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for tomorrow's world



04 annual report



*Scripps Institution of Oceanography*

UNIVERSITY OF CALIFORNIA, SAN DIEGO



EDITOR'S NOTE.

In an effort to provide fiscal year information in a more timely manner, the Scripps *Annual Report* will be published separately from *Explorations*. To obtain additional copies of the report, please contact Scripps Communications Office at (858) 534-3624 or via e-mail at [scrippsnews@ucsd.edu](mailto:scrippsnews@ucsd.edu)

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Fig. 15





## 02 | Director's Report

FROM SCRIPPS DIRECTOR CHARLES F. KENNEL



Scripps Institution of Oceanography had another year of notable accomplishments in 2004. Perhaps most notable was creation of a strategic plan that sets out a course for our research and educational enterprises and outlines steps we must take in the near term in order to stabilize our long-term fiscal health.

Creating this plan began with the 2003 institutional review by an independent group of advisors, led by former UC Senior Vice President V. Wayne Kennedy. This past year we began implementing many of the recommendations of the Kennedy Committee, with guidance from the SIO Council. I now feel that we are in a position to capture new opportunities, to be more entrepreneurial in our thinking, and to remain a world-class scientific organization in our second century.

Last year we welcomed UCSD's new chancellor, Marye Anne Fox, who is already becoming a great friend to the institution. Her background as a scientist has helped her make a special connection with Scripps, and we look forward to working with her for many years to come.

An increasing concern for UCSD has been the boom in undergraduate students in recent years, which has become an opportunity for institutional growth at Scripps. In preparation for an expanded role in undergraduate teaching, Professor Lisa Tauxe has taken on the new position of interim director of educational affairs to oversee these new steps. Professor Myrl Hendershott remains in his role as Graduate Department chair, and Professor Michael Landry serves as vice chair in charge of undergraduate curriculum development. This team has already helped Scripps create new cooperative programs, with much more to follow.

While we are increasingly involved with teaching today's students, we are also connecting with yesterday's students—our alumni. More than

70 percent of our nearly 1,400 graduates responded to a request asking where they are now and what they've been doing since receiving their degrees. We are now creating an alumni website, to launch this spring, which we hope will foster the institution's relationship with our alumni for years to come—as well as help alumni reconnect with one another.

A major upcoming challenge for Scripps and the UC system is renewal of our fleet of ships. At least two of our ships will be retiring in the next 10 years, and we have begun making our way through a very competitive process for new ships so that we can continue our vital ocean-going science.

December's catastrophic tsunami in the Indian Ocean was a sad and humbling experience for the entire world. At Scripps, where we have studied ocean phenomena for a century, we were reminded of the contributions that science can make to saving lives. An international effort has been under way for several years to create a massive network of earth-observing systems to provide a continuous and comprehensive picture of Earth and its environment. This "system of systems" will provide an understanding of the ever-changing conditions on our planet and will support decision making in such areas as energy management, water availability and quality, and early warning systems for natural disasters.

In preparation for a leadership role in this effort, last year we set up the Center for Earth Observations and Applications at Scripps. This will be an area of tremendous development for Scripps and all of earth science in the decades ahead. Stay tuned.

*Charles Kennel*



## 03 | Research Report

FROM DEPUTY DIRECTOR FOR RESEARCH JOHN ORCUTT

One of the most exciting and profound initiatives in modern oceanographic history—the effort to create a permanent observational presence in the world’s oceans—made significant progress in 2004. Scripps Institution of Oceanography was at the center of several key advances in this arena.

Several research institutions and government agencies around the world are aiming to create a new kind of observatory, one that trains its eye on our home planet to watch and record the important natural events that unfold over many time and space scales.

Examples of this research can be found right in Scripps’s backyard. In 2004, the California Coastal Conservancy awarded \$21 million to two consortia, including the Southern California Coastal Ocean Observing System headed by Scripps, to enhance and expand an existing current-modeling network to cover most of the state’s coastline. The Coastal Ocean Currents Monitoring Program will provide real-time maps of currents that will benefit users ranging from shippers to public health officials on a daily basis. In the longer term, scientists will be able to use the record of these currents to gain new insights into our coastline’s large-scale physical processes.

The effect of climate cycles and other physical phenomena on commercially important marine ecosystems off the California coast is the focus of another program launched this year. The National Science Foundation (NSF) commissioned a study of the California Current ecosystem as the latest location in its Long-Term Ecological Research network. An initial six-year, \$5-million endeavor will enable a Scripps-led research team to test hypotheses about the influence of physical processes on marine life.

Farther afield, the goal of a permanent presence in the global ocean moved closer to reality as a remotely controlled glider jointly developed by Scripps and Woods Hole Oceanographic Institution passed an important field test. The Spray glider is designed to record temperature and salinity, the “vital signs” of the ocean, while on the move. In October, a Spray model traveled 950 kilometers (600 miles) from Woods Hole, Massachusetts, to Bermuda, successfully negotiating the fast-moving

Gulf Stream along the way. It was a breakthrough in the development of an instrument that researchers hope to deploy en masse to provide continuous comprehensive monitoring of the oceans, leading to increased understanding of long-term, large-scale physical trends. Like so many of these modern systems, the ability to interact remotely with the instrument itself is of paramount importance.

An atmospheric observatory with objectives similar to its ocean counterparts continued its growth in 2004. In October, Scripps researchers installed a surface station equipped to measure atmospheric chemistry, aerosol content, and solar radiation in the Maldives, an island chain nation in the Indian Ocean. This facility and others in development will observe the long-range transport of southeast Asian pollution, monitoring it from locations where tropical climate patterns collide with anthropogenic emissions from the world’s most rapidly growing economic region.

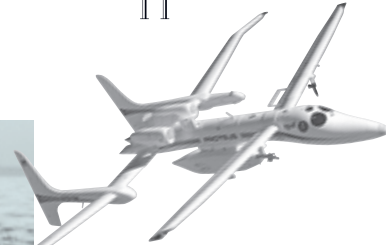
As important as the new cadre of observation platforms is the technical support needed to collect, process, and assimilate the vast quantities of data that these systems produce. To that end, NSF awarded UCSD, the University of Washington, and other institutions nearly \$4 million to launch the Laboratory for the Ocean Observatory Knowledge Integration Grid. The grid will develop computer and Internet technology to facilitate communication between observatories and data users, as well as among the users themselves.

These many programs will soon find a common locus on the UCSD campus. The new Center for Earth Observations and Applications will assist researchers with subsequent program operations, writing major grant proposals, and securing matching funds.

As oceanography enters an exciting new era, UCSD and Scripps will use inherent interdisciplinary strengths to establish the university as a leader in earth observation research and education.



## 04 | Research Divisions, Labs, Institutes, and Centers at Scripps



### CalSpace

The California Space Institute (CalSpace), a multicampus research unit of the University of California, supports space and earth sciences, education, and technology. CalSpace scientists conduct pure and applied research in various interdisciplinary space-related fields. Many CalSpace researchers emphasize the atmosphere and atmosphere-ocean interactions. Some scientists study space plasma physics and planetary science, while others investigate Earth's environment using remote sensing from satellites.

[CALSPACE.UCSD.EDU](http://CALSPACE.UCSD.EDU)

### Center for Atmospheric Sciences

Researchers at the Center for Atmospheric Sciences (CAS) focus on fundamental investigations of the atmosphere related to large-scale climate change. To interpret and predict these changes, CAS scientists design and conduct field experiments, map out new satellite missions, and use regional and global atmospheric models. Their analyses include integration of the models with space and in situ observations.

[CAS.UCSD.EDU](http://CAS.UCSD.EDU)

### Center for Marine Biotechnology and Biomedicine

The Center for Marine Biotechnology and Biomedicine (CMBB), headquartered at Scripps, is a UCSD campuswide center dedicated to the exploration of potential biotechnological and biomedical resources from the world's oceans. CMBB researchers conduct a broad range of investigations, from the special properties of deep-sea marine microbes to the genetic engineering of commercially important marine animals.

[CMBB.UCSD.EDU](http://CMBB.UCSD.EDU)

### Climate Research Division

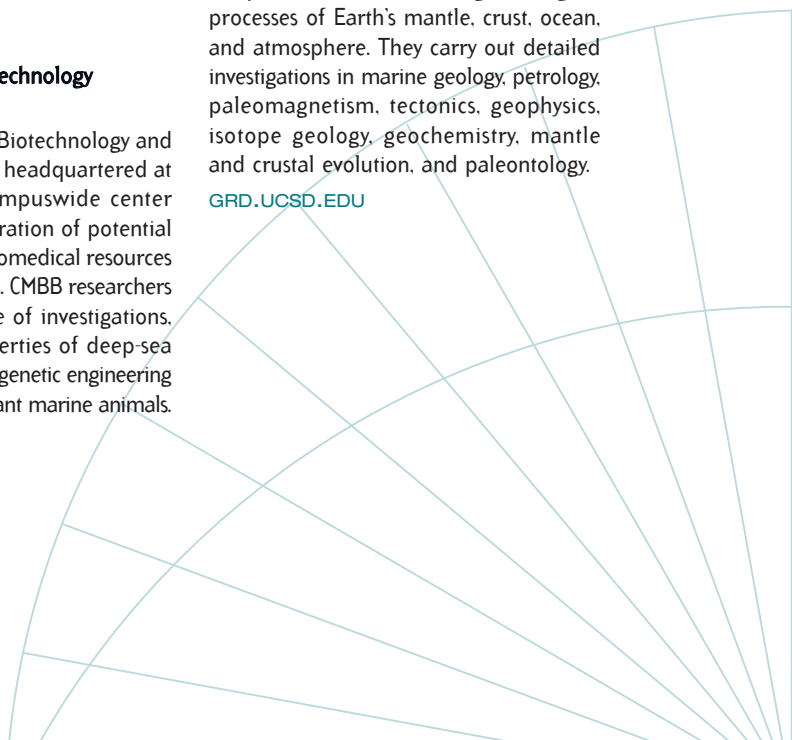
In the Climate Research Division (CRD), scientists study phenomena spanning time scales from weeks to decades. They identify and predict the natural variability of climate and the consequences of anthropogenic increases in the greenhouse effect. CRD researchers use the principles of meteorology, oceanography, hydrology, and other disciplines to understand the complex interactions among the atmosphere, seas, land, and living things.

[METEORA.UCSD.EDU](http://METEORA.UCSD.EDU)

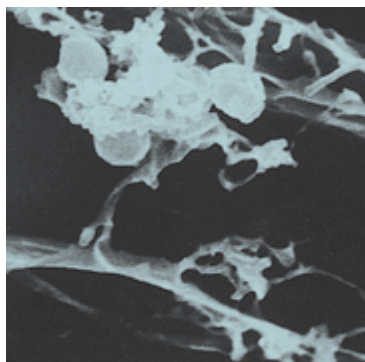
### Geosciences Research Division

Scientists with the Geosciences Research Division (GRD) address a wide range of topics in the earth, ocean, and atmospheric sciences. GRD researchers study the physical, chemical, and geobiological processes of Earth's mantle, crust, ocean, and atmosphere. They carry out detailed investigations in marine geology, petrology, paleomagnetism, tectonics, geophysics, isotope geology, geochemistry, mantle and crustal evolution, and paleontology.

[GRD.UCSD.EDU](http://GRD.UCSD.EDU)







### **Institute of Geophysics and Planetary Physics**

The Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics (IGPP) at Scripps is a branch of the University of California IGPP and hosts the systemwide office. Researchers at IGPP operate a global network of seismic stations; several modern seismic arrays; a permanent space geodesy network in California; an acoustic thermometry network in the North Pacific; and a variety of microwave and satellite data links to remote instruments at sea and on land. IGPP also maintains an active seagoing program, including seafloor and deep-earth research using a fleet of ocean-bottom seismometers, measurement of gravity on the seafloor, a nonlinear processes laboratory, acoustic thermometry, and seafloor electromagnetics.

[IGPP.UCSD.EDU](http://IGPP.UCSD.EDU)

### **Integrative Oceanography Division**

The Integrative Oceanography Division (IOD) was formed to allow collaborations between coastal physicists and biologists and to strengthen interdisciplinary capabilities in nearshore and offshore systems. In addition to collaborative research benefits, IOD is intended to be a base from which to develop a more interdisciplinary graduate student curriculum.

[IOD.UCSD.EDU](http://IOD.UCSD.EDU)

### **Marine Biology Research Division**

Scientists in the Marine Biology Research Division (MBRD) investigate the fundamental processes affecting life and energy flow in marine ecosystems. They examine biodiversity at multiple levels, from geographical and ecological to physiological and molecular. MBRD investigators explore a variety of habitats, including coral reefs, the deep sea, Antarctica, and coastal California.

[MBRD.UCSD.EDU](http://MBRD.UCSD.EDU)

### **Marine Physical Laboratory**

Scientists in the Marine Physical Laboratory (MPL) use knowledge of the ocean and its boundaries to perform basic research and solve problems in ocean acoustics, ocean optics, marine physics, marine geophysics, signal processing, and ocean technology. MPL scientists develop advanced ocean technology for in situ and remote environmental measurement programs and for testing new engineering concepts.

[WWW.MPL.UCSD.EDU](http://WWW.MPL.UCSD.EDU)

### **Physical Oceanography Research Division**

Scientists in the Physical Oceanography Research Division (PORD) study a range of observational and theoretical topics related to the physics of the ocean. Some researchers study the large-scale circulation of the world's oceans or the specifics of smaller environments such as the continental shelf, estuaries, or the shoreline. Others examine the interactions between the ocean and atmosphere. PORD scientists also develop new technologies such as autonomous drifters, specialized sensors, and new versions of current profilers.

[PORD.UCSD.EDU](http://PORD.UCSD.EDU)



# 06 | Birch Aquarium at Scripps Report

FROM EXECUTIVE DIRECTOR NIGELLA HILLGARTH

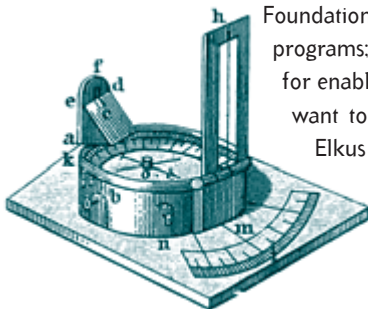
For the Birch Aquarium at Scripps, 2004 was a wonderful year. We finished nearly two years of strategic planning designed to help us better fulfill our mission of connecting the public to ocean and earth science and serving as the gateway to research at Scripps Institution of Oceanography. We have several new exhibits and expanded school and public programs with far more hands-on and interactive elements. We are also planning several more exhibits, large and small, during the next five years that will engage the public in ocean science as well as being fun.

Our beautiful new tide-pool exhibits opened at the end of March in memory of Alex Szekely. Alex was a great friend and supporter of Scripps as well as the Birch Aquarium, and every time I see children gathered around the tide pools talking with one of our docents, and clearly fascinated by the animals, I realize what a wonderful memorial the pools are. Thanks to the generosity of Alex's friends and family, we have doubled the outdoor tide pools, which provide a great introduction for our visitors and school groups to the wonders of ocean life.

Near the end of 2004, we completed the renovation of the museum side of the Birch Aquarium. Now called the Scripps Explorers Gallery, it is designed to house dynamic, interactive exhibits that connect the public to some of the main areas of research at Scripps. The first new exhibit, **EARTHQUAKE! Life on a Restless Planet**, opened in November, and was designed with the help of more than 20 scientists at Scripps. Our continued partnership with Monroe Clarke Middle School education programs as well as several other schools have benefited, as they are using the earthquake exhibit as a major teaching tool for sixth-grade students.

The aquarium does not receive direct public funding, so the support of donors is vital to the success of our vision. I would like to thank Wells Fargo Bank, Union Bank of California, SDG&E, and ITLA Capital Corporation for their continued support of our education programs: the Reuben H. Fleet

Foundation for funding the development of our earth science programs; and the county of San Diego and many other donors for enabling us to produce the new earthquake exhibit. I also want to thank our many individual donors, especially Rick Elkus and Jeanne Sleeper, whose generosity has enabled us to provide terrific programs and exhibits.



ON-SITE VISITORS	• 343,949
PUBLIC EDUCATION ACTIVITIES	<ul style="list-style-type: none"> <li>• 1,255 on-site and field programs for 34,222 participants K-12</li> <li>• 69 public activities programs</li> <li>• 187 naturalist-led whale-watching cruises</li> <li>• 91 birthday programs</li> <li>• Total participants: 28,848</li> </ul>
SUMMER LEARNING ADVENTURES	• 62 sessions, 897 participants total
MONROE CLARK MIDDLE SCHOOL	• 9 sessions, 2,817 participants total
OUTREACH PROGRAM PARTICIPANTS	<ul style="list-style-type: none"> <li>• 262 programs, 6,996 students total</li> <li>• 203 charity programs, 5,958 participants total</li> <li>• 1,935 programs reaching a total of 71,503 people</li> </ul>
SCRIPPS OCEANOGRAPHIC SOCIETY	• 6,588 members
VOLUNTEER HOURS	• 25,663
STAFF MEMBERS	• 49 career, 27 by agreement, 8 students
EARNED INCOME	• \$2,804,045
DONOR-DESIGNATED GIFTS AND GRANTS	• \$749,278
OPERATING EXPENSES	• \$2,801,285

Throughout 2004, we hosted several wonderful member events and lectures. The highlight was definitely the visit of renowned primatologist Jane Goodall. As many of you know, Dr. Goodall received the Scripps Nierenberg Prize for Science in the Public Interest on April 30. A reception was held before the ceremony. Dr. Goodall then gave a public lecture in a huge tent to the largest audience ever seen at the aquarium. There were more than 1,300 people, many of whom could not fit inside the tent. The sound of Dr. Goodall sending a resounding chimp call to those outside of the tent will be remembered for a long time to come!

*Nigella Hillgath*



## 07 | Education Report

FROM DEPUTY DIRECTOR, EDUCATIONAL AFFAIRS LISA TAUXE

As part of Scripps's response to a California-wide budget crisis, a faculty committee drafted a strategic plan for education at Scripps Institution of Oceanography, which was unveiled in May 2004. The plan called for increased recognition of the importance of education at the institution and outlined possible new directions such as the development of an undergraduate major and an expanded master's program. Plans are under way to add a marine biology track to UCSD's Ecology, Behavior, and Evolution major.

Scripps faculty members continue to teach classes for the UCSD's Earth Sciences Program, which included a record number of undergraduates this year. They are the primary teaching force for the Environmental Systems Program and contribute significantly to the teaching programs in the Division of Biological Sciences and at the Jacobs School of Engineering.

As part of the plan to enhance recognition for excellent teaching, the second annual SIO Outstanding Teaching Awards were presented in October 2004. Ten professors were nominated for the Outstanding Graduate Teaching award, and after a student body vote and a student committee evaluation, Professor Farooq Azam was the recipient. Three faculty members were nominated for the Outstanding Undergraduate Teaching Award, and Peter Selkin was the recipient.

The Scripps graduate program is flourishing, with an all-time high in enrollment in the class that entered in fall 2004. During the academic year July 2003-June 2004, the Graduate Department saw 19 graduate students complete their PhD degree programs and nine complete their master's degree programs. Fifteen of the graduates majored in oceanography, nine in earth sciences, and four in marine biology.

Scripps students continue to receive national attention. Jessica Lundquist, a graduate student in applied ocean science, was awarded the Desert Research Institute's Peter B. Wagner Memorial Award for Women in Atmospheric Sciences for her study of factors that determine when and how fast the Sierra Nevada snowpack begins to melt in the spring. Jim Behrens, Peter Selkin, and Jill Weinberger won Outstanding Student Paper Awards from the American Geophysical Union.

For the last two years, the Visualization Center at Scripps has held its Student Visualization Competition. In 2003, nine graduate students entered the competition with creative visualization presentations of their research data. Kerry Key was the first place winner for his presentation of magnetotelluric and seismic reflection data from Gemini Prospect, Gulf of Mexico. In 2004, 14 graduate students entered visual presentations of their research. Bridget Smith won first place for her movie on California seismicity.

In July 2004, Jeanine Donley, a graduate student in marine biology, became the ninth recipient of the Frieman Prize for Excellence in Graduate Student Research. The annual prize was established in 1996 in honor of Scripps Institution's eighth director, Edward A. Frieman, to recognize the graduate student who published the best research paper in the preceding 12 months. Jeanine was selected as the final winner by a faculty committee for her research paper published in the May 2004 issue of *Nature*, "Convergent Evolution in Mechanical Design of Lamnid Sharks and Tunas."

Continued development of the undergraduate curriculum and the master's program underscores the institution's commitment to education. Many challenges lie ahead, but the result of these changes will further secure Scripps's reputation for teaching the leaders of tomorrow's science.



*Lisa Tauxe*

*The Graduate Department of Scripps Institution of Oceanography offers instruction leading to Ph.D. degrees in oceanography, marine biology, and earth sciences. Because of the interdisciplinary nature of the ocean sciences, the department provides a choice of eight curricular groups through which the student may pursue a Ph.D. degree. Each group has prerequisites for admission in addition to the departmental requirements.*

### **Applied Ocean Science (AOS)**

This interdepartmental program serves as a bridge between the classical disciplines of biological, geological, and physical oceanography and the UCSD engineering departments. The aim of the AOS program is to develop scientists capable of designing and operating novel instrumentation in support of ocean research, as well as analyzing and interpreting the data.

### **Biological Oceanography**

In the biological oceanography curriculum, the interactions of marine organisms with the physical-chemical environment and with each other are studied. Research and instruction in this curriculum range from food-web dynamics and community structure to systematics, behavior, biogeography, and physical-biological interactions.

### **Climate Sciences**

The climate sciences curriculum concerns the study of the climate system of the earth with emphasis on the physical, dynamical, and chemical interactions of the atmosphere, ocean, land, ice, and the terrestrial and marine biospheres. The program includes investigations of changes on seasonal to interannual time scales, changes induced by human activities, and paleoclimatic changes on time scales from centuries to millions of years.

### **Geological Sciences**

This curriculum applies observational, experimental, and theoretical methods to the understanding of the solid earth and the solar system and how they relate to the ocean and the atmosphere. Principal subprograms are marine geology

and geophysics, tectonics, sedimentology, micropaleontology and paleoceanography, petrology and geochemistry, and isotope geology. Expedition work at sea and fieldwork on land are emphasized as essential complements to laboratory and theoretical studies.

### **Geophysics**

This curriculum educates the student about the physics of the solid earth, including the earth's magnetic field, the mechanics of tectonic processes, earthquakes and the waves they produce, the physics of the earth's interior, and mathematical methods for analyzing data and interpreting them in terms of models of the earth. Physical and mathematical approaches to geophysical research are emphasized.

### **Marine Biology**

The marine biology curriculum emphasizes course work, seminars, and research on all aspects of the biology of marine organisms. Teaching and research focusing on both prokaryotes and eukaryotes encompass the disciplines of cell and molecular biology, biochemistry, developmental biology, physiology, biomechanics, genetics, ecology, and evolutionary biology.

### **Marine Chemistry and Geochemistry**

The marine chemistry and geochemistry curriculum emphasizes the chemical and geochemical processes operating in the oceans, atmosphere, and other environments, and includes the subdiscipline of marine natural products chemistry. Education and research in this curriculum combine field observations with laboratory

or modeling projects. Studies of natural systems are often multidisciplinary and integrate chemical concepts and techniques with information about physical, geological, or biological processes, including the effects of human activity.

### **Physical Oceanography**

The physical oceanography curriculum deals with mechanisms of energy transfer through the sea and across its boundaries and with the physical interactions of the sea with its surroundings, especially its influence on climate. Research activities are both observational and theoretical. These include study of the general circulation of the oceans; mechanisms of transport of energy, momentum, and physical substances within the sea and across its boundaries; properties of wind waves, internal waves, tsunami waves, and planetary waves; the thermodynamic description of the sea as a system not in equilibrium; optical and acoustical properties of the sea; and the influence of the surf on nearshore currents and the transport of sediments.

### **Student Enrollment**

In the fall of 2003, 39 new students were admitted to graduate study. Of these, six were admitted in applied ocean sciences, three in biological oceanography, four in climate sciences, seven in geophysics, one in geological sciences, 12 in marine biology, three in marine chemistry and geochemistry, and three in physical oceanography. Enrollment at the beginning of the academic year was 221. In fiscal year 2004, UCSD awarded 19 doctor of philosophy degrees and nine master of science degrees to the students listed on the following page.



# 09 | Degree Recipients

JULY 1, 2003–JUNE 30, 2004

*The list of degree recipients reflects fiscal year reporting, not calendar year as in previous years. Some names have been duplicated from previous year's reporting.*

## **Doctor of Philosophy Degrees Awarded, with Titles of Dissertations**

### **Earth Sciences**

#### **Alexi M. Grachev**

"Laboratory-Determined Air Thermal Diffusion Constants Applied to Reconstructing the Magnitudes of Past Abrupt Temperature Changes from Gas Isotope Observations in Poland"

#### **Eric Christian Hallenborg**

"The Structure of Mature Oceanic Crust: Tectonic Features Revealed in Superfast-Spread Cocos Plate by Multichannel Seismic Grids and Swath Bathymetry"

#### **David Ericsson Hunter**

"Interannual and Decadal Climate Variability in Coral and Instrumental Records, with a Focus on the Western Indian Ocean"

#### **Kerry William Key**

"Application of Broadband Marine Magnetotelluric Exploration to a 3D Salt Structure and a Fast-Spreading Ridge"

#### **Linda M. Warren**

"Analysis of Global Compressional-Wave Spectra to Determine Anelastic Earth Structure and Earthquake Rupture Directivity"

#### **Peter A. Selkin**

"Paleomagnetism and Rock Magnetism of Precambrian Intrusions"

### **Marine Biology**

#### **Suzanne Carole Dufour**

"Adaptations to Chemoautotrophic Symbiosis in the Bivalve Family Thyasiridae"

#### **Harry Scott Rapoport**

"Biomechanics, Biochemistry, and Molecular Biology of a Molluscan Scleroprotein Elastomer: Whelk Egg Capsules"

#### **John Andrew Tincu**

"Acid Soluble Peptides from the Hemocytes of the Ascidians: Characterization and Antimicrobial Activity"

### **Oceanography**

#### **Katherine Alexandra Curtis**

"Pattern in Space and Time of Clupeoid Fish Eggs in the California Current Region"

#### **Geoffrey Fred Edelman**

"Underwater Acoustic Communications Using Time Reversal"

#### **Jessica Knight Nolan**

"Picophytoplankton Productivity: Perspectives from Ecology, Photophysiology, and Optics"

#### **Melissa L. Lerch**

"Investigation of the Potential of Marine Natural Products as Inhibitors of HIV Integrase"

#### **David H. Levenson**

"The Visual Pigments of Diving Tetrapods: Genetic and Electroretinographic Investigations of Pinipeds, Cetaceans, Sea Turtles, and Penguins"

#### **Luc Rainville**

"Propagation of the Internal Tide from the Hawaiian Ridge"

#### **Wilford Edward Schmidt**

"Lagrangian Observations of Surfzone Currents"

#### **Cynthia A. Taylor**

"Patterns of Early-Stage Pelagic Dispersal and Gene Flow in Rockfish Species from the Southern California Bight"

#### **Peter von Dassow**

"Regulation of Bioluminescence in the Dinoflagellate *Lingulodinium polyedrum*"

#### **Joshua Kendall Willis**

"Combining Satellite and In Situ Data to Make Improved Estimates of Upper-Ocean Thermal Variability on Eddy to Global Scales"

## **Master of Science Degrees Awarded**

### **Earth Science**

Jeana Lee Driver  
Neil Harvey Kussat  
Troy Swift

### **Marine Biology**

Florence J. Folmer

### **Oceanography**

Angela Adams  
Genevieve C. Boisvert  
Patricia Cheng  
Renee Maabadi  
Allan Spyere

For application procedures or for more information, please write to:

University of California, San Diego  
Scripps Institution of Oceanography  
Graduate Department  
9500 Gilman Drive, Dept. 0208  
La Jolla, CA 92093-0208  
scripps.ucsd.edu/grad\_dept



Henry D. I. Abarbanel, Physics/MPL, Physics  
 † David K. Adams, CAS, Atmospheric Sciences  
 ● Duncan C. Agnew, IGPP, Geophysics  
 Eric J. Alfaro-Martinez, CRD, Oceanography  
 ● Lihini Aluwihare, GRD, Chemical Oceanography  
 † Victor C. Anderson, ECE/MPL, Marine Physics  
 † Tarsicio Antezana, IOD, Ecology  
 ● Laurence Armi, PORD, Physical Oceanography  
 † James R. Arnold, Chemistry/CSI, Space Research  
 ● Gustaf O. S. Arrhenius, GRD, Oceanography  
 † Stephen Arrowsmith, IGPP, Seismology  
 † Ratnakar N. Asolkar, CMBB, Chemistry  
 † Guillermo Auad, CRD, Oceanography  
 † Roswell W. Austin, IOD, Optical Physics  
 ● Farooq Azam, MBRD/CMBB, Microbiology  
 † Jeffrey M. Babcock, IGPP, Earth Sciences  
 † George E. Backus, IGPP, Geophysics  
 ● Jeffrey L. Bada, GRD, Marine Chemistry  
 † Roberta Baldwin, MBRD, Biology  
 † Ford Ballantyne, MBRD, Biology  
 † Eugene Baranov, CMBB, Marine Biology  
 † Katherine A. Barbeau, GRD, Marine Chemistry  
 † Jay P. Barlow, SIO, Biological Oceanography  
 † Tim P. Barnett, CRD/MPL, Physical Oceanography  
 ● Douglas H. Bartlett, MBRD/CMBB, Marine Bacterial Molecular Genetics  
 † Christine Beardsley, MBRD, Marine Microbiology  
 † Laura Beaster-Jones, MBRD, Biological Sciences  
 †☆ Thorsten Becker, IGPP, Geophysics  
 † Rizlan Bencheikh-Latmani, MBRD, Environmental Engineering  
 † Andrew A. Benson, MBRD, Marine Biology  
 † Jonathan Berger, IGPP/CSI, Geophysics  
 ● Wolfgang H. Berger, GRD, Oceanography  
 † Diego Bernal, MBRD, Marine Biology  
 † Bruce G. Bills, IGPP, Planetary Sciences  
 † Donna K. Blackman, IGPP, Marine Geophysics  
 † Yehuda Bock, IGPP, Geodesy  
 † Hugh Bradner, MAE/IGPP, Physics  
 † Bianca M. Brahamsha, MBRD/CMBB, Microbiology  
 † Edward Brinton, IOD, Marine Biology  
 † Peter D. Bromirski, IOD, Geology & Geophysics  
 ● Kevin M. Brown, GRD, Geological Sciences  
 † James N. Brune, GRD/IGPP, Geophysics  
 † Greg Buchanan, CMBB, Organic Chemistry  
 ● Michael J. Buckingham, MPL, Ocean Acoustics

† Timothy Bugni, CMBB, Medicinal Chemistry  
 † Theodore H. Bullock, Neuroscience, Neurobiology  
 ● Theodore E. Bunch, GRD, Earth Sciences  
 ● Ronald S. Burton, MBRD/CMBB, Biological Sciences  
 † Brett C. Bush, CAS, Physics  
 † Lillian B. Busse, IOD, Freshwater Ecology  
 ● John L. Butler, MBRD, Marine Biology  
 ● Steven C. Cande, GRD, Marine Geophysics  
 † George F. Carnevale, PORD, Oceanography  
 ● Paterno R. Castillo, GRD, Petrology  
 † Daniel R. Cayan, CRD/MPL, Meteorology  
 † Luca Centurioni, PORD, Ocean Physics  
 ● Paola Cessi, PORD, Physical Oceanography  
 † C. David Chadwell, MPL, Geodesy  
 ● Christopher D. Charles, GRD, Paleoclimatology  
 ● David M. Checkley, IOD, Marine Ecology  
 † Ji Chen, CRD, Hydrology  
 † Shyh-Chin Chen, CRD, Meteorology  
 † Lanna Cheng, MBRD/CMBB, Marine Entomology  
 † Teresa Chereskin, PORD/IOD, Physical Oceanography  
 † Ji Young Cho, CMBB, Biochemistry  
 † Chul Chung, CAS, Meteorology  
 † Linden Clarke, IOD, Oceanography  
 † George Claypool, GRD, Geochemistry  
 † Henderson Cleaves, GRD, Biochemistry  
 ● Catherine Constable, IGPP, Geophysics  
 ● Steven C. Constable, IGPP, Geophysics  
 † Bruce D. Cornuelle, PORD/CRD, Oceanography  
 † Craig E. Corrigan, CAS, Chemistry  
 † Charles S. Cox, PORD, Physical Oceanography  
 ● Paul Crutzen, D-SIO, Stratospheric Chemistry  
 † Joseph R. Curray, GRD, Marine Geology  
 † David L. Cutchin, PORD, Physical Oceanography  
 † J. Peter Davis, IGPP, Geophysics  
 ● Russ E. Davis, PORD, Physical Oceanography  
 ● Steven M. Day, IGPP, Geophysics  
 ● Paul K. Dayton, IOD, Biological Oceanography  
 † Grant B. Deane, MPL, Mathematics  
 † Catherine deGroot-Hedlin, IGPP, Geophysics  
 † Dimitri D. Dehyen, MBRD, Marine Biology  
 ● David Demer, MPL, Applied Ocean Sciences  
 ● Christian P. de Moustier, MPL/SOMTS, Oceanography  
 † Richard B. Deriso, D-SIO, Fisheries Population Dynamics  
 ● Michael D. Dettinger, CRD, Atmospheric Sciences

Edward P. Dever, IOD, Oceanography  
 ● Andrew G. Dickson, MPL, Chemistry  
 † Emanuele DiLorenzo, PORD, Oceanography  
 † Andrew E. Dizon, D-SIO, Zoology  
 † Clive Dorman, IOD, Physical Oceanography  
 ● LeRoy M. Dorman, GRD/MPL, Geophysics  
 ● Neal Driscoll, GRD, Marine Geology and Geophysics  
 ● Ellen Druffel, IOD, Chemistry  
 † Gerald D'Spain, MPL, Oceanography  
 † Seibert Q. Duntley, D-SIO, Physics  
 † Matthew Dzieciuch, IGPP, Electrical Engineering  
 † Geoffrey F. Edelmann, MPL, Oceanography  
 ● Stephen Elgar, IOD, Nearshore Processes  
 ● M. Hany S. Elwany, IOD, Coastal and Ocean Engineering  
 † James T. Enright, MBRD, Biological Oceanography  
 † Peng Fang, IGPP, Geodesy  
 † Falk Feddersen, IOD, Oceanography  
 ● Horst Felbeck, MBRD/CMBB, Marine Biochemistry  
 ● William H. Fenical, CMBB, Chemistry  
 ● Yuri Fialko, IGPP, Geosciences  
 † Jean H. Filloux, PORD, Physical Oceanography  
 † Frederick H. Fisher, MPL, Physics  
 † Robert L. Fisher, GRD, Marine Geology/Oceanography  
 † Piotr Flatau, CAS/CSI, Atmospheric Sciences  
 ● Reinhard E. Flick, IOD, Coastal Processes  
 ● Theodore D. Foster, GRD, Physics  
 ● Peter J. S. Franks, IOD, Biological Oceanography  
 † Sharon E. Franks, IOD, Oceanography  
 † Helen A. Fricker, IGPP, Glaciology  
 † Edward A. Frieman, Director Emeritus/IGPP, Physics  
 † Robert J. Frouin, CSI, Meteorology  
 † Yoshihiro Fujiwara, MBRD, Marine Biology  
 † Hironobu Fukami, MBRD, Marine Biology  
 ● Theresa Gaasterland, MBRD, Computer Science  
 † Blanca Galindo, MBRD, Biochemistry  
 † Zaul Garcia-Esquivel, MBRD, Marine Biology  
 † Jeffrey S. Gee, GRD/IGPP, Earth Sciences  
 † John Geller, MBRD, Marine Biology  
 † Konstantine Georgakakos, CRD, Hydrology and Water Resources  
 † Alexander Gershunov, CRD, Geography  
 † Peter Gerstoft, MPL, Civil Engineering  
 ● Carl H. Gibson, MAE/D-SIO, Fluid Dynamics  
 ● Joris M. T. M. Gieskes, IOD, Marine Chemistry  
 † J. Freeman Gilbert, IGPP, Geophysics  
 ● Sarah Gille, PORD, Physical Oceanography  
 † John Gilson, PORD, Physical Oceanography  
 † Ralf Goericke, IOD, Biological Oceanography



- Edward D. Goldberg, GRD, Chemistry
- Rafael Gonzales-Quiros, IOD, Biology
- Joseph J. Gorga, IOD, Marine Sciences
- William J. Gould, PORD, Oceanography
- Jeffrey B. Graham, CMBB/MBRD, Marine Biology/Physiology
- Nicholas E. Graham, CRD/MPL, Meteorology
- Peter R. Guenther, GRD, Marine Chemistry
- Robert T. Guza, PORD/IOD, Physical Oceanography
- Roberta Hamme, GRD, Chemical Oceanography
- Harold T. Hammel, CMBB, Physiology
- Alistair J. Harding, IGPP, Seismology
- John S. Harrison, MBRD, Biology
- Philip A. Hastings, MBRD, Ecology & Evolutionary Biology
- Richard A. Haubrich, IGPP, Geophysics
- Loren R. Haurly, IOD, Biological Oceanography
- James W. Hawkins, GRD, Geology
- Francis T. Haxo, MBRD, Marine Botany
- Margo G. Haygood, MBRD/CMBB, Marine Biology
- Thomas L. Hayward, IOD, Biological Oceanography
- Michael A. Hedlin, IGPP, Earth Sciences
- Edvard A. Hemmingsen, CMBB, Physiology
- Myrl C. Hendershott, IOD/PORD, Physical Oceanography
- Stephen Henderson, IOD, Physical Oceanography
- Thomas H. Herbers, IOD, Radiation Stress
- Juan C. Herguera, GRD, Oceanography
- Jose Hernandez-Ayon, MPL, Coastal Oceanography
- Julian Herszage, GRD, Chemistry
- Robert R. Hessler, MBRD, Biological Oceanography
- Hugo Hidalgo-Leon, CRD, Civil Engineering
- John A. Hildebrand, MPL/GRD, Applied Physics
- Mark Hildebrand, MBRD, Biochemistry
- R. Hilton, GRD, Isotope Geochemistry
- William S. Hodgkiss, Jr., MPL, Signal Processing
- Linda Z. Holland, MBRD, Molecular Biology
- Nicholas D. Holland, MBRD, Marine Biology
- Osmund Holm-Hansen, MBRD, Marine Biology
- Ibrahim Hoteit, PORD, Applied Mathematics
- John R. Hunter, D-SIO, Ichthyology
- Sam F. Iacobellis, CRD, Physical Oceanography
- Glenn R. Ierley, IGPP/PORD, Physical Oceanography
- Anand K. Inamdar, CAS, Radiative Transfer/Numerical Computation
- Douglas L. Inman, IOD, Physical Oceanography
- Fumito Ishibashi, CMBB, Marine Biology
- Miaki Ishii, IGPP, Geophysics
- Jeremy B. C. Jackson, GRD/MBRD, Geology
- Jules S. Jaffe, MPL, Biophysics
- Paul R. Jensen, CMBB, Microbiology
- Catherine Johnson, IGPP, Geophysics
- Hope Johnson, MBRD, Environmental & Engineering Sciences
- Kenneth G. Johnson, GRD, Geology
- Emrys Jones, GRD, Mechanical Engineering
- Mati Kahru, IOD, Biological Oceanography
- Adrianus J. Kalmijn, PORD, Biology/Physics
- Hideki Kanamaru, CRD, Climatology & Hydrology
- Masao Kanamitsu, CRD, Meteorology
- Miriam Kastner, GRD, Geology
- Ronald Kaufmann, MBRD, Marine Biology
- Charles D. Keeling, GRD, Marine Chemistry
- Ralph F. Keeling, GRD, Atmospheric Chemistry
- Michael P. Kennedy, GRD, Geology
- Charles F. Kennel, Director, Astrophysics
- Graham M. Kent, IGPP, Geophysics
- Kerry W. Key, IGPP, Geophysics
- Deborah L. Kilb, IGPP, Seismology
- Katherine H. Kim, MPL, Electrical Engineering
- Jochen Klinke, PORD, Physics
- Jody Klymak, MPL, Oceanography
- John A. Knauss, PORD, Oceanography
- Nancy Knowlton, MBRD, Zoology
- Robert A. Knox, PORD/SOMTS/DO, Oceanography
- Armin Koehl, PORD, Physical Oceanography
- Antonius Koppers, IGPP, Isotope Geochronology
- Gerald L. Kooyman, CMBB, Physiology
- William A. Kuperman, MPL, Marine Acoustics
- Hak Cheol Kwon, CMBB, Pharmacy
- Ngai C. Lai, CMBB, Marine Biology
- Devendra Lal, GRD, Nuclear Geophysics
- Michael R. Landry, IOD, Oceanography
- Carina B. Lange, GRD, Marine Diatoms
- John L. Largier, IOD, Coastal and Estuarine Hydrodynamics
- M. Gabrielle Laske, IGPP, Geophysics
- Michael Latz, MBRD/CMBB, Bioluminescence of Marine Organisms
- James J. Leichter, IOD, Biological Sciences
- Lisa A. Levin, IOD, Marine Population and Community Ecology
- Ralph A. Lewin, MBRD/CMBB, Marine Biology
- Fang Li, CRD, Mechanical Engineering
- Leonard N. Liebermann, Physics/MPL, Physics
- Thomas C. Lippmann, IOD, Nearshore Oceanography
- Peter F. Lonsdale, MPL, Geology
- Ralph Lovberg, PHYS, Physics
- Carl D. Lowenstein, MPL, Marine Physics
- Dan Lubin, CAS/CSI, Atmospheric Physics
- Timothy J. Lueker, GRD, Oceanography
- Gunter W. Lugmair, GRD, Geochemistry
- Suzanne N. Lyons, IGPP, Geophysics
- J. Douglas Macdougall, GRD, Marine Geology
- Jennifer A. Mackinnon, IOD, Oceanography
- Jacqueline Mammerickx, GRD, Geology
- Maura Manganelli, MBRD, Marine Biology
- Elizabeth Mann, MBRD, Biological Oceanography
- Arnold Mantyla, IOD, Oceanography
- David Marsden, CAS, Physics
- Glenroy Martin, CMBB, Organic Chemistry
- Simon J. Mason, CRD/MPL, Geography
- Patricia M. Masters, IOD, Biology
- T. Guy Masters, IGPP, Geophysics
- James K. McCarthy, MBRD, Microbiology
- John A. McGowan, IOD, Biological Oceanography
- Kimberly W. McSherry, GRD, Marine Geology
- W. Kendall Melville, MPL/PORD, Fluid Mechanics
- Sarah Mesnick, MBRD, Ecology & Evolutionary Biology
- Frances Michaelis, MBRD, Marine Biology
- John W. Miles, AMES/IGPP, Geophysics/Fluid Dynamics



R.P. FLIP  
SAN DIEGO

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15  
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- Arthur J. Miller, CRD/CSI, Physical Oceanography  
Benjamin R. Miller, GRD, Earth Sciences  
Stephen P. Miller, GRD, Geophysics
- Jean-Bernard H. Minster, IGPP, Geophysics
  - B. Gregory Mitchell, IOD, Phytoplankton Biology
  - Russell Moll, SGP, Biology
  - ⊕ H. Geoffrey Moser, MBRD, Fisheries Biology
  - ✦ Mingquan Mu, CAS, Atmospheric Dynamics
  - ✦ Jens Muhle, GRD, Atmospheric Chemistry
  - ⌈ Walter H. Munk, IGPP, Geophysics
  - ✦ Venkata R. Muvva, CAS, Atmospheric Sciences
  - Douglas J. Neilson, CRD, Biological Sciences
  - ✦ Peter Nelson, MBRD, Marine Biology
  - ✦ Boris Nemzer, MPL, Thermodynamics
  - William A. Newman, MBRD/DO, Biological Oceanography
  - P. Peter Niiler, IOD/PORD, Applied Mechanics
  - ✦ Mamoru Nomura, MBRD, Developmental Biology
  - Joel Norris, IGPP, Atmospheric Sciences
  - Richard Norris, GRD, Earth & Planetary Sciences
  - ✦ R. Glenn Northcutt, Neurosciences, Zoology
  - ✦ Alexey Novaradovsky, MBRD, Marine Biology
  - ✦ Thomas James Noyes, IOD, Oceanography
  - Anna Obratsova, MBRD, Microbiology
  - Jose L. Ochoa de la Torre, PORD, Oceanography
  - ✦ J. Carter Ohlmann, PORD, Oceanography
  - Mark D. Ohman, IOD/STS, Biological Oceanography
  - John A. Orcutt, IGPP, Geophysics
  - Brian Palenik, MBRD, Oceanography
  - ⊕ Dorothy L. Parker, MBRD, Molecular Biology
  - Robert L. Parker, IGPP/PORD, Geophysics
  - ✦ Paul Parnell, IOD, Oceanography
  - ☆ Gary L. Pavlis, IGPP, Geophysics
  - Cheryl L. Peach, BAS, Geology
  - ✦ William F. Perrin, D-SIO, Zoology
  - ☆ Roger Jay Phillips, IGPP, Geophysics
  - Emily Pidgeon, IOD, Civil & Environmental Engineering
  - Robert Pinkel, PORD/MPL, Internal Waves
  - Stephen C. Piper, GRD, Modeling
  - Igor A. Podgorny, CAS, Physical & Mathematical Science
  - Paul J. Ponganis, CMBB, Biology
  - Shelly K. Pope, CAS, Planetary Sciences
  - ✦ Francis J. Poulin, IOD, Applied Mathematics
  - Kimberly A. Prather, Chem/CAS, Chemistry
  - ✦ Linette Prawiridirdjo, IGPP, Earth Sciences
  - ✦ Gernot Presting, MBRD, Marine Biology
  - ⊕ Zhengxu Qian, PORD, Physics
  - ✦ Veerabhadran Ramanathan, CSI/CRD/CAS, Planetary Atmospheres
  - ✦ Linda Rasmussen, IOD, Oceanography
  - ⊕ Anthony E. Rathburn, IOD, Geology
  - ⊕ Freda M. Reid, IOD, Taxonomy
  - ⌈ Joseph L. Reid, IOD, Physical Oceanography
  - ✦ Sally Ride, PHYS, Physics
  - ⌈ William R. Riedel, STS, Marine Geology
  - John O. Roads, CRD/CSI, Meteorology
  - Paul E. Robbins, PORD, Oceanography
  - Gregory C. Roberts, CAS, Atmospheric Sciences
  - Dean H. Roemmich, PORD/IOD, Oceanography
  - ⊕ James J. Rohr, MBRD, Engineering Physics
  - ⌈ Richard H. Rosenblatt, MBRD, Marine Zoology
  - ⊕ Arnold Ross, MBRD, Marine Biology
  - ✦ Moninya Roughan, IOD, Mathematics
  - Philippe Roux, MPL, Liquid Physics
  - Daniel L. Rudnick, PORD, Physical Oceanography
  - Lynn M. Russell, CAS, Chemical Engineering
  - ✦ Karim Sabra, MPL, Mechanical Engineering
  - ✦ Pratap Sahay, IGPP, Seismology
  - Enric Sala, IOD, Ecology
  - Richard L. Salmon, PORD, Oceanography
  - David T. Sandwell, IGPP, Marine Geophysics
  - Annika B. Sanfilippo, GRD/STS, Paleontology
  - Glenn S. Sasagawa, IGPP, Earth Sciences
  - Allan W. Sauter, MPL/GRD, Ocean Bottom Seismology
  - ✦ Wilford E. Schmidt, IOD, Oceanography
  - Nicklas Schneider, CRD, Oceanography
  - John G. Sclater, GRD, Geophysics
  - ✦ Peter Selkin, GRD, Earth Sciences
  - Uwe Send, PORD, Oceanography
  - Jeffrey P. Severinghaus, GRD, Geological Sciences
  - Richard J. Seymour, IOD, Oceanography
  - Robert E. Shadwick, MBRD/CMBB, Connective Tissue Biophysics
  - Peter M. Shearer, IGPP, Seismology
  - Jeffrey T. Sherman, PORD, Applied Ocean Sciences
  - ⌈ George G. Shor, Jr., SOMTS/MPL, Marine Geophysics
  - Alexander Shukolyukov, GRD, Radiochemistry
  - James J. Simpson, IOD, Physical Oceanography
  - Jerome A. Smith, PORD/MPL, Physical Oceanography
  - Kenneth L. Smith, Jr., MBRD, Ecological Energetics
  - ✦ Paul E. Smith, D-SIO, Pelagic Ecology
  - ✦ Raymond C. Smith, IOD, Physics



- Richard C. J. Somerville, CRD/CAS, Meteorology
- Hee Chun Song, MPL, Ocean Engineering
- ▲ Fred N. Spiess, MPL, Marine Physics
- Janet Sprintall, PORD, Physical Oceanography
- Detlef Stammer, PORD, Physical Oceanography
- Hubert H. Staudigel, IGPP, Geology
- 🌐 Jeffrey L. Stein, MBRD/CMBB, Marine Biology
- ▲ Iris Stewart, CRD, Hydrogeology
- Malcom D. Stokes, MPL, Biological Oceanography
- Dariusz Stramski, MPL, Oceanography
- George Sugihara, PORD, Mathematical Biology
- James H. Swift, PORD/IOD/STS, Physical Oceanography
- William Sydeman, IOD, Ecology
- Lynne D. Talley, PORD, Oceanography
- ▲ Lik T. Tan, CMBB, Pharmacy
- Fabian Tapia, IOD, Biology
- Lisa Tauxe, GRD, Geophysics
- 🌐 Steven W. Taylor, CMBB/MBRD, Chemistry
- Bradley M. Tebo, MBRD/CMBB, Marine Biology
- ▲ Jane Teranes, GRD, Earth Sciences
- Eric Terrill, MPL, Oceanography
- ▲ Jurgen Theiss, PORD, Atmospheric Dynamics
- Aaron Thode, MPL, Oceanography
- William H. Thomas, IOD, Microbiology
- 🌐 Michael F. Tillman, MBRD, Fisheries
- ▲ Michael Tryon, GRD, Earth Sciences
- Mizuki Tsuchiya, IOD, Physical Oceanography
- Frederick I. Tsuji, MBRD/CMBB, Biochemistry
- Valentina Turk, MBRD, Marine Biology
- ◇ Victor Vacquier, MPL, Geophysics
- Victor D. Vacquier, MBRD/CMBB, Developmental Biology
- David Valentine, MBRD, Marine Biology
- Francisco Valero, CAS/CSI, Atmospheric Physics
- ◇ William G. Van Dorn, PORD, Physical Oceanography
- ▲ Jolante Van Wijk, IGPP, Tectonics
- Elizabeth L. Venrick, IOD, Oceanography
- ▲ Michael Vera, IGPP, Physics
- Maria Vernet, IOD, Oceanography
- Frank L. Vernon, IGPP, Seismology
- 🌐 Fabrice Veron, MPL, Oceanography
- Roland E. A. Von Glasow, CAS, Atmospheric Physics (Meteorology)
- Laura Waggoner, MBRD, Marine Biology
- Martin Wahlen, GRD/CAS, Physics
- ▲ John P. Walsh II, GRD, Oceanography
- ▲ Haili Wang, IOD, Marine Chemistry
- ▲ Kenneth M. Watson, MPL, Physical Oceanography
- ▲ Wilbert Weijer, PORD, Physical Oceanography

- ☆ Chester J. Weiss, IGPP, Geophysics
- Ray F. Weiss, GRD, Geochemistry
- Bradley Werner, IGPP, Geomorphology
- ▲ Anthony Westerling, CRD, Economics & International Affairs
- ◇ Fred N. White, Medicine/CMBB, Comparative Physiology
- Warren B. White, PORD/CRD, Oceanography
- ▲ Philip G. Williams, CMBB, Chemistry
- Clinton D. Winant, IOD, Oceanography
- Amos Winter, GRD, Geology
- ▲ Edward L. Winterer, GRD, Geology
- Kraig Winters, IOD, Applied Mathematics
- Peter F. Worcester, IGPP/MPL/PORD, Oceanography
- Alexandra Worden, MBRD, Marine Biology
- ◇ A. Aristides Yayanos, MBRD/CMBB, Physiology
- William R. Young, PORD/IGPP, Physical Oceanography
- ▲ Yong Jae Yu, GRD, Geophysics
- Shimizu Yugo, PORD, Physical Oceanography
- Guang J. Zhang, CAS/CSI, Atmospheric Physics
- Xin Zhang, PORD, Physical Oceanography
- 🌐 Alberto Zirino, MBRD, Oceanography
- Mark A. Zumberge, IGPP, Physics

- ↪ Adjunct Professor Series
- ☆ Cecil H. & Ida M. Green Scholar
- ⚓ Alderson Chair
- ◇ Emeritus
- ▲ Emeritus. on site
- Faculty. Department of Scripps Institution of Oceanography
- 🏠 John D. Isaacs Chair
- ▲ Postgraduate research scientist
- ★ Ritter Chair
- Visiting/Postdoctoral scholar
- 🌐 Nonsalaried. affiliated elsewhere
- Member of Scripps Institution of Oceanography Faculty



CAS	Center for Atmospheric Sciences
CMBB	Center for Marine Biotechnology and Biomedicine
CRD	Climate Research Division
CSI	California Space Institute
DO	Director's Office
ECE	Electrical and Computer Engineering Department
GRD	Geosciences Research Division
IGPP	Institute of Geophysics and Planetary Physics
INLS	Institute for Nonlinear Science
IOD	Integrative Oceanography Division
MAE	Mechanical and Aerospace Engineering
MBRD	Marine Biology Research Division
MPL	Marine Physical Laboratory
PHYS	Physics Department
PORD	Physical Oceanography Research Division
SGP	Sea Grant Program
SIO	Scripps Institution of Oceanography Graduate Department
SOMTS	Ship Operations and Marine Technical Support
STS	Shipboard Technical Support

## 14 | Awards and Honors

**Farooq Azam** was elected a fellow of the American Academy of Microbiology, received the inaugural Tiedje Award from the International Society for Microbial Ecology, and received an honorary doctorate from Sweden's University of Kalmar.

The Birch Aquarium at Scripps exhibit, Secrets of the Seahorse, received the Munson Aquatic Conservation Exhibitory Award from the American Zoo and Aquarium Association and the Curtis and Edith Munson Foundation.

**Paul Dayton** received the 2004 E. O. Wilson Naturalist Award from the American Society of Naturalists. He also received the 2004 Faculty Research Lecture Award from the UCSD Division of the Academic Senate.

**Robert Fisher** was awarded the inaugural Drake Medal by the General Bathymetric Chart of the Oceans organization.

**J. Freeman Gilbert** received the 2004 Medal of the Seismological Society of America and received an honorary doctor of engineering degree from the Colorado School of Mines.

**Ancel Keys**, a Scripps Institution alumnus, received the Professional Achievement Award from the UCSD Alumni Association at 100 years old.

**William Kuperman** was elected to the National Academy of Engineering and was named a Secretary of the Navy/Chief of Naval Operations Oceanographic Research Chair by the Office of Naval Research.

**Walter Munk** was selected as an honorary fellow of the Acoustical Society of America.

**V. Ramanathan** was appointed by Pope John Paul II to be an academician of the Pontifical Academy of Sciences.



David Sandwell

The San Diego Metropolitan Wastewater Department's new Environmental Monitoring and Technical Services Laboratory was formally dedicated to late Scripps scientist Mia Tegner.

**Edward L. Winterer** was elected a fellow of the American Geophysical Union.



**Lynn Russell** received the Kenneth T. Whitby Award from the American Association for Aerosol Research.

**David Sandwell** received the George P. Woollard Award from the Geological Society of America.

**Glenn Sasagawa, Mark Zumberge,** and graduate student **Scott Nooner** were honored by the Society of Exploration Geophysicists for best paper in the journal *Geophysics*.



Lynn Russell

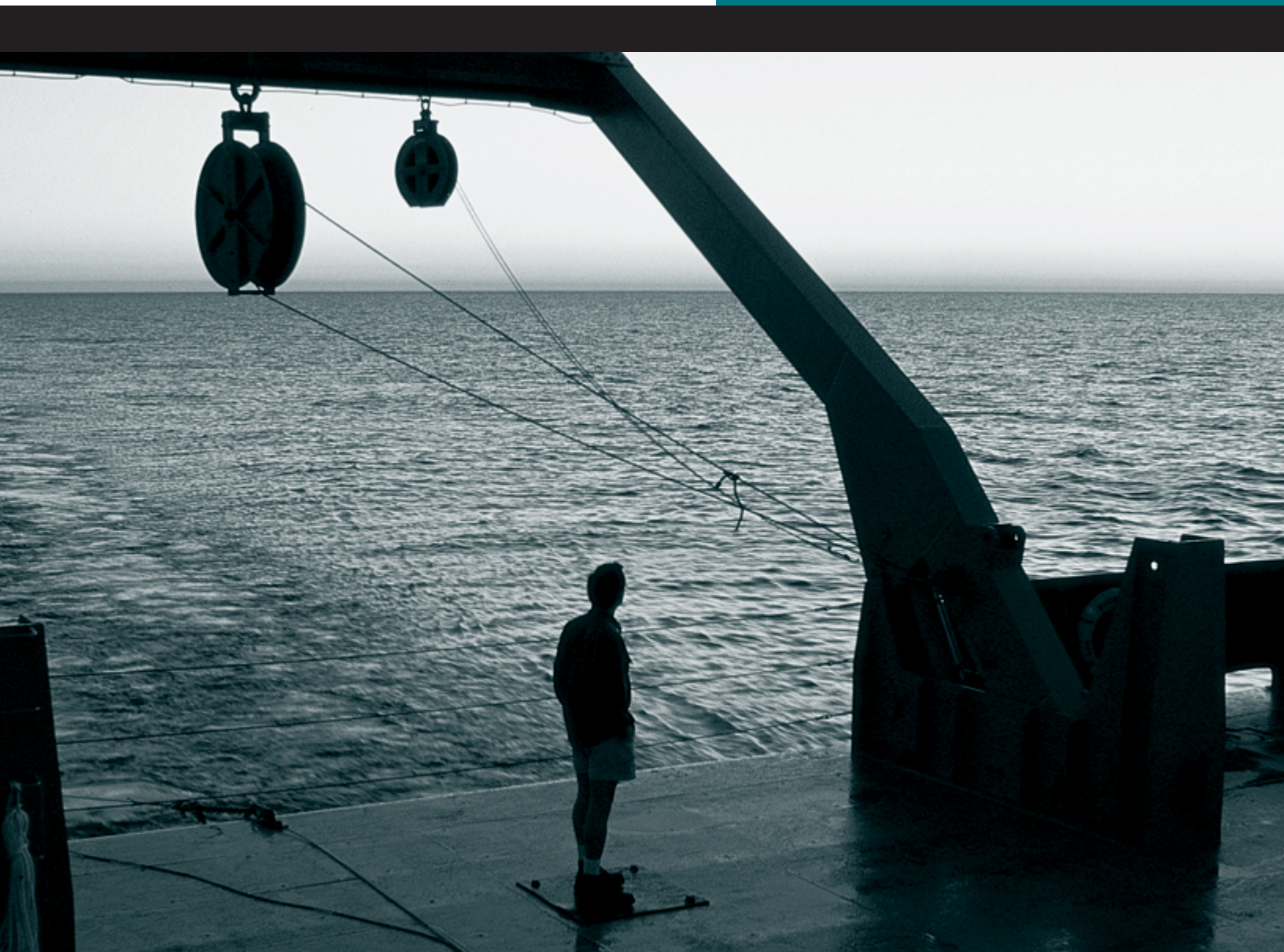


# 15 | Seagoing Operations Report

FROM ASSOCIATE DIRECTOR, SHIP OPERATIONS AND MARINE TECHNICAL SUPPORT ROBERT A. KNOX

The Scripps Institution of Oceanography fleet completed a busy year of support to seagoing science. The wide range of disciplines, observational methods and tools, technical support requirements, ship capabilities, and geographic locations of study areas formed a substantial challenge. That this challenge was met and that most scientific objectives were accomplished or exceeded is primarily due to the talent and effort of the ships' crews and technical support personnel.

*Robert A. Knox*





# THE SCRIPPS FLEET

## R/V Roger Revelle

Work during fiscal year 2003–04 ranged from detailed study of biocomplexity in the upper water column to precise measurements of seafloor shape and structure. R/V *Roger Revelle* began the year off Kauai completing a U.S. Navy-supported acoustic program on the Pacific Missile Range. After a marine geophysical survey of the Central American Margin, *Revelle* returned to a site off Chile to recover and redeploy a Woods Hole Oceanographic Institution mooring that included meteorological sensors to measure air–sea interactions and a tsunami warning buoy, in a collaborative effort with the National Oceanic and Atmospheric Administration, the Pacific Marine Environmental Laboratory, and the Chilean Navy Hydrographic and Oceanographic Service.

At the East Pacific Rise, *Roger Revelle* supported experiments to map the hydrothermal circulation systems removing heat from the mid-ocean ridge magma chambers in order to quantify the total amount of melt in the crustal magma chamber and to examine the relationship between mantle melting and crustal melt accumulation. Scientists used electromagnetic techniques that image the electrical conductivity of the seafloor, because conductivity is a strong function of fluid content, whether magma or seawater. The fiscal year concluded with the Navy's NPAL04 Long-Range Propagation Experiment, which set vertical receiving arrays for future coordinated experiments.

Science carried the ship to sites ranging from the equatorial Pacific at the Galapagos Triple Junction to the Juan de Fuca Ridge, off Washington state. R/V *Roger Revelle* made port calls at Manta (Ecuador), Callao (Peru), Puntarenas (Costa Rica), Newport (Oregon), Arica (Chile), Mazatlan (Mexico), and Honolulu (Hawaii). Of the 12 legs during the year, nine required clearances for research in the Exclusive Economic Zones (EEZs) of the coastal nations involved.



Roger Revelle



## R/V Melville

The beginning of 2003–04 fiscal year found R/V *Melville* working in the Timor Sea off northwest Australia completing a physical oceanography cruise sponsored by the Office of Naval Research. For nearly the entire remaining fiscal year, *Melville* worked off northern Australia and the Fly River Delta of Papua New Guinea for the National Science Foundation MARGINS program, which encompassed multidisciplinary studies of sediment dynamics in this region. This work required comparing seasonal variations in river runoff—the source of sediments—and focused on the mechanisms and rates of sediment dispersal within the Fly River Delta. The continental shelf in the Gulf of Papua contains a distinct clinoform feature, a relatively abrupt depth change between the shallow inshore seafloor and the deeper offshore portion of the shelf. This feature is crossed by several channels that are significant elements of the processes that distribute sediments from the river to the shelf and ultimately move some portions of the sediment inputs into deeper waters offshore.

The final cruise of this fiscal year was carried out for the Climate Variability and Predictability (CLIVAR) hydrography program. Full-depth profiles of conductivity and temperature as well as biogeochemical variables were made at closely spaced stations along a transect (30 N) from Japan to California. CLIVAR is an international research program addressing many issues of natural climate variability and anthropogenic climate change. Understanding the rate at which the deep-ocean can absorb carbon dioxide (anthropogenic or other) from the atmosphere and changes over time in the deep-ocean inventory of carbon are keys to assessing how natural systems will respond to anthropogenic forcing.

R/V *Melville* made port calls at Darwin, Brisbane, and Cairns (Australia), Port Moresby (Papua New Guinea), Yokohama (Japan), and Honolulu (Hawaii). Studies in the waters of Australia, Papua New Guinea, and Japan required research clearances.



Melville



## R/P FLIP

R/P FLIP supported three research cruises during fiscal year 2003–04. All cruises were conducted in the southern California area and were supported by U.S. Navy tugs. The first cruise supported the Office of Naval Research–sponsored acoustic and visual monitoring of marine mammals and was led by Scripps scientist John Hildebrand. The second cruise, led by Scripps scientist Gerald D'Spain, was the Passive Synthetic Aperture Sonar (PasSAS) experiment conducted in an area south of San Clemente Island. A second PasSAS cruise was also conducted by D'Spain.





FLIP



New Horizon

### R/V New Horizon

R/V *New Horizon's* 2003–04 schedule incorporated wide scientific variety. A goal of the Global Ocean Ecosystems Dynamics project was to determine physical, plankton, and nutrient/chemical conditions and to deploy drifters over the continental margin for climate change studies in the northeast Pacific. *New Horizon* carried out three cruises in support of the ongoing investigations of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). Established in 1949, this series of observations of physical, chemical, biological, and meteorological conditions in the California Current System constitutes perhaps the most extensive long-term study of a marine ecosystem and its variations ever undertaken.

A diving program in the deep ocean off Hawaii studied mats of the organism *Rhizosolenia* as a source of nitrogen flux into the surface waters of the Pacific. R/V *New Horizon* was used to help scientists quantify the effects of the cold seep source on the chemical signature preserved by barite in marine sediments in the San Clemente Fault and San Clemente Basin, in both the U.S. and Mexican EEZs. The ship transited to the Guaymas Basin in the Gulf of California for a comparative study of alkenone production and biological productivity, contrasting the results with those from other sites in the North Pacific. Also in Mexican waters, R/V *New Horizon* completed a five-year marine biocomplexity investigation, including work for the Global Ocean Ecosystem Dynamics marine benthic population dynamics.

Port calls and research clearances in Mexico were part of the year's operations for *New Horizon*.



Robert Gordon Sproul

### R/V Robert Gordon Sproul

R/V *Robert G. Sproul* serves as our versatile small research ship, and is often treated as an adaptable extension of the chief scientist's laboratory. Available on relatively short notice and extremely flexible, *Sproul* offers scientists the opportunity to test equipment, collect specimens, and deploy instruments. The 2003–04 fiscal year was no exception to this. *Sproul* carried out nearly 40 separate cruises, each requiring the ship to be loaded, outfitted for the particular demands of the intended project, and then unloaded. Research included physical, chemical, biological, geological, geophysical, and marine acoustical investigations.

As one example, *Sproul* was used to deploy wave and current measuring instruments offshore of La Jolla for the Nearshore Canyon Experiment (NCEX). NCEX was designed to determine the effects of submarine canyons and other complex seafloor formations on waves and currents. Understanding such processes will help scientists answer questions about beach and shoreline changes in response to wave conditions and to address practical public safety issues such as rip currents on bathing beaches.

*Sproul* had no operations in foreign waters during the year.

	R/V Roger Revelle	R/V Melville	R/V New Horizon	R/V Robert G. Sproul	R/P FLIP
Captain	Thomas Desjardins	Christopher Curl	John Manion	Ian Lawrence	Tom Golfinos
Relief captain	David Murline	Eric Buck and Murray Stein	Wesley Hill, Murray Stein, and Roger Price	Louis Zimm and Roger Price	NA
Type	oceanographic research	oceanographic research	oceanographic research	oceanographic research	floating instrument platform
Year built	1996	1969 (refitted, 1992)	1978 (refitted, 1995–96)	1981	1962
Year acquired by Scripps	1996	1969	1978	1984	1962
Owner	U.S. Navy	U.S. Navy	University of California	University of California	U.S. Navy
Length	273 feet	279 feet	170 feet	125 feet	355 feet
Beam	52 feet 5 inches	46 feet	36 feet	32 feet	20 feet
Draft, full	17 feet	16 feet 6 inches	12 feet	9 feet 6 inches	12 feet
Displacement, full	3,512 long tons	2,944 long tons	1,007 long tons	696 long tons	700 long tons
Cruising speed	12 knots	11.7 knots	10 knots	9 knots	varies*
Range	15,000 nautical miles at 12 knots	10,061 nautical miles at 11.7 knots	9,600 nautical miles	4,300 nautical miles	varies*
Crew	22	23	12	5	4 in port, 5 underway
Scientific party	37	38	19	12	11

\*R/P FLIP is towed to its various destinations.

## 18 | Development Report

FROM EXECUTIVE DIRECTOR OF DEVELOPMENT JOHN EVEY

In the face of declining state support, friends of the Scripps Institution of Oceanography continue to play an important role in enabling the institution to build on its record of more than 100 years of outstanding accomplishments. During this past year, for example, the generous support of the Nierenberg family made it possible to bring primatologist Dr. Jane Goodall to the campus to receive the Nierenberg Prize for Science in the Public Interest, and gifts from numerous donors, including many members of the Scripps family throughout the country, paved the way for the ceremonial groundbreaking of the Robert Paine Scripps Forum for Science, Society, and the Environment. This extraordinary facility is scheduled for completion in 2006.

An endowed chair, established to honor pioneering weather and climate scientist Jerome Namias, was established with trust and estate gifts from his family. The first career development award—we hope there will eventually be 25—was created with a gift made during the Scripps centennial by Audrey Geisel through the Dr. Seuss Fund at the San Diego Foundation. Career development awards are vital as young scientists establish their research programs during the crucial early years of their careers.

E. W. Scripps Associates (EWSA) membership grew by more than 50 percent, and the resulting support for special projects, programs, and people throughout the institution truly made a difference. A number of EWSA members stepped up to higher giving levels, which range from \$1,000 to \$100,000 per year. Along with support for the Scripps Oceanographic Collections and the Birch Aquarium at Scripps, EWSA allocations assisted research-project funding and student recruitment.

Scripps created a new Center for Earth Observations and Applications to consolidate and expand its global observation capabilities—in and on the oceans, on land, in the atmosphere, and from space. It appears quite likely that a special state bond program will allow construction of a building to house scientists from Scripps and other UCSD units focusing on earth observations. A private gift or gifts of about \$10 million will leverage the approximately \$30 million needed to complete the project, making it a top-tier priority for the coming year, along with the career development awards program.

The demand for expanded graduate programs for students in marine biodiversity and conservation and limited capacity for significantly increased research activity, especially in marine biomedicine, are stressing current facilities, therefore it is also evident that a new, privately funded, biological sciences building is needed, and fund-raising will soon begin to make this a reality.

Support for students at all levels is especially influential in shaping the talent that will guide the future—from graduate fellowships to K-12 program grants that make educational opportunities available to youth throughout San Diego County.

Friends of Scripps made 7,277 gifts this past fiscal year, with a value of \$9,966,079. That represents a more than 40 percent increase in dollars, and is nearly double the giving level of two years ago.

Thanks to all those who are, by sharing their financial resources, making a difference in what those at Scripps Institution of Oceanography can accomplish as they seek to advance understanding of our planet for the benefit of society.

A list of Scripps donors appears on the following page.





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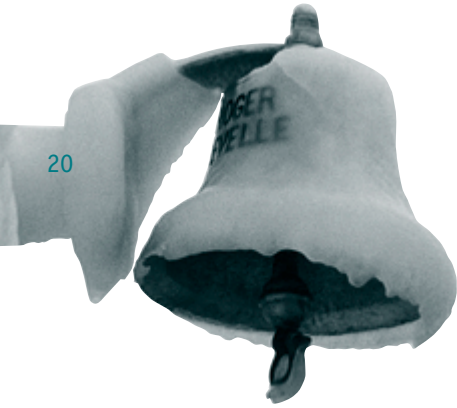
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Special thanks to our 6,588 members whose membership dues help support the Birch Aquarium at Scripps and Scripps Institution operations.

*Scripps is especially grateful to numerous anonymous donors.*



**S**cripps Institution of Oceanography (SIO) has established a working site on the California Digital Library's eScholarship Repository. Digital repositories are a new means of cataloging, disseminating, and archiving digital documents. Scripps's site on the repository provides the opportunity to publish technical reports at the institutional, divisional, program, and individual principal investigator levels. The repository can also be used for peer-reviewed series and online journals, as well as researcher contributions, which are no longer listed in this section.

You can visit the eScholarship Repository on the web ([repositories.cdlib.org/sio](http://repositories.cdlib.org/sio)) for more information. Currently the Scripps working site includes the following: Coastal Morphology Group, SIO Technical Report Series, SIO Archives, SIO Library, and the Center for Marine Biodiversity and Conservation.

Listed on this page are descriptions of various Scripps publications as well as information about how they can be obtained.

#### Bulletin

Published by the University of California, the *Bulletin of the Scripps Institution of Oceanography* is a series of original monographic research written by Scripps scientists. For information about the series (including a bibliography, *Bulletin* issues are available from the SIO library and are available for purchase from the University of California Press), visit [siolibrary.ucsd.edu/guide/siopublns.html](http://siolibrary.ucsd.edu/guide/siopublns.html).

#### CalCOFI Publications

The work of the California Cooperative Oceanic Fisheries Investigations (CalCOFI), in which Scripps Institution of Oceanography, the California Department of Fish and Game, and the National Marine Fisheries Service cooperate, is published in a variety of formats. Peer-reviewed scientific articles are published annually in the *California Cooperative Oceanic Fisheries Investigations Reports*. Maps of physical, chemical, climatological, and biological factors measured by CalCOFI researchers during the program's 53-year history are published irregularly in the *California Cooperative Oceanic Fisheries Investigations Atlas* series. Data reports, containing the processed data from quarterly cruises carried out under CalCOFI sponsorship, were previously published in the SIO Reference Series and are now available on the CalCOFI website: [www.calcofi.org](http://www.calcofi.org).

#### Naga Report Series

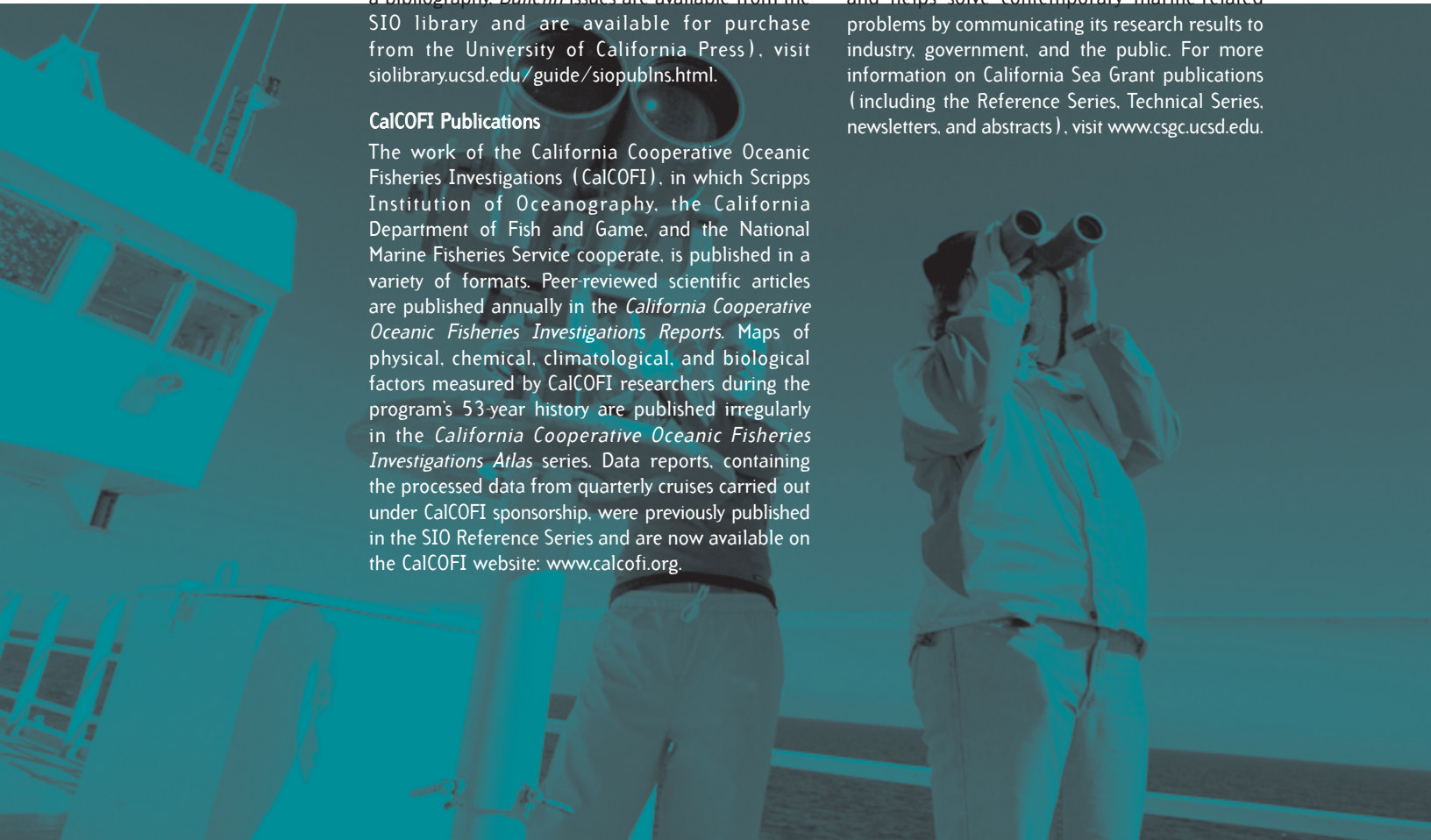
The Naga Report Series covers the scientific results of marine investigations in the South China Sea and the Gulf of Thailand from 1959 through 1961. For a list of available reports, visit [siolibrary.ucsd.edu/guide/siopublns.html](http://siolibrary.ucsd.edu/guide/siopublns.html).

#### Publications for Members of the Scripps Oceanographic Society

Members of the Scripps Oceanographic Society receive two publications as a membership benefit. The quarterly newsletter *OnBoard* lists upcoming aquarium events and activities, features short articles highlighting exhibits and programs, and interprets the science that supports them. Members also receive Scripps Institution of Oceanography *Explorations*, which features the cutting-edge research taking place at Scripps. *Explorations* is published quarterly, including one video edition. For more information, visit [scripps.ucsd.edu/explorations](http://scripps.ucsd.edu/explorations).

#### California Sea Grant Publications

Part of the Sea Grant program, California Sea Grant sponsors research on coastal and marine resources, and helps solve contemporary marine-related problems by communicating its research results to industry, government, and the public. For more information on California Sea Grant publications (including the Reference Series, Technical Series, newsletters, and abstracts), visit [www.csgc.ucsd.edu](http://www.csgc.ucsd.edu).





## 30 | Current Funds

FROM DEPUTY DIRECTOR, ADMINISTRATIVE AFFAIRS TOM COLLINS  
JULY 1, 2003–JUNE 30, 2004

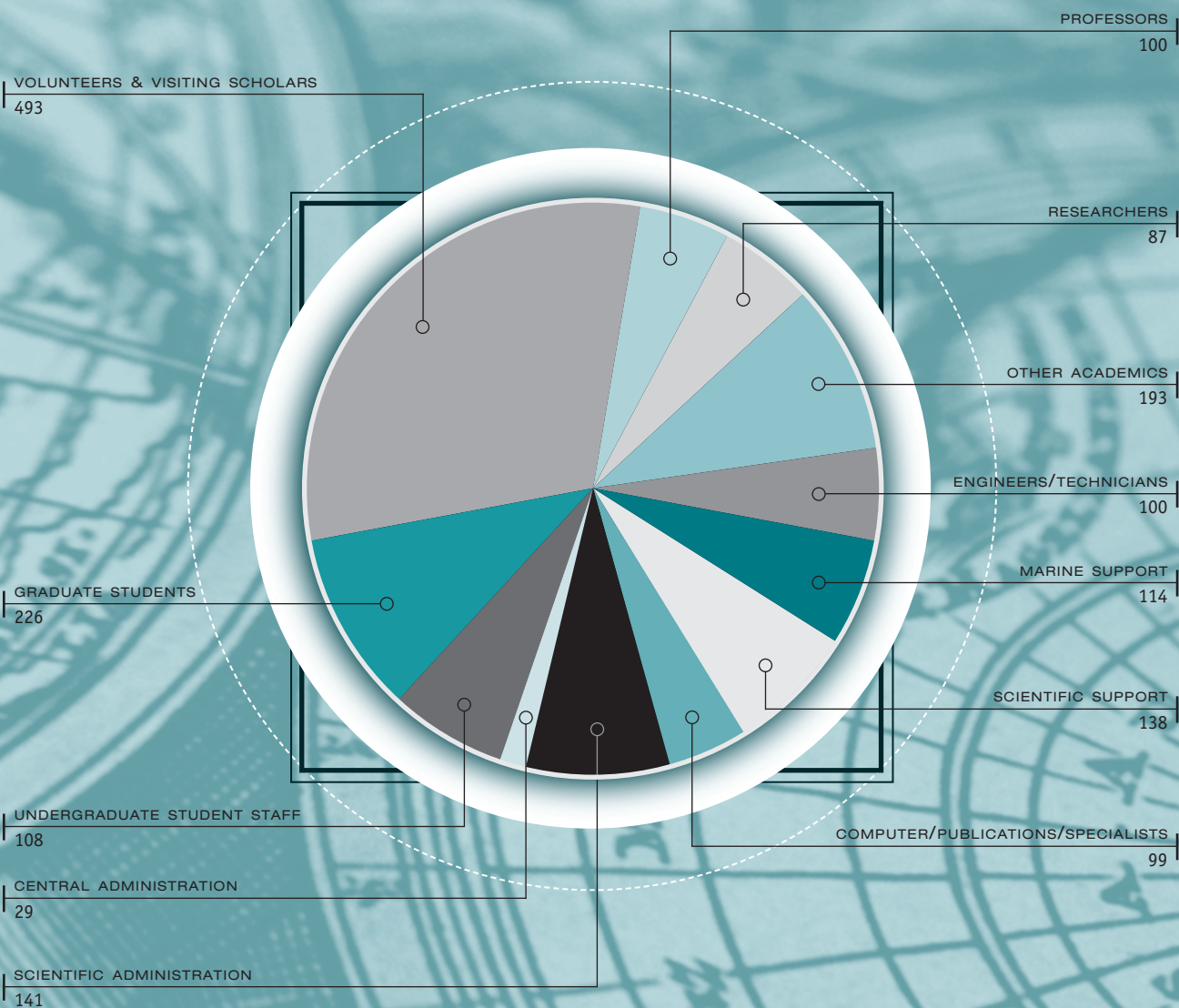
This statement does not purport to present all annual expenditures associated with operating the institution. Many services provided by campus departments outside of Scripps are not reflected in the annual expenditure of the institution. Examples of campus-provided services include building construction and maintenance, parking lot and road maintenance, utilities, seawater utilities, custodial services, landscaping and grounds maintenance, accounting, payroll, and personnel services.

<b>FEDERAL FUNDS</b>	
National Science Foundation	\$37,974,606.45
Department of the Navy	\$19,170,083.79
National Oceanic and Atmospheric Administration	\$20,592,514.46
National Aeronautics and Space Administration	\$5,055,690.59
Department of Energy	\$1,457,001.12
Department of Defense	\$538,597.55
Federal flowthru	\$8,242,263.04
Other federal	\$4,179,624.29
<b>Total Federal</b>	<b>\$97,210,381.29</b>
<b>OTHER</b>	
State	\$2,904,589.51
General funds	\$21,926,093.72
Private	\$5,976,558.03
Endowments	\$1,147,704.40
University funds	\$3,176,480.08
Other	\$16,526,190.02
<b>Total Other</b>	<b>\$51,657,615.76</b>
<b>Total Expenditures</b>	<b>\$148,867,997.05</b>



# CAMPUS CENSUS

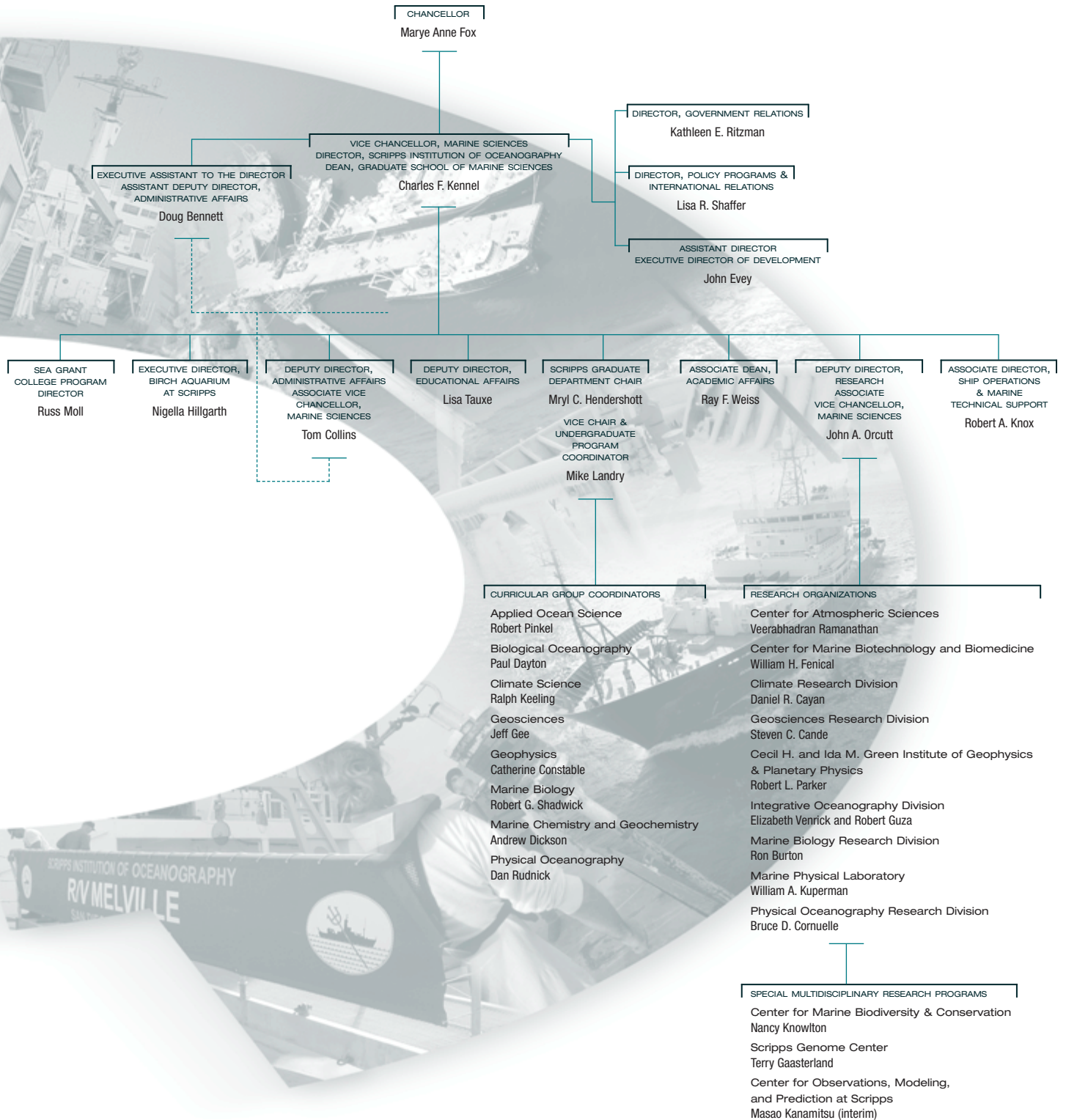
## • SCRIPPS INSTITUTION OF OCEANOGRAPHY • 2004 CENSUS (TOTAL 1,828)





# 32 | Scripps Organization

ORGANIZATION CHART AND LISTINGS REFLECT INSTITUTION STRUCTURE AT TIME OF PUBLICATION





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## DIRECTOR'S CABINET AND SIO COUNCIL

The Director's Cabinet consists of a select group of individuals who actively support the critical efforts of Scripps Institution of Oceanography to lead the scientific search for a sustainable environment. The goal of the Director's Cabinet is to expand awareness and support of Scripps. Individuals are chosen for membership on the basis of their regional, national, or international prominence and their support of Scripps. Members are community, business, and communications leaders. The individuals listed below served on the cabinet in 2004.

The SIO Council is a high-level group of nationally and internationally prominent individuals who provide advice, assistance, and support to Scripps and its director. Members are executives of major corporations, leaders of national organizations, and prominent philanthropists. Council members use their experience, connections, influence, and wealth on behalf of the institution. The individuals listed below served on the council in 2004.



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 A. Thomas Young



James Enright



**Robert Dill - JANUARY 2004**

Bob Dill participated in a number of significant Scripps expeditions, including MidPac in 1950 and Capricorn in 1952. His doctoral dissertation, completed at Scripps in 1966, was based on extensive diving in the Scripps and La Jolla submarine canyons. He founded Geological Diving Consultants (later called General Oceanographics, then Nekton, Inc.) with several Scripps scientists. In 1976 he became a professor at the West Indies Laboratory of Fairleigh Dickinson University. He returned to San Diego following his retirement in 1983.

**Celeste Gilpin Engel - JANUARY 2004**

Celeste Engel was a field geologist and analytical chemist with the U.S. Geological Survey. She was the widow of Scripps marine geologist Albert E. J. Engel, with whom she traveled and studied extensively. The two made pioneering discoveries in marine igneous geochemistry in the 1960s-70s, particularly in their analyses of the oceanic crust. She also worked closely with Scripps scientist Robert Fisher on expeditions in the Pacific and Indian Oceans, and she analyzed lunar rock samples from the U.S. Apollo missions. Her autobiography, *Rocks in My Head*, was published in 1987. Albert Engel passed away in 1995.

**Isabel Taylor - JANUARY 2004**

Isabel Taylor was a research assistant to Scripps geologist Bill Menard in the 1960s, assisting him with drafting maps and data compilations for seafloor depth distribution and other projects. From the early 1970s until 1993 she worked with Scripps geomorphologist Jacqueline Mammerickx, assimilating bathymetric data and drafting charts of the South Pacific for the General Bathymetric Chart of the Oceans organization.

**Dale F. Leipper - FEBRUARY 2004**

Dale Leipper first came to Scripps as a World War II Air Corps weather officer to receive training in meteorology. After the war he enrolled at Scripps, receiving his Ph.D. in 1950. He went on to found Texas A&M University's Oceanography and Meteorology Department and the Oceanography Department at the Naval Postgraduate School in Monterey,

California. He is perhaps best known at Scripps for the interchange of letters he initiated among oceanographers, which lasted from 1948 to 1991 that are now in the Scripps Archives.

**Stephen E. Pazan - MARCH 2004**

Steve Pazan received his Ph.D. from Scripps in 1975 after studying physical oceanography under Russ Davis. He then joined the Scripps scientific staff, focusing on climate and El Niño research. He worked as data manager for the North Pacific Experiment and helped establish the Joint Environmental Data Analysis Center. In 1993 he retired from Scripps and established the consulting firm Ocean Prospects.

**Madeleine Mahnken - MAY 2004**

Longtime staff member Madeleine Mahnken began her career at Scripps in 1944 as an artist and illustrator with the UC Division of War Research. She later worked in the Scripps Machine Shop and with the Deep Sea Drilling Project, drawing technical illustrations and blueprints of a wide range of marine instruments. She also designed the trident now displayed on Scripps ships. Mahnken retired in 1986, but continued to work as a clerk in the Scripps Contracts and Grants Office.

**Al Arsenault - MAY 2004**

After many years in the U.S. Navy, Captain Al Arsenault retired and joined the Scripps Marine Facilities in 1964, as an ordinary seaman aboard R/V *Argo*. In 1976 he was promoted to senior captain, and continued leading expeditions until 2000. During the course of his career, he sailed aboard every ship operated by Scripps.

**Christine Baldwin - JUNE 2004**

Chris Baldwin first joined Scripps as a draftsman in the UC Division of War Research. Joining the Marine Physical Laboratory shortly after its formation in 1946, she soon became its business manager, a position she held until her retirement in 1977. She and her husband, Dave, were active participants in the UCSD Retirement Association.

**Nell Beardsley - JUNE 2004**

Nell Beardsley retired from Scripps in 1991 after 27 years as an office administrator in Academic Personnel.

**Virginia Partlow Floyd - JUNE 2004**

Virginia Floyd was an administrative staff member in the Geological Research Division for 10 years, beginning in 1971. She then transferred to the Scripps Graduate Department and later to the California Space Institute, where she worked until her retirement in 1992.

**James Enright - SEPTEMBER 2004**

James Enright, professor emeritus of behavioral physiology at Scripps, studied biological rhythms, marine ecology, human eye movements, and visual perception. After receiving bachelor and master's degrees in zoology from UCLA, he completed his Ph.D. at Scripps in 1961. Following postdoctoral work in Germany, he was appointed an assistant professor in the department of zoology at UCLA in 1963. He rejoined Scripps in 1966 and retired in 2000.

**Alfred J. Carsola - OCTOBER 2004**

Alfred Carsola received his Ph.D. from Scripps in 1952 and worked for 13 years at the Navy Electronics Laboratory in Point Loma. His research included studies of the seafloor, coastal pollution, deep-ocean mining, and the application of geology and oceanography to military purposes. In 1960 he became director of physical oceanography research for the Lockheed Marine Laboratory, and in 1974 began a science teaching career at several San Diego-area colleges.

**Ancel Keys - NOVEMBER 2004**

Ancel Keys received a Ph.D. in oceanography from Scripps in 1930. Although he studied fish biology and physiology at Scripps, he spent his career studying the physiology of humans. Among his many notable career achievements were the development of K-rations during World War II and his landmark studies of the relationship between diet and blood cholesterol levels. He died at age 100.



Dale F. Leipper



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