrate larvae, ecologists have paid less attention to analogous environmentally induced tags in larval invertebrate hard parts. Invertebrate ecologists only recently demonstrated the potential to use the elemental composition of molluscan statoliths and protoconchs as tags of natal origin. However, to date, no study has effectively used this tool to identify the natal source of any marine invertebrate recruit. This research will use environmentally induced tags in the statoliths of recently recruited Kelletia kelletii whelks to examine exchange of larvae among distinct regions of this species' range.

Robert Warner **7/1/2005-6/30/2006** **$30,000**
UC Office of the President, SB060009

Defining the Extent of Larval Exchange Among Kelp Rockfish (Sebastes atrovirens) Populations Using Otolith Microchemistry

The extent to which populations are connected through larval dispersal remains one of the fundamental unresolved issues in marine ecology. Larval connectivity among marine populations has far-reaching consequences for understanding population dynamics and the structure of marine communities, as well as the management of exploited species. Despite its importance, the level of connectivity among marine populations remains poorly understood. Currently, explicit information regarding the sources and destination of larvae remains unknown for any marine species with pelagic larvae, which is necessary both for the development of effective management strategies and the design and placement of marine protected areas. Recent developments in the use of elemental signatures contained within the calcified structures and hard parts of fishes have shown great promise as a means of reconstructing the past histories of individual fish. This project conducted by graduate student Julie Standish will use the variation in otolith chemistry of a nearshore rockfish species (Sebastes atrovirens) to evaluate larval exchange and determine potential limitations to dispersal along the coast of California.

Robert Warner **2/1/2005-6/15/2005** **$7,195**
University of Hawaii, Z739835

Larval Retention, Larval Exchange and Population Connectivity in the Hawaiian Islands

This award provided funds for analysis of more than 300 egg masses and 200 recruits that were collected during the summer of 2004 from over 25 different sites on five of the Main Hawaiian Islands. Graduate students Ruttenberg and Hamilton dissected the otoliths of the recruits and polished them to expose the core for chemical analysis. Preliminary data from a collection trip in 2003 suggested that natal chemical signatures differed between Oahu and Hawaii, with sites on Oahu having elevated concentrations of trace metals such as lead. Small sample sizes on the previous trip limited the power of additional statistical tests. However, preliminary data gave hope that chemical signatures of natal otoliths will differ among islands with the much larger sample sizes and more developed egg mass collections from summer 2004.

Libe Washburn **2/1/2005-12/31/2006** **$534,613**
UC San Diego, 0478.01SB

Short-Medium Range Resolution/Long Range HF Radars-Task A.1

As part of the Southern California Coastal Observing System (SCCOOS)m UCSB will collaborate with other institutions in the Southern California Bight, including Scripps Institution of Oceanography, USC and CalPoly San Luis Obispo to operate an array of HF radars for mapping surface currents. This portion of the project involves purchase, installation, calibration and operation of approximately twenty-one HF Radar installations. The installation consists of the placement of HF radar mast, antenna and associated computer hardware and shelter.

Libe Washburn **2/1/2005-12/31/2006** **$10,828**
UC San Diego, 0478.03SB

Two Bight-Scale Sections Using an Underway CTD-Task C.1

As part of the Southern California Coastal Observing System (SCCOOS)m UCSB will collaborate with other institutions in the Southern California Bight, including Scripps Institution of Oceanography, USC and CalPoly San Luis Obispo to operate an array of HF radars for mapping surface currents. Researchers will use the current data obtained from the radar array to develop products for agencies charged with managing coastal ocean waters. UCSB will lead the research effort to acquire one line of CTD stations from ships that regularly travel between the mainland and one of the offshore islands in the Southern California Bight.

Libe Washburn **9/25/2002-9/30/2005** **$135,210**
USDI - Minerals Management Service, Task 85386 MMS-31063

Observations of the Surface Circulation in the Eastern Santa Barbara Channel Using High Frequency Radar and Langrangian Drifters

The MMS has long recognized the need to understand the circulation in the Santa Barbara Channel (SBC) because of extensive oil and gas production in the area. Accurate descriptions of the near surface circulation throughout the Channel are required to assess the consequences of a large oil spill, such as occurred in 1969 and to respond accordingly. Much has been learned about circulation in the SBC since 1969, due in large part to MMS-funded studies. This project will assist state and local agencies and the MMS by advancing understanding of circulation processes in the eastern SBC. This area has many active oil production platforms, so organizations that may have to respond to ill spills, such as the not-for-profit cooperative Clean Seas, need good data on likely spill trajectories. Several creeks and two rivers, the Ventura and the Santa Clara, discharge freshwater runoff into the eastern SBC during winter storms. Results from this research will benefit other agencies responsible for monitoring pollution due to runoff, such as the Central Coast Ambient Monitoring Program, and Santa Barbara County's Ocean Monitoring Program. There is strong agency interest in measuring coastal currents for local pollution studies. This project will complement monitoring efforts of these agencies by obtaining information about the transport and dispersion of runoff plumes into the coastal ocean.

Corwith White **10/13/2005-10/12/2008** **$39,000**
Bruce Kendall
American Assn for the Advancement of Science, SB060039

Population Connectivity and the Management of Coastal Fishery Species across the California-Mexico International Border

This project focuses on the interconnections between populations of fish and invertebrate species on either side of the California-Mexico international border. Despite the fact that California is moving quickly toward promoting sustainable harvest through ecosystem-based management approaches in its own waters, there has been little consideration of the role of other regions in supplying individuals. Indirect evidence suggests that ocean currents may cause a significant number of marine communities in California to depend on larval re-seeding from Baja, Mexico, with populations in Channel Islands National Park being particularly susceptible to fluctuations in recruitment from southern source locations. Without consideration of the role of cross-border connectivity, California and National Park Service efforts to safeguard their populations and create sustainable harvests will be misinformed and likely unsuccessful. The graduate student researcher will estimate the frequency, direction, and magnitude of larval exchange across the US-Mexico border using oceanographic and state-of-the-art genetic tools, and will evaluate using a modeling framework for implications of cross-border connectivity on conservation and management of fishery resource populations shared by both countries. Current and novel management strategies will be explored to identify practical solutions providing for successful management of an ensemble of valuable fishery species along the west coast of North America.

Allison Whitmer **12/1/2005-6/30/2006** **$6,009**
Shoreline Preservation Fund - Associated Students UCSB, Fall 05-08

Education and Outreach Internship

The Marine Science Institute's Education and Outreach Internship Program offers UCSB undergraduates the opportunity to extend their learning outside of the lecture hall through experiential education in marine and environmental science. Interns learn about local coastal ecosystems and the natural history of marine organisms, as well as ongoing, locally relevant, marine research at UCSB. This program also has a strong public education component, as the interns conduct tours for the public and K-12 classes at the REEF and through visits to tri-county classrooms.

Alison Whitmer **10/15/2004-9/30/2005** **$13,837**
Shoreline Preservation Fund - Associated Students UCSB, FALL4-01

Education and Outreach Internship

This is an ongoing Education and Outreach Internship program which offers UCSB undergraduate students the opportunity to extend their learning outside of the lecture hall through experiential education in marine science. Interns learn about local coastal ecosystems and the natural history of marine organisms, as well as ongoing, locally-relevant, marine science research at UCSB. This program has a strong public education component, as the interns conduct tours for the public and K-12 classes. This program creates UCSB undergraduates who are not only extremely knowledgeable about the campus coastline, but also about coastal ecosystems in general, increasing their science literacy and empowering them to make informed decisions that will lead to coastal habitat conservation and preservation.

Allison Whitmer **6/1/2005-1/31/2006** **$7,712**
Shoreline Preservation Fund - Associated Students UCSB, Spring05-08

Education and Outreach Internship

This is an ongoing Education and Outreach Internship program which offers UCSB undergraduate students the opportunity to extend their learning outside of the lecture hall through experiential education in marine science. Interns learn about local coastal ecosystems and the natural history of marine organisms, as well as ongoing, locally-relevant, marine science research at UCSB. This program has a strong public education component, as the interns conduct tours for the public and K-12 classes. This program creates UCSB undergraduates who are not only extremely knowledgeable about the campus coastline, but also about coastal ecosystems in general, increasing their science literacy and empowering them to make informed decisions that will lead to coastal habitat conservation and preservation.

Robert Wilkinson **1/1/2005-12/31/2006** **$28,000**
UC Institute for Energy Efficiency, C-05-12B

A Statewide Assessment of Energy Use Associated with California Water Use

Energy use associated with water use in California is significant based on a series of reports, some including California case studies. A statewide assessment of this type of energy use, however, has not been performed. Such assessment is necessary to determine what priority should be given to managing energy use associated with water use, and to determine if and how the California Energy Commission or other organizations might take actions related to water use that would help to control and manage energy demand and costs and the air quality impacts of energy use. This project has one goal: to perform a credible, fully documented, statewide assessment that will allow policy-makers to make these types of decisions.

Robert Wilkinson **12/2/2005-9/30/2007** **$114,560**
UC Santa Cruz, SB060086

Developing a Tool to Guide State and Local Desalination Planning: A Comprehensive Economic and Environmental Framework to Fully Assess the Benefits and Costs of Desalination

This research involves: 1) undertaking a literature review of desalination cost and benefit research; 2) identifying, securing, reviewing, and analyzing the cost and benefit analyses of existing and proposed desal plants; and 3) reviewing and analyzing the documents provided by agency participants as in-kind contributions. The core of the work is a series of workshops designed to help develop a thorough understanding of the potential costs and benefits of desalination as an urban water supply strategy.

Michael Williams **12/15/2003-11/30/2006** **$225,757**
Joshua Schimel
William Murdoch
Susan Swarbrick
National Science Foundation, NSF DBI 0330442

Sedgwick Reserve Infrastructure Development

Sedgwick Reserve is one of the largest reserves in the University of California's Natural Reserve System. It is exceptional for its biological diversity and landscape heterogeneity. The Reserve is available for use as a research site and outdoor classroom by researchers, teachers and students from any institution of higher learning, government agency or scientific organization. Located about 50 km northwest of the UC Santa Barbara campus, on the slopes of the San Rafael Mountains, Sedgwick Reserve has become a site for both important ecological research and for major outreach activities in environmental education. This grant provides support to upgrade the Reserve's existing infrastructure in preparation for a new multipurpose building funded by UC. The University's long-term goal is to provide facilities that would support world-class environmental research and university-level instruction, as well as K-12 environmental education, while restoring and preserving Sedgwick's natural resources.

Douglas Wilson **7/10/2005-6/28/2008** **$40,012**
Joint Oceanographic Institutions, Inc., JSA-44 T309A44
Joint Oceanographic Institutions, Inc., T312A44

Integrated Ocean Drilling Program Scientific Cruise 309 and Cruise 312

Shipboard paleomagnetic measurements during Expedition 312 were limited by conservative sampling strategy in low recovery, intended to preserve material for shore-based sampling, and also by the limitations of the shipboard magnetics lab. Samples in general showed incomplete removal of drilling overprint. Thermal demagnetization, important for estimating blocking temperature at which intrusive rocks acquired their magnetization, was done on only eight samples due to recovery and time constraints. New measurements in a shore-based lab will offer significantly better characterization of the magnetization prior to drilling overprint. Integration of sample data with downhole magnetic field data provides the best chance of determining in situ magnetization direction and intensity. Characterization of in situ magnetization will address fundamental questions on the source layer of marine magnetic anomalies.

Douglas Wilson **11/6/2002-12/31/2005** **$52,886**
Texas A&M Research Foundation, F001642

Ocean Drilling Program Scientific Cruise 206

This award supports Dr. Wilson's participation in Leg 206 of the Ocean Drilling Program as co-chief scientist and paleomagnetist. The objective of the leg is to increase understanding of the formation and alteration of oceanic crust by deep sampling at a site about 400 miles southwest of Nicaragua. He was involved in planning the operations of the leg and selecting the scientific party. During the expedition, Dr. Wilson will have responsibility to participate in decisions on division of sample material, revisions to the operational plan, writing weekly summaries of operations and preliminary science results, and taking and measuring samples for paleomagnetic analysis. Post-cruise duties will include contributing to writing a summary manuscript, editing all of the manuscripts for the Scientific Results volume, and completing and publishing analysis of the paleomagnetic samples.

Douglas Wilson **1/5/2003-11/7/2005** **$21,988**
Texas A&M Research Foundation, F001735

Magnetic Studies of ODP Leg 206 Samples and Logging Data

Shipboard paleomagnetic measurements during Leg 206 showed highly variable magnetic stability, with all units at least slightly affected by drilling overprint and some units completely remagnetized. New measurements in a shore-based lab will offer significantly better characterization of the

magnetization prior to drilling overprint. Integration of sample data with downhole magnetic field data provides the best chance of determining in situ magnetization direction and intensity. Characterization of in situ magnetization will address fundamental questions on the source layer of marine magnetic anomalies. This research addresses the goal of improving the understanding of the source layer of marine magnetic anomalies by improving on the shipboard paleomagnetic data using measurements of smaller paleomagnetic samples in a magnetically cleaner lab, and by integrating the paleomagnetic results with downhole measurements of magnetic field and with core orientation determinations. Paleomagnetic data will also supplement the interpretation of eruption history by providing time constraints from changes in inclination, and rock magnetic data will supplement the interpretation of alteration with information on the oxidation state of magnetite and titanomagnetite.

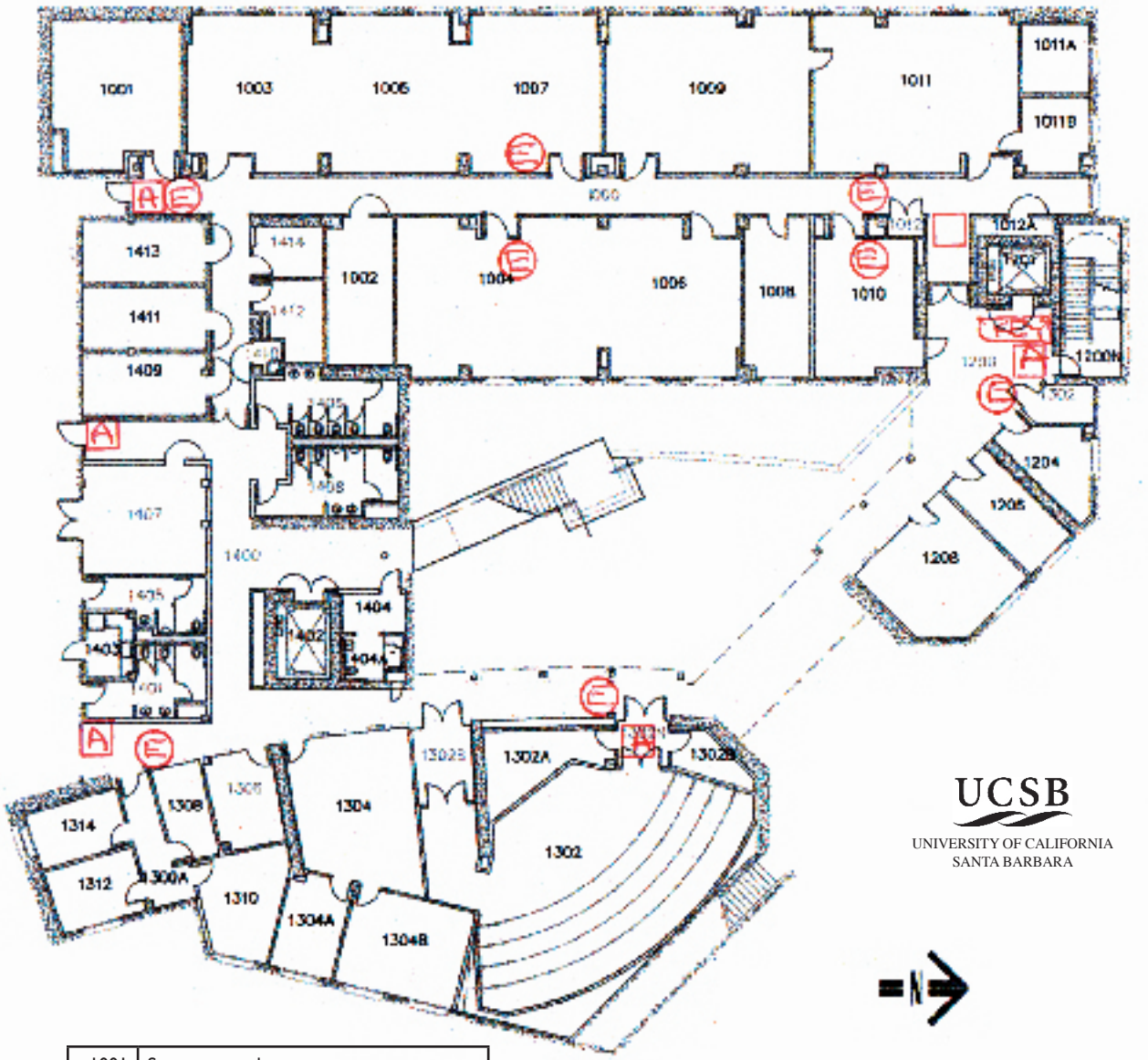
Oran Young **9/1/2004-8/31/2006** **$37,016**
The New Media Studio, BERKMAN_NSF_DUE_0329044

Marine Mammal Commission Digital Library of International Environmental and Ecosystem Policy Documents

This flow-through award from the National Science Foundation provides funds to support graduate student Julie Ekstrom, whose task is to create, with input from the advisory board, a simple multiple-choice questionnaire about the functionality, operation, design and application of the Digital Library of International Environmental and Ecosystem Policy Documents. The student will also oversee the interpretation of the user activity logs and questionnaire, to iteratively refine the digital library so that it can be effectively utilized and maintained in future years. REU (Research Experiences for Undergraduates) students will be involved with the project and will be supervised by the graduate student.

Space

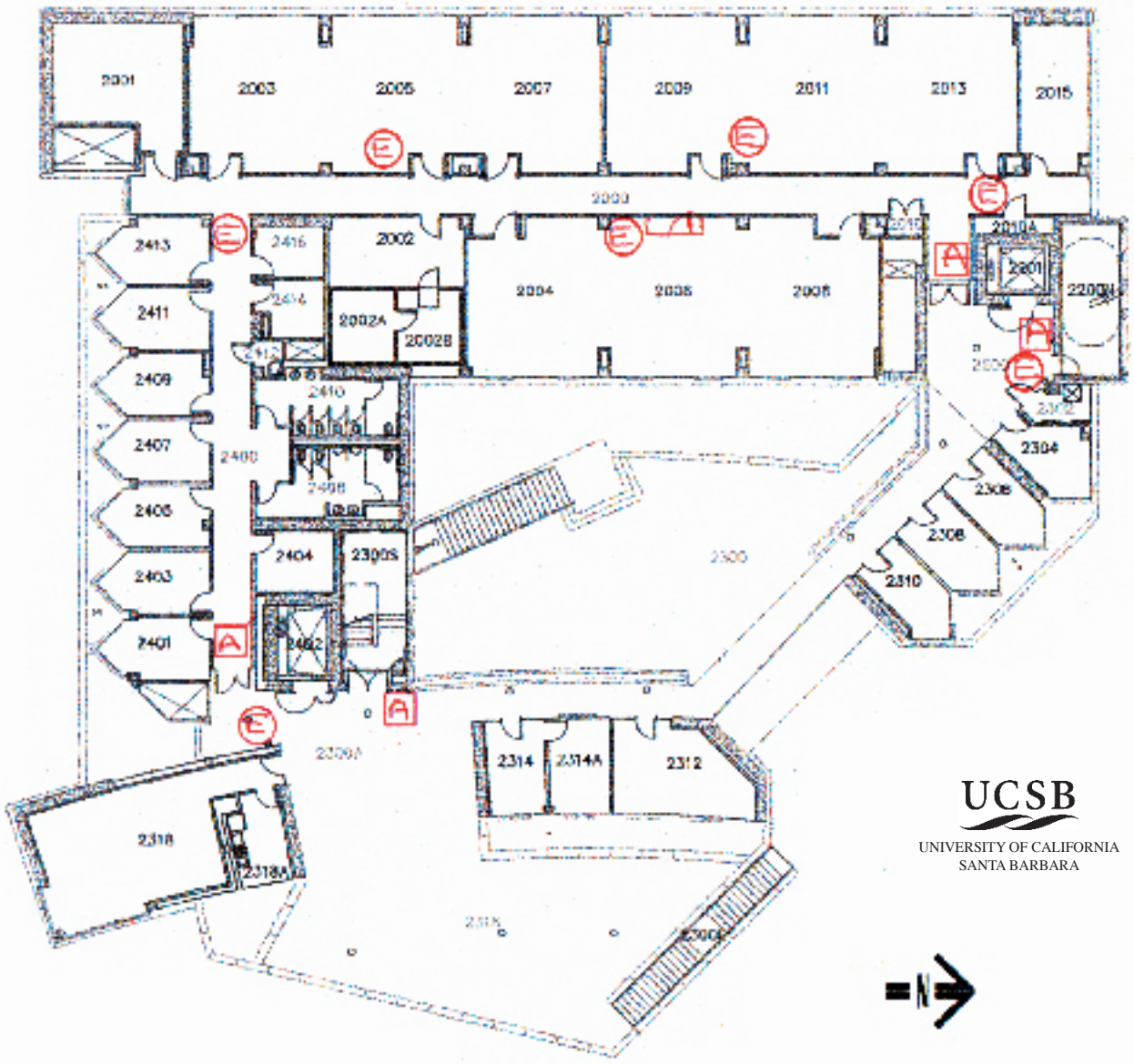
Marine Science Research Building
Bldg. No. 520 - 1st floor
01/2006



1001	Seawater workroom
1002	Common support laboratory
1003	Gaines laboratory
1004	Page/Dugan laboratory
1005	Gaines laboratory
1006	EPA laboratory
1007	Siegel laboratory
1008	Postdoc/Visiting Scholar office
1009	Analytical Laboratory
1010	Hazardous Materials Storage
1011	Analytical Laboratory
1204	Carolyn Culver/Patricia Halpin
1206	Graduate Student office space

1208	Graduate Student office space
1302	Auditorium
1304	Graduate Student office space
1304a	Graduate Student office space
1304b	Graduate Student office space
1308	Copier room
1310	Graduate Student office space
1312	Postdoc office space
1314	Postdoc office space
1409	Seawater workroom
1411	Seawater workroom
1413	Seawater workroom

Marine Science Research Building
Bldg. No. 520 - 2nd floor
01/2006



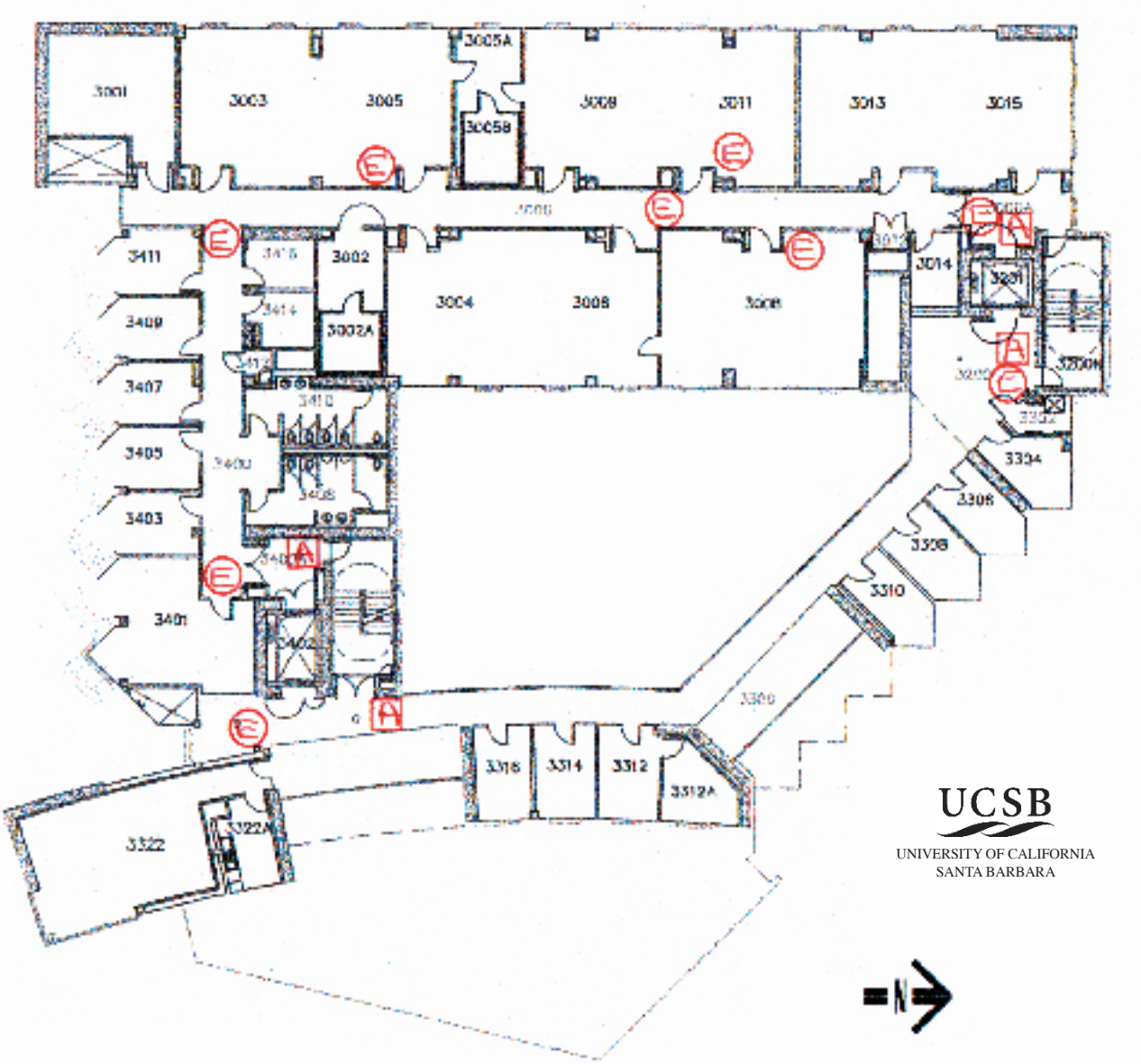
UCSB
UNIVERSITY OF CALIFORNIA
SANTA BARBARA

2001	Seawater workroom
2002	Common support laboratory
2002a	Environmental room
2002b	Environmental room
2003	Hofmann laboratory
2004	Quetin/Ross laboratory
2005	Hofmann laboratory
2006	Quetin/Ross laboratory
2007	Hofmann laboratory
2008	Dudley laboratory
2009	Levine laboratory
2011	Levine laboratory

2013	Valentine laboratory
2015	Will McClintock
2304	Postdoc office
2306	O'Donnell/Damschen
2308	Kevin Lafferty
2310	Fielman/Todgham
2312	Natural Reserve System/ Donna Moore
2314	Natural Reserve System/ William Murdoch
2314a	Natural Reserve System/ Sue Swarbrick
2318	Conference room

2401	Mark Page
2403	Jenifer Dugan
2404	Storage
2405	Langdon Quetin
2407	Robin Ross
2409	Allison Whitmer
2411	Gretchen Hofmann
2413	Postdoc office

Marine Science Research Building
Bldg. No. 520 - 3rd floor
01/2006

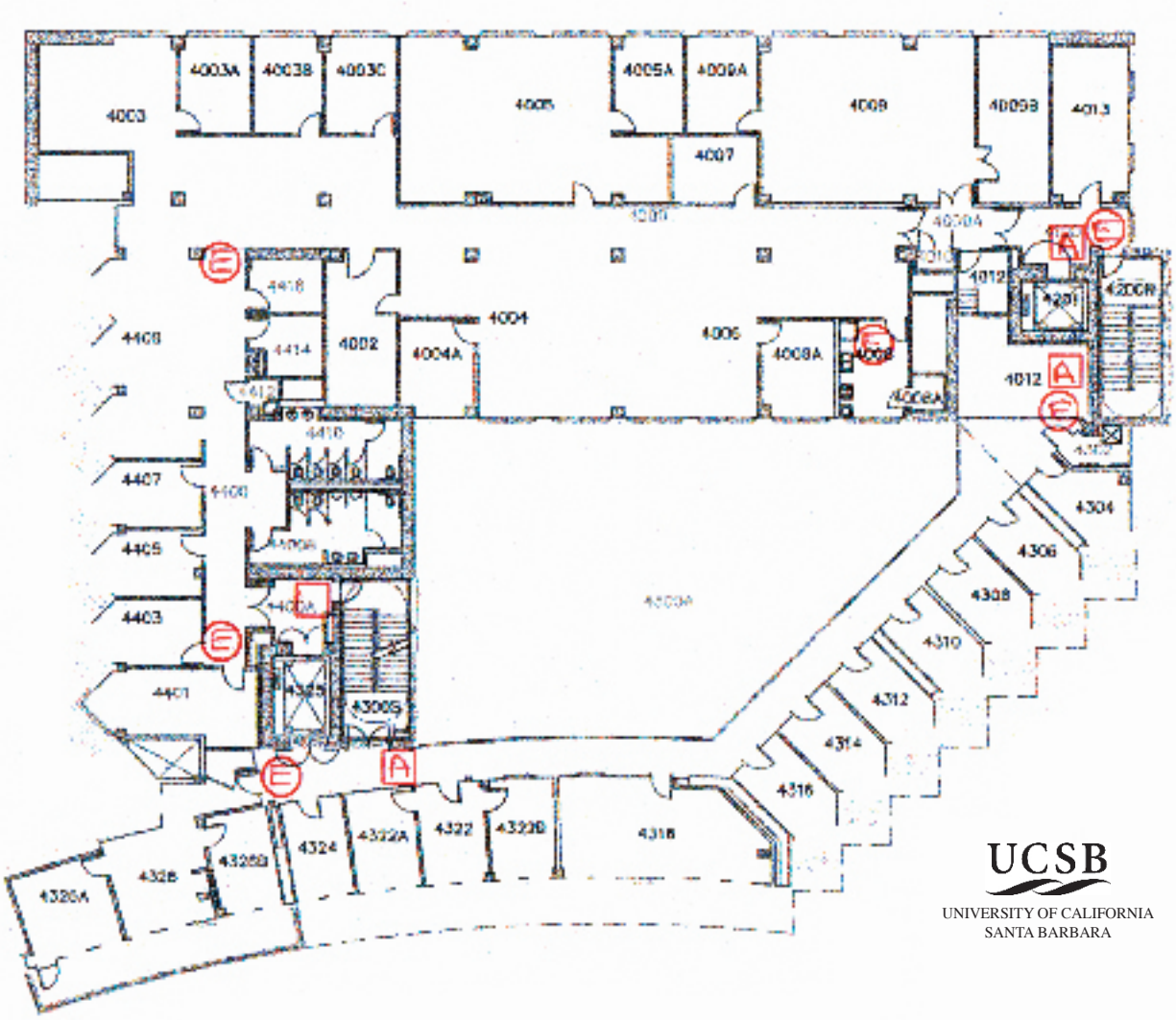


3001	Seawater workroom
3002	Common support laboratory
3003	Reed laboratory
3004	Holbrook laboratory
3005	Reed laboratory
3005a	Common support laboratory
3006	Schmitt laboratory
3008	Gaines laboratory
3009	Warner laboratory
3011	Warner laboratory
3013	Washburn laboratory

3014	Storage
3015	MacIntyre laboratory
3304	Thomas Dudley
3306	Postdoc office
3308	Dan Reed
3310	Andrew Brooks
3312	Postdoc office
3312a	Postdoc office
3314	Russell Schmitt
3316	Sally Holbrook
3322	Conference room

3401	Margaret O'Brien/Jordan Morris/ Sabine Grabner
3403	Econinformatics - Jing Tao/Chad Berkley
3405	Econinformatics - Dan Higgins/Sid Garg
3407	Econinformatics - Matthew Brook/Matt Jones
3409	Econinformatics - John Harris/Mark Schildhauer
3411	Econinformatics - Peter Anderson/Nico Franz

Marine Science Research Building
Bldg. No. 520 - 4th floor
01/2006



4002	Copier/mail room
4003a	Ocean O'Graphics - Monica Pessino
4003b	Storage
4003c	Joyce Wolever
4004A	Rachel Whitacre
4004d	Steve Gilbert
4005A	Elvira Rose
4005a	India Morgan
4005b	vacant
4005c	Nicole Zavala
4005e	vacant
4006A	Deb Owens
4006a	Marie Ciluaga
4006b	Bonnie Roper
4006e	Mike O'Neil

4007	Conference room
4008	Break room
4009B	Server room
4009b	Jim Woods
4009d	Mike Franklin
4012	IT storage
4013	Shipping/receiving
4304	Sally MacIntyre
4306	Libe Washburn
4308	Gail Osherenko
4310	William Freudenberg
4312	Jonathan Levine
4314	Jen Caselle
4316	Carol Blanchette
4318	Conference Room

4322	Eugenio Carpizo
4322a	Satie Airame
4322b	Robert Warner
4324	Development - Amelia Picciotto
4326	Development - Nannette Pedroso
4326a	MSI Director
4401	Tim Schmidt
4403	Jim Reichman
4405	Laurie Eusey
4407	Bonnie Williamson
4409A	Judy McCaslin
4409B	Joanna Yates
4409C	Marisol Hernandez

Marine Science Institute
Trailers

319-a	Jack Engle
319-b	Jack Engle
319-c	Jack Engle
319-d	Herb Waite
319-e	Herb Waite
325-a	John Richards
325-b	Craig Nicholson
325-c	Craig Nicholson
325-d	Miriam Polne-Fuller
325-e	Jack Engle
334-a	Scott Simon
334-b	REEF
334-c	REEF

Statistical Summary

Research Support Summary

	Awards	Percentage of Total
Federal Agencies		
National Aeronautics and Space Administration	$ 48,000	0.19%
National Science Foundation	7,555,270	29.86%
UC Sea Grant	235,007	0.93%
US Department of Agriculture	487,234	1.93%
US Department of Commerce	18,200	0.07%
US Department of Energy	252,530	1.00%
US Department of the Navy	111,330	0.44%
US Environmental Protection Agency	14,984	0.06%
US Fish & Wildlife Service	100,000	0.40%
US Forest Service	16,000	0.06%
US Geological Survey	10,000	0.04%
USDC - National Oceanic & Atmospheric Administration	3,825,495	15.12%
USDI - Minerals Management Service	1,298,117	5.13%
USDI - National Park Service	232,146	0.92%
Federal Totals	**$ 14,204,313**	**56.14%**
Private Agencies		
American Assn for the Advancement of Science	$ 39,000	0.15%
American Chemical Society	80,000	0.32%
Camille & Henry Dreyfus Foundation	20,000	0.08%
Caribbean Marine Research Center (Perry Foundation Inc)	26,247	0.10%
Channel Islands National Marine Sanctuary Foundation	30,456	0.12%
David and Lucile Packard Foundation	785,285	3.10%
Harvard University	63,000	0.25%
Joint Oceanographic Institutions, Inc.	84,003	0.33%
Marine Biological Laboratory	215,970	0.85%
Oregon State University	1,574,435	6.22%
Paul G. Allen Charitable Foundation	2,000,000	7.90%
Princeton University	650,000	2.57%
Resources Legacy Fund Foundation	362,603	1.43%
Santa Barbara Channelkeepers	6,943	0.03%
Simpson and Simpson Business and Personnel Services, Inc.	1,617,689	6.39%
SRS Technologies	15,000	0.06%

The Nature Conservancy	25,000	0.10%
The New Media Studio	50,145	0.20%
The Pew Charitable Trusts	100,000	0.40%
University of Kiel	33,900	0.13%
University of Queensland	56,046	0.22%
University of Southern California	25,000	0.10%
USC Sea Grant	42,211	0.17%
Virginia Institute of Marine Science	96,000	0.38%
WetLabs, Inc.	30,000	0.12%
Private Agency Totals	**$ 8,028,933**	**31.73%**

State/Public Agencies

Cal State Lands Commission	$ 207,000	0.82%
California Department of Fish and Game	298,451	1.18%
California Regional Water Quality Control Board	804,111	3.18%
City of Santa Barbara	208,931	0.83%
Shoreline Preservation Fund - Associated Students UCSB	25,862	0.10%
UC Berkeley	94,048	0.37%
UC Davis	1,000	0.00%
UC Institute for Energy Efficiency	28,000	0.11%
UC Lawrence Livermore National Laboratory	49,943	0.20%
UC MEXUS	13,500	0.05%
UC Office of the President	578,342	2.29%
UC San Diego	218,645	0.86%
UC Santa Cruz	150,560	0.60%
UC Toxic Substances Research and Teaching Program	270,000	1.07%
University of Hawaii	7,195	0.03%
University of Rhode Island	20,000	0.08%
University of Washington	84,216	0.33%
Utah State University	10,000	0.04%
State/Public Agencies Totals	**$ 3,069,804**	**12.13%**
Total	**$25,303,050**	**100.00%**

Budget Summary
2005-2006

Permanent Funds	FTE	Appropriation	Expense	Balance
Academic Salaries				
Director				
Stipend—Director		11,100	11,100	0
Stipend—Deputy Director		0	4,200	-4,200
Other	0.75	31,014	53,708	-22,694
Staff Salaries	13.60	779,775	733,734	46,041
General Assistance		14,901	285,056	-270,155
Employee Benefits		316,887	315,193	1,694
Supplies & Expense		31,589	21,664	9,925
Travel & Equipment				0
Other				0
Total 2005-2006		**1,185,266**	**1,424,655**	**-239,389**
Less budgetary savings target			24,130	-24,130
Less 2005/06 budget cut			15,652	-15,652
Adjusted total 2005-06		**1,185,266**	**1,464,437**	**-279,171**

Temporary Funds	Appropriation	Expense	Balance
A-21 Return	560,568	103,949	456,619
Butler A-21	209	169	40
Prézelin A-21	738	448	290
Herbst A-21	1,100	704	397
MSI Development Support	-36	16,898	-16,934
Dudley salary	90,625	38,092	52,533
Osherenko Salary	40,000	39,672	328
GUS support	131,618	129,988	1,630
Insurance claim - Kuris	23,656	0	23,656
Insurance claim - Reed	1,755	0	1,755
Outreach programs	-7,445	54,925	-62,370
REEF operations	3,498	1,887	1,610
Research support - Brzezinski	7,242	953	6,288
Research support - Gaines	1,885	1,885	0
Research support - Lafferty	900	570	330
Research support - Lea	59,599	14,310	45,289
Grant match - Leifer	3,000	3,000	0
Grant match - Matthys	38,791	31,078	7,713
Grant match - Schmitt (MMS)	51,202	51,202	0

Grant match - Morse (NASA)	44,455	31,897	12,558
Grant match - Quetin/Ross	14,331	7,054	7,278
Grant match - Reed (SBC-LTER	40,901	35,750	5,151
Grant match - Reichman (ITR)	179,006	84,484	94,523
Grant match - Schmitt (MCR-LTER)	127,786	45,920	81,866
Total 2005-06	**1,415,385**	**694,836**	**720,549**

Recharges	**Income**	**Expense**	**Balance**
MSI Revenue	104,848	125,147	-20,300
Analytical Laboratory	180,356	159,598	20,758
DOC - Carlson	2,521	645	1,875
Mass Spectrometer - Brzezinski	18,537	1,923	16,614
Mass Spectrometer - Lea	31,846	23,369	8,478
MSI Graphics recharge	15,604	9,151	6,453
Outreach - Floating Lab	8,291	7,000	1,291
HP wide format printer	-87	942	-1,029
CRC copier (discarded Spring '06)	3,153	331	2,823
MSI GUS revenue	35,460	8,094	27,366
Total 2005-06	**400,529**	**336,200**	**64,329**

Statistical Summary for the Marine Science Institute

1.	Academic personnel engaged in research:	
	a. Faculty	59
	b. Professional Researchers (including Visiting)	23
	c. Project Scientists	7
	d. Specialists	18
	e Postdoctoral Scholars	36
	f Postgraduate Researchers	23
	g Academic Coordinators	8
	TOTAL	174
2.	Graduate Students:	
	a Employed on contracts and grants	82
	b. Employed on other sources of funds	
	c. Participating through assistantships	
	d. Participating through traineeships	
	e Other- students at other campuses	13
	TOTAL	95
3.	Undergraduate Students:	
	a. Employed on contracts and grants	155
	b. Employed on other funds	
	c. Number of volunteers, & unpaid interns	126
	TOTAL	281
4.	Participation from outside UCSB: (optional)	
	a. Academics (without Salary Academic Visitors)	
	b. Other (specify)	
5.	Staff (Univ. & Non-Univ. Funds):	
	a. Technical	182
	b. Administrative/Clerical	49
6.	Seminars, symposia, workshops sponsored	125
7.	Proposals submitted	205
8.	Number of different awarding agencies dealt with*	87
9.	Number of extramural awards administered	260
10.	Dollar value of extramural awards administered during year**	$83,646,654
11.	Number of Principal Investigators***	140
12.	Dollar value of other project awards ****	$878,572
13.	Number of other projects administered	60
14.	Total base budget for the year (as of June 30, 2006)	$868,379

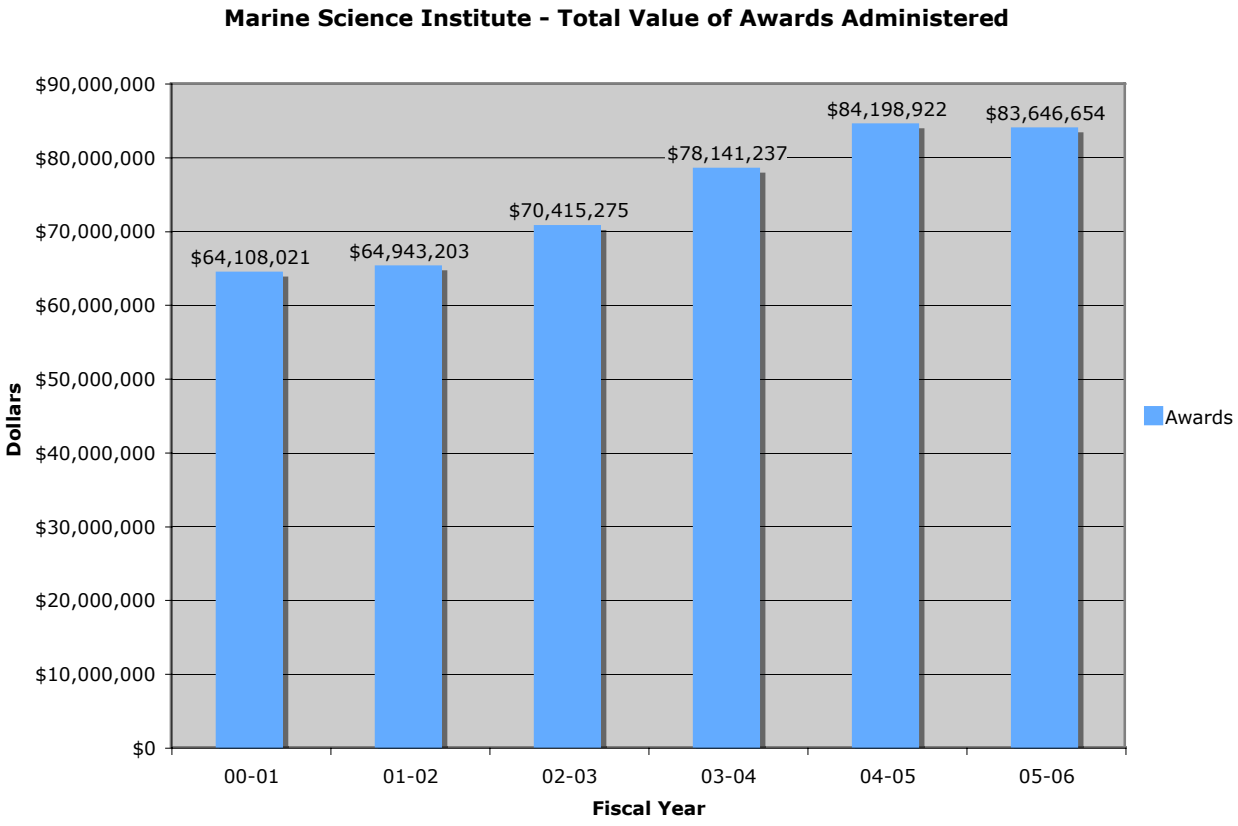
15.	Dollar value of intramural support	$2,016,623
16.	Total assigned square footage in ORU	35,000
17.	Dollar value of awards for year (08 Total)	$25,303,050

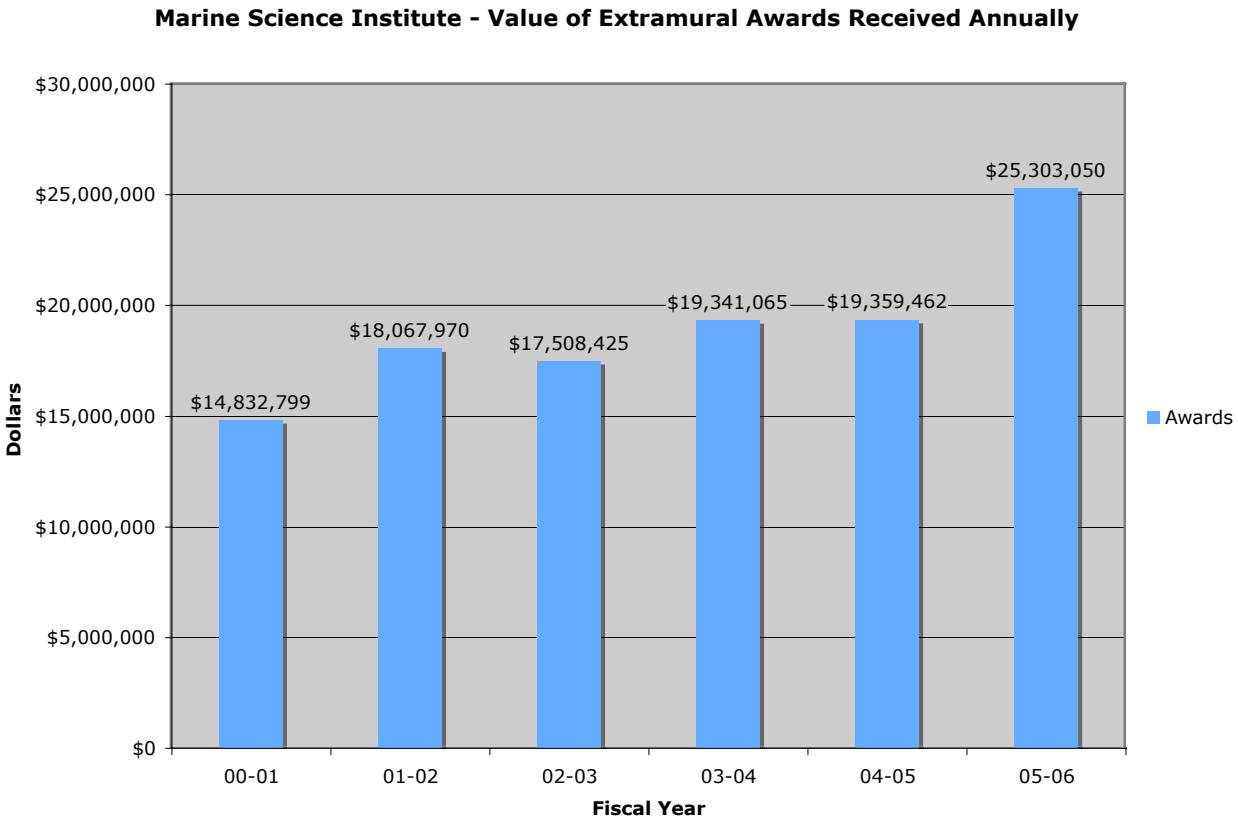
* Count each agency only once (include agencies to which proposals have been submitted).
** If the award was open during the year, even if for only one month, please include in total.
*** Number of PIs, Co-PIs and Proposed PIs (count each person only once.)
**** Other projects - such as donation, presidential awards, fellowships, anything that isn't core budget, extramural, or intramural.

Five-Year Statistical Summary 2001-2006

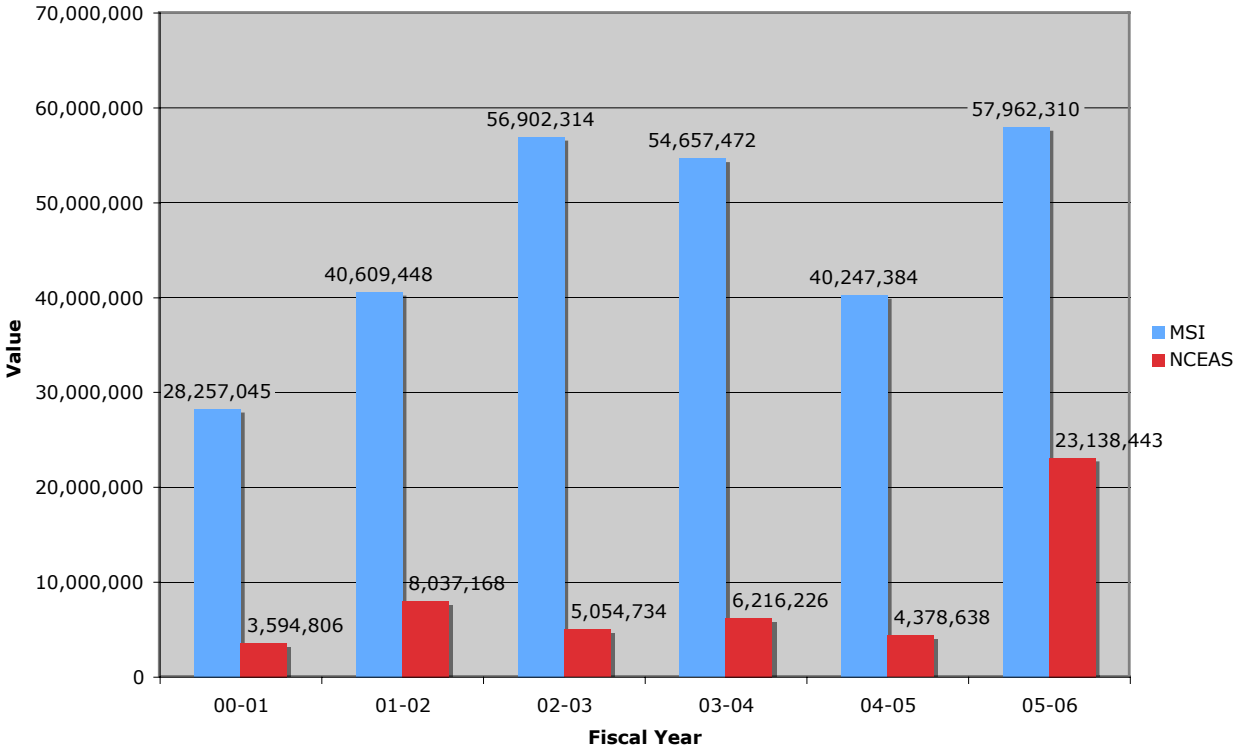
	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
1. Academic personnel engaged in research					
a. Faculty	60	62	58	63	59
b. Researchers/Project Scientists	52	52	50	39	30
c. Visiting Researchers	15	12	7	8	7
d. Specialists/Academic Coord/Academic Admin.	10	15	18	13	26
e. Postdoctorals/ Postgraduates		56	56	60	54
Total	**193**	**197**	**193**	**177**	**174**
2. Staff (Univ. & Non-Univ. Funds)					
a. Technical	179	186	200	168	182
b. Administrative/Clerical	33	35	28	64	49
Total	**212**	**221**	**228**	**232**	**231**
3 Graduate students employed by MSI	84	88	110	97	82
4. Undergraduate students employed by MSI	200	177	216	257	155
5. Publications	350	2**	2**	1**	1**
6. Seminars, symposia, workshops, etc., sponsored by MSI	98	105	109	115	125
7. Proposals submitted	157	191	182	164	205
8. Annual extramural awards	$18,067,970	$17,508,425	$19,341,065	$19,359,462	$25,303,050
9. Extramural awards administered	223	238	246	239	260
10. Other project awards	$366,055	$292,948	$1,145,713	$1,420,623	$878,572
11. Other projects administered	46	53	55	68	60
12. MSI base budget	$820,165	$834,306	$857,373	$846,304	$868,379
13. Intramural support	$1,422,616*	$1,513,343*	$1,552,076	$1,631,875	$2,016,623
14. Total Funds Administered	$64,943,203	$70,415,275	$78,141,237	$84,198,922	$83,646,654

*Includes $500,000 in matching funds from the State of California for NCEAS. **Only Departmental Publications

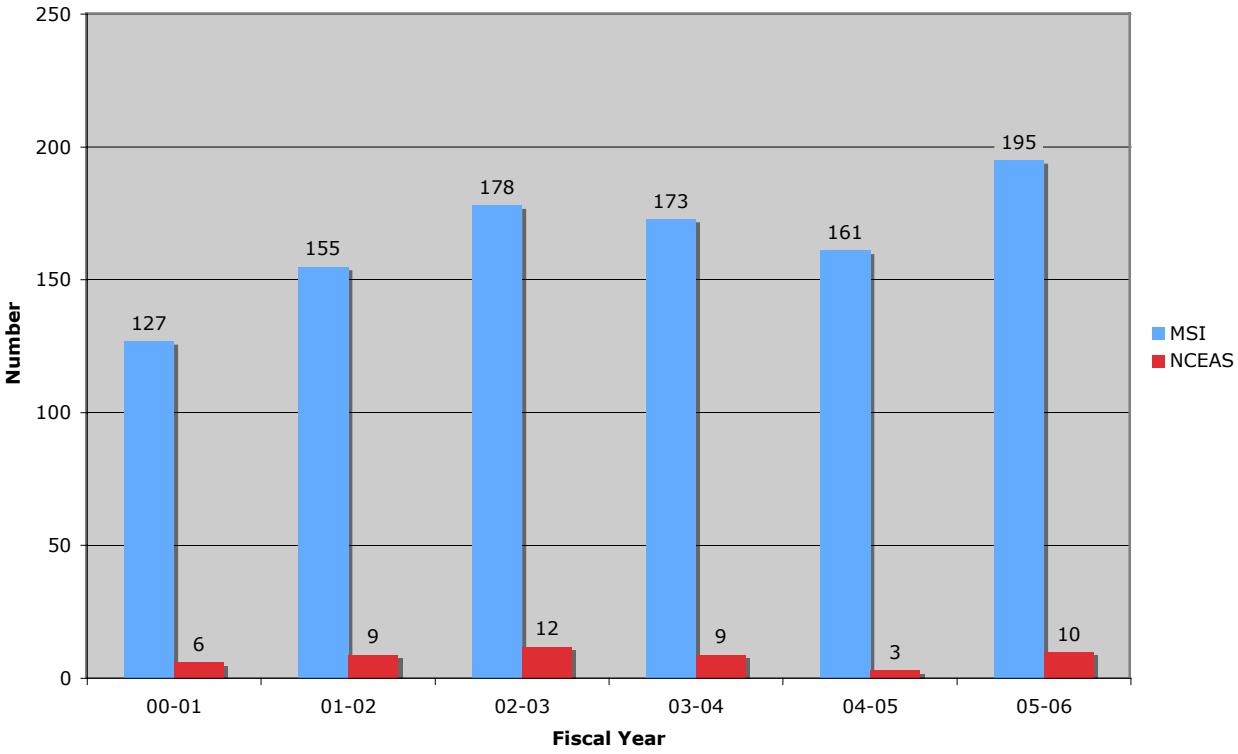

Marine Science Institute - Total Value of Awards Administered
$90,000,000
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$0
Dollars
$64,108,021
$64,943,203
$70,415,275
$78,141,237
$84,198,922
$83,646,654
00-01
01-02
02-03
03-04
04-05
05-06
Fiscal Year
Awards


Marine Science Institute - Value of Extramural Awards Received Annually
$30,000,000
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
Dollars
$14,832,799
$18,067,970
$17,508,425
$19,341,065
$19,359,462
$25,303,050
00-01
01-02
02-03
03-04
04-05
05-06
Fiscal Year
Awards

Value of Proposals Submitted Annually by MSI & NCEAS



Number of Proposals Submitted Annually by MSI & NCEAS



Funding Agencies

Advanced Technology Institute
AMEC Environmental and Energy Services Co., Inc.
American Assn for the Advancement of Science
American Chemical Society
Andrew W. Mellon Foundation
Cal State Lands Commission
California Artificial Reef Enhancement
California Department of Fish and Game
California Regional Water Quality Control Board
California State University - Fullerton
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California Trout
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Caribbean Marine Research Center (Perry Foundation Inc)
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Channel Islands National Marine Sanctuary Foundation
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Gordon and Betty Moore Foundation
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Howard Hughes Medical Institute
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The Pew Charitable Trusts
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UC Office of the President
UC Riverside
UC San Diego
UC Santa Cruz
UC Sea Grant
UC Toxic Substances Research and Teaching Program
University of Hawaii
University of Kiel
University of Miami
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University of Queensland
University of Rhode Island

University of Southern California

University of Utah

University of Washington

US Department of Agriculture

US Department of Commerce

US Department of Energy

US Department of the Army

US Department of the Navy

US Environmental Protection Agency

US Fish & Wildlife Service

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USC Sea Grant

USDC - National Oceanic & Atmospheric Administration

USDI - Minerals Management Service

USDI - National Park Service

Utah State University

Virginia Institute of Marine Science

WetLabs, Inc.

William M. Keck Foundation

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Marine Science Institute
2005-2006

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Deputy Director	Mark A. Brzezinski
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Steven Gaines, Director of Marine Science Institute, Professor, Ecology, Evolution & Marine Biology
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Marine Science Institute
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Mike Franklin, Desktop Support
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Joanna Yates, Contracts & Grants Analyst
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Marine Science Institute
Principal Investigators
2005-2006

Marine Science Institute
Principal Investigators
2005-2006

Adler, Peter	Postdoctoral Researcher	Ecology, Evolution and Marine Biology
Airame, Satie	Academic Coordinator	Marine Science Institute
Allen, Andrew	Postdoctoral Researcher	Marine Science Institute
Alroy, John	Assistant Research Biologist	Marine Science Institute
Andelman, Sandy	Specialist; Deputy Director, National Center for Ecological Analysis & Synthesis	Marine Science Institute
Anderson, Clarissa	Graduate Student Researcher	Ecology, Evolution and Marine Biology
Arkema, Katherine	Graduate Student Researcher	Marine Science Institute
Berkman, Paul	Project Scientist	Environmental Science & Management
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Boles, James	Professor of Geology	Earth Sciences
Brooks, Andrew	Assistant Researcher	Marine Science Institute
Brzezinski, Mark	Professor of Biology, Deputy Director, Marine Science Institute	Ecology, Evolution and Marine Biology
Butler, Alison	Professor of Chemistry	Chemistry
Campbell, Brian	Graduate Student Researcher	Earth Sciences
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Case, James	Research Professor of Neurobiology	Marine Science Institute
Caselle, Jennifer	Assistant Research Biologist	Marine Science Institute
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Cooper, Scott	Professor of Ecology	Ecology, Evolution and Marine Biology

Costello, Christopher	Associate Professor of Environmental Science	Environmental Science & Management
Culver, Carolyn S.	Assistant Research Biologist	Marine Science Institute
Damschen, Ellen	Postdoctoral Researcher	Marine Science Institute
Dawson, Daniel R.	Reserve Director, Valentine Eastern Sierra Reserve	Marine Science Institute
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Dudley, Tom	Associate Research Biologist	Marine Science Institute
Dugan, Jenifer	Associate Research Biologist	Marine Science Institute
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Herbst, David	Associate Research Biologist	Marine Science Institute
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Hofmann, Gretchen	Associate Professor of Ecology	Ecology, Evolution and Marine Biology
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Holden, Patricia	Assistant Professor of Environmental Science	Environmental Science & Management
Hu, Evelyn	Professor of ECE & Materials	Electrical & Computer Engineering

Hufford, Kristina	Postdoctoral Researcher	Ecology, Evolution and Marine Biology
Jacobs, Robert	Professor of Pharmacology	Ecology, Evolution and Marine Biology
Jellison, Robert	Associate Research B	Marine Science Institute
Jones, Christopher	Systems and Database Specialist	Marine Science Institute
Jones, Matthew B.	Database and Information Specialist	Marine Science Institute
Keller, Edward A.	Professor of Geology	Earth Sciences
Kendall, Bruce	Assistant Professor	Environmental Science & Management
Kennett, James	Professor of Geology	Earth Sciences
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Lafferty, Kevin	Assistant Research Biologist	Marine Science Institute
Laughrin, Lyndal L.	Reserve Director, Santa Cruz Island Reserve	Marine Science Institute
Lea, David	Professor	Earth Sciences
Leifer, Ira	Assistant Research Chemical Engineer	Marine Science Institute
Lenihan, Hunter S.	Assistant Professor of Ecology	Environmental Science & Management
Levine, Jonathan	Assistant Professor of Biology	Ecology, Evolution and Marine Biology
Love, Milton	Research Zoologist	Marine Science Institute
Luyendyk, Bruce	Professor of Geology	Earth Sciences
Macdonald, Ken	Professor of Marine Geology	Earth Sciences
MacIntyre, Sally	Professor of Ecology	Marine Science Institute
Matthys, Eric	Professor of Engineering	Mechanical Engineering
Mau, Susan	Postdoctoral Researcher	Earth Sciences
Mayfield, Margaret	Postdoctoral Researcher	Marine Science Institute
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McClintock, William	Associate Project Scientist	Marine Science Institute
McGinnis, Michael	Assistant Researcher	Marine Science Institute

Melack, John	Professor of Biology	Ecology, Evolution and Marine Biology
Miller, Paige	Postdoctoral Researcher	Marine Science Institute
Morse, Aileen	Associate Researcher	Marine Science Institute
Morse, Daniel E.	Professor, Genetics and Biochemistry; Director, Marine Biotechnology Center	Molecular, Cellular & Developmental Biology
Muller, Erik	Assistant Researcher	Marine Science Institute
Murdoch, William	Professor of Biology	Ecology, Evolution and Marine Biology
Nicholson, Craig	Associate Researcher	Marine Science Institute
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Osovitz, Christopher	Graduate Student Researcher	Ecology, Evolution and Marine Biology
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Petty, Robert	Manager, Analytical Laboratory	Marine Science Institute
Polne-Fuller, Miriam	Academic Coordinator	Marine Science Institute
Prézelin, Barbara	Professor of Biology	Ecology, Evolution and Marine Biology
Quetin, Langdon	Research Biologist	Marine Science Institute
Reed, Daniel	Research Biologist	Marine Science Institute
Reichman, O. James	Professor of Biology Director, NCEAS	Ecology, Evolution and Marine Biology
Rice, Ronald	Professor of Communications	Communications
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Richards, John B.	Marine Resources Specialist	Marine Science Institute
Roberts, Dar	Professor of Geography	Geography
Ross, Robin	Research Biologist	Marine Science Institute
Runft, Linda	Postdoctoral Researcher	Marine Science Institute

Ruttenberg, Ben	Graduate Student Researcher	Ecology, Evolution and Marine Biology
Sandoval, Cristina P.	Reserve Director, Coal Oil Point Reserve	Marine Science Institute
Schildhauer, Mark	Director of Computing, NCEAS	Marine Science Institute
Schimel, Joshua	Professor of Ecology	Ecology, Evolution and Marine Biology
Schizas, Nikolaos	Assistant Research Biologist	Marine Science Institute
Schmitt, Russell J.	Professor of Biology; Director, Coastal Research Center	Ecology, Evolution and Marine Biology
Schroeter, Stephen	Research Ecologist	Marine Science Institute
Shaw, Jenny	Graduate Student Researcher	Ecology, Evolution and Marine Biology
Shears, Nicholas	Postdoctoral Researcher	Marine Science Institute
Siegel, David	Professor of Geography	Geography
Simpson, Julie	Graduate Student Researcher	Marine Science Institute
Smith, Katherine	Graduate Student Researcher	Marine Science Institute
Sorlien, Christopher	Associate Research Geologist	Marine Science Institute
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Stewart-Oaten, Allan	Professor of Ecology	Ecology, Evolution and Marine Biology
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Vogt, Peter	Research Geologist	Marine Science Institute
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Warner, Robert	Professor of Biology	Ecology, Evolution and Marine Biology
Washburn, Libe	Professor of Geography	Geography
White, Corwith	Graduate Student Researcher	Marine Science Institute
White, Will James	Graduate Student Researcher	Marine Science Institute
Whitmer, Allison	Academic Coordinator	Marine Science Institute
Wilkinson, Robert	Assistant Researcher	Environmental Science & Management
Williams, Michael P.	Reserve Director, Sedgwick Reserve	Marine Science Institute

Wilson, Douglas	Associate Research Geologist	Earth Sciences
Wilson, Leslie	Professor of Biochemistry	Molecular, Cellular & Developmental Biology
Young, Oran	Professor of Environmental Science	Environmental Science & Management
Ziegler, Karen	Postdoctoral Researcher	Marine Science Institute
Zok, Francis	Professor of Material Science	Materials