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SCRIPPS INSTITUTION OF OCEANOGRAPHY

UC San Diego

JEFFREY & MARCY

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Research

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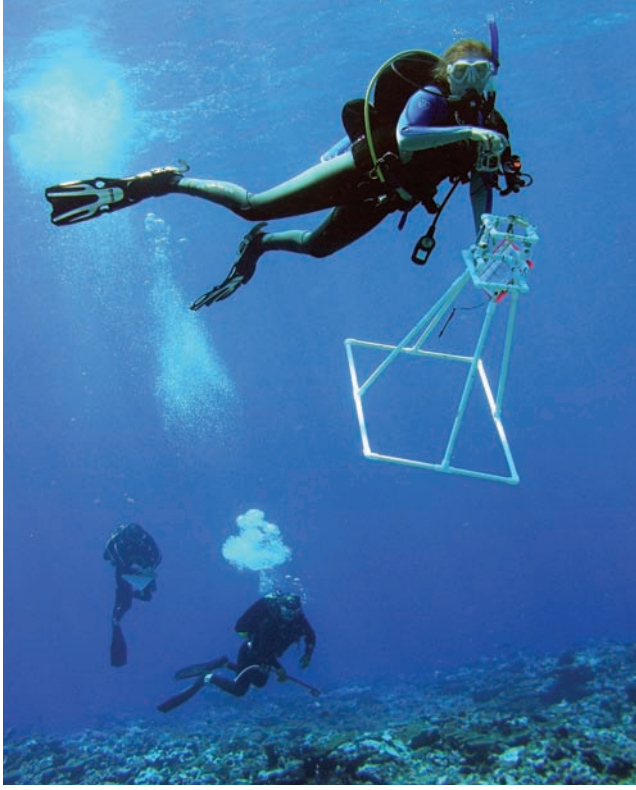
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO is committed to actively recruiting new faculty. Their energy and innovation is crucial to maintaining and enhancing the Scripps research enterprise. Early career Scripps researchers also inspire our amazing Scripps students, whose bright minds keep this century old institution on the cutting edge of ocean and earth science. Supporting the research of our new scientists is a top priority for Scripps.

Scripps is seeking support for practical resources such as lab and field equipment in support of our newest scientists' core research needs.

Learn more about what our new Scripps scientists and students are investigating and how you can help support their research...



Jennifer E. Smith

Assistant Professor in Marine Ecology and Conservation

CENTER FOR MARINE BIODIVERSITY AND CONSERVATION

CORAL CONSERVATION – CHANGING THE TIDE

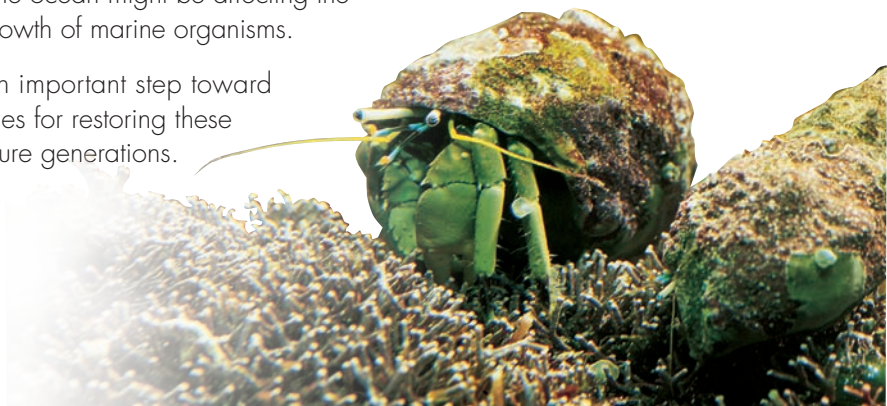
How are human-produced impacts affecting coral communities?
How can damaged coral ecosystems be restored?

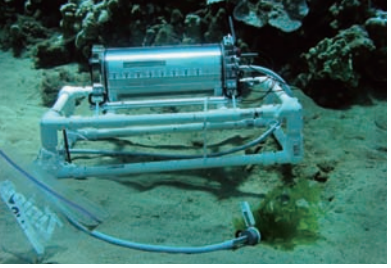
Coral reef ecosystems around the world are suffering. Healthy reefs full of sharks, large fishes, sea turtles, and healthy corals are all but gone. Overfishing disrupts the natural balance. Pollution and rising sea temperatures can lead to coral sickness and open the door to the spread of algae that can overrun reefs. A looming question remaining for marine scientists is how best to heal and preserve these beautiful and ailing ecosystems.

In their Scripps Oceanography laboratory, assistant professor **Jennifer Smith** and her science team are studying how human impacts such as overfishing, pollution, climate change, and ocean acidification are affecting coral communities.

Members of Smith's lab are performing experiments to identify ways to restore these degraded environments and are participating in expeditions to remote parts of the world to document pristine, unimpacted coral reefs to set baselines and targets for conservation. The Smith lab is working locally in California and on coral reefs in the central Pacific and Caribbean to document how increased carbon dioxide in the ocean might be affecting the calcification and growth of marine organisms.

Their research is an important step toward developing strategies for restoring these environments for future generations.





In order to advance their marine ecosystem research, Jennifer Smith and her team of stellar graduate students require a series of customized tools and resources:

WISH LIST

Cannon digital cameras (G10) **$5,000**
Digital cameras with underwater housings for student research

Custom aquaria **$5,000**
For wet lab at Scripps

New dimming and lighting system **$7,500**
For running sea water wet lab at Scripps

SCUBA gear for graduate students **$8,000**

Custom-built CO_2 enrichment system **$10,000**
For experimental use in the lab

Oceanographic underwater sensors for light intensity **$10,000**

Oceanographic underwater sensors **$15,000**
For measuring seawater pH
(Built by Scripps researcher Todd Martz)

Website support **$15,000**
Support for web development and website design and maintenance/photographic database development

Olympus microscope and imaging system **$17,000**
For marine organism identification and cataloging

Oxygen electrodes **$20,000**
For photosynthesis research

Custom underwater heating system **$30,000**
For global warming experiments

Underwater fluorometer **$40,000**
To measure health of marine organisms by Waltz

Cruise support **$10,000-$50,000**
Support for upcoming cruise (Fall 2010) to the Northern Line Islands organized by Jennifer Smith and Scripps researcher Stuart Sandin.

Securing donations to support Scripps students remains an ongoing priority.

FISHING FOR ANSWERS

Emily Kelly, a Scripps graduate student with Jennifer Smith, is focusing her research on determining the effects of local pollution and overfishing of reef fish on coral reef communities in the Hawaiian Islands. Emily is seeking to identify solutions to reef degradation on the island of Maui where a number of coral reefs have been showing significant signs of decline. She is working to understand if herbivorous fishes such as parrotfish and surgeonfish can mitigate the effects of nutrient pollution by eating excess algae, thus allowing corals to continue growing without becoming overgrown. Emily is currently designing an underwater heating device to perform global warming experiments underwater.

Todd Martz

Assistant Professor of Marine Chemistry

GEOSCIENCES RESEARCH DIVISION

SENSING THE OCEANS – TOOLS OF THE TRADE

How is the ocean changing?
How can scientists predict the future state of the oceans?

The ocean is vast and seemingly endless. For marine scientists this creates mind-boggling challenges of finding new and innovative ways to discover how the oceans are changing. To study the oceans, scientists need the most crucial element of all: access.

To better understand and characterize the state of the ocean at a given time, look into the Scripps Oceanography laboratory of **Todd Martz**, Scripps' newest assistant professor of marine chemistry. Spatiotemporal processes are a fundamental area of study in the environmental and physical sciences and the oceans harbor one of the most active research topics.

Most of what is known about ocean chemistry comes from snapshots obtained by ships. Because the ocean is immense and time aboard a research ship is extremely costly, many locations have only been sampled one or two times, if at all.

Autonomous sensors now play an increasing role in ocean science by providing continuous, high-resolution, sometimes hourly, time series measurements of properties such as bio-optics, oxygen, and partial pressure of CO_2 as often as every hour. These measurements are gathered from a variety of platforms including moorings, volunteer observing ships, profiling floats, gliders, drifters, and AUVs. The goal of Martz and his science team is to develop chemical sensors for additional CO_2 parameters in order to fully characterize the ocean's CO_2 system.

Developing new methods and technologies for measuring dissolved carbon dioxide in the ocean and adapting these techniques for use on autonomous instrumentation, such as oceanic floats and moorings, is paramount for scientists and their students to continue their pursuits in understanding the state of the oceans.

In order to advance their ocean sensor research, Todd Martz and his team of stellar graduate students require improved facilities and equipment:

WISH LIST

Experimental aquarium renovation **$50,000**

The most pressing need for the Martz laboratory at Scripps right now involves the experimental aquarium, a campus facility with large tanks of ambient and chilled seawater systems used for the studies of living plants, animals, and seawater. A large instrumentation test tank is needed exclusively for studies related to the aqueous CO_2 system (e.g. instruments for ocean acidification monitoring and a variety of other carbonate system studies), where they bring together a diverse set of instruments for an intercomparison or to simultaneously calibrate a large number of instruments.

Water purification system **$10,000**

For the large experimental aquarium test tank

System of overhead beams with block and tackle **$5,000**

For the large experimental aquarium test tank

Steel instrument frames **$5,000**

For the large experimental aquarium test tank

Securing donations to support Scripps students remains an ongoing priority.

TAKING THE PULSE OF THE PLANET

Yui Takeshita, a graduate student in marine chemistry and geochemistry with Todd Martz, is in his second year at Scripps Oceanography. In support of Martz's ocean sensing research, he is working on applications of autonomous pH sensors on moorings and underway pH and CO_2 measurement systems on ships. Yui conducts analyses of oxygen sensor data coming back from profiling floats in the Argo program. Argo is a global array of more than 3,000 free-drifting profiling floats that measures the temperature and salinity of the upper 2,000 meters (6,561 feet) of the ocean. This allows, for the first time, continuous monitoring of the temperature, salinity, and velocity of the upper ocean, with all data being relayed and made publicly available within hours after collection.

Amro Hamdoun

Assistant Professor of Biology

MARINE BIOLOGY RESEARCH DIVISION

SEA URCHIN DEFENSES – HOW EMBRYOS SURVIVE UNDER STRESS

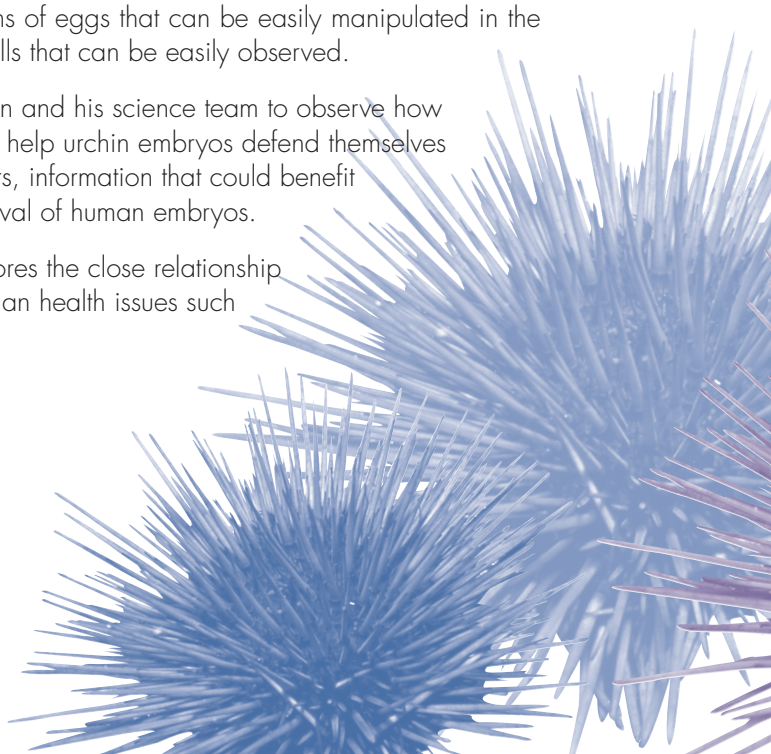
How do sea urchins defend themselves?
What can their cellular behaviors teach us about human health?

Extensive research on the most basic biology of marine organisms can lead to better understanding of health in the human body. In an effort to learn more about defense mechanisms in cells and embryos, **Amro Hamdoun**, Scripps assistant professor of biology, studies sea urchin cells and embryos, which are closely related to those of humans.

Sea urchins make excellent lab specimens because these production powerhouses generate millions of eggs that can be easily manipulated in the laboratory and have large cells that can be easily observed.

This research allows Hamdoun and his science team to observe how proteins change and move to help urchin embryos defend themselves against environmental stressors, information that could benefit our understanding of the survival of human embryos.

Hamdoun's research underscores the close relationship between the oceans and human health issues such as aging and disease.



In order to advance their sea urchin genome research, Amro Hamdoun and his team of graduate students require a series of high-tech tools:

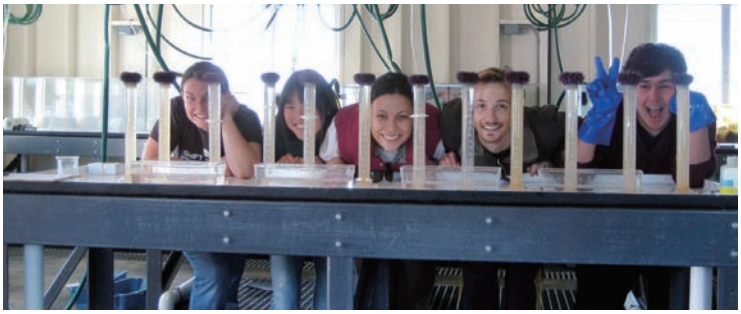
WISH LIST

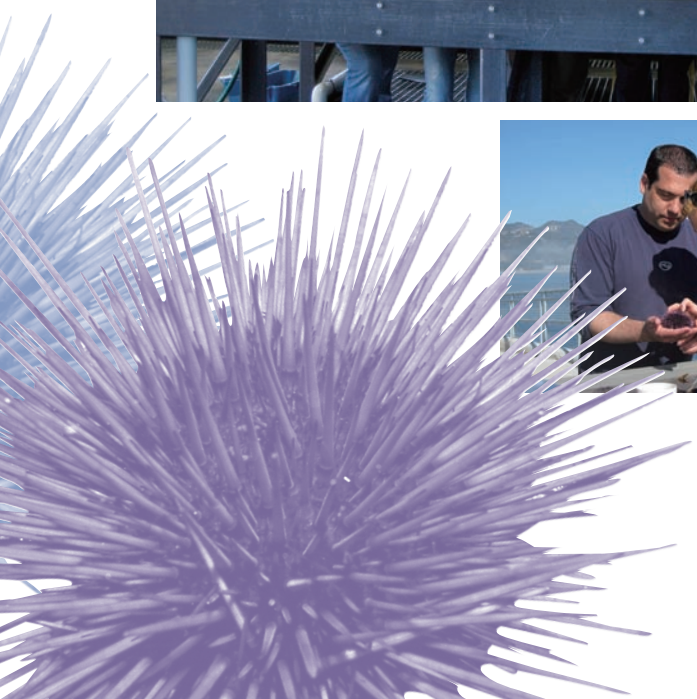
In toto imaging workstation **$40,000**
Image analysis hardware and software for processing analysis of cell movements in high-density optical imaging datasets.

Stereo fluorescence microscope **$30,000**
This microscope is needed for rapidly screening the effects of genetic manipulations on large numbers of sea urchin embryos.

Nanostring probe set **$30,000**
Nanostring is a high throughput digital gene expression profiling technology that allows simultaneous analysis of the expression of up to 1,000 genes. Hamdoun's science team hopes to bring this technology to bear on understanding the temporal patterns of defense gene expression. Funds are needed for construction and analysis of a sea urchin probe set.

Securing donations to support Scripps students remains an ongoing priority.





SEA URCHIN WATCH

Joseph Campanale, a Scripps graduate student with Amro Hamdoun, is currently leading the Hamdoun laboratory's effort to use optical imaging technologies to describe changes in cellular physiology of embryo stem cells in sea urchins. Joseph has had a long-standing interest in the effects of environmental stress on development. Prior to joining the Hamdoun lab he completed his Master's degree at California Polytechnic, San Luis Obispo, and conducted groundbreaking research on the effects of ultraviolet radiation on cellular proteins.

Stuart Sandin

Marine Ecologist

CENTER FOR MARINE BIODIVERSITY AND CONSERVATION

PARADISE REDEFINED – REVISITING A VANISHING WORLD

How do humans affect coral reef ecosystems?
What makes for a healthy coral reef?

There are almost no pristine or even nearly pristine coral reefs in the world. Reefs once teeming with sharks, large fishes, sea turtles, and healthy corals are all but gone. Impacts such as chronic overfishing, pollution, climate change, and disease have deteriorated these precious ecosystems.

One of the major problems for the conservation of coral reefs is the lack of ecological baselines against which to compare present reefs. Such quantitative baselines can reveal the ecological characteristics that have been lost and can guide scientists toward strategies to restore degraded reefs.

Scripps Oceanography marine ecologist **Stuart Sandin** and his research team have conducted thorough studies to explore and document the uninhabited coral reef atolls of the Line Islands laced in the vast central Pacific, one of the most remote places in the ocean.

Of particular interest to Sandin is the gradient of human disturbance across the Line Islands archipelago – from uninhabited, pristine reefs to moderately inhabited and anthropogenically impacted ecosystems. Sandin has been using this island gradient to explicitly study the roles that local human activities play in fisheries dynamics and general functioning of coral reef ecosystems. This work in the Pacific is complemented by experimental studies of basic questions of reef ecology and species interactions conducted in various regions of the Caribbean.

In order to advance their marine ecology research, Stuart Sandin and his team of stellar graduate students require additional custom tools and modern equipment:

WISH LIST

Underwater photomosaic system **$40,000**

Sandin is working to develop a new tool to take large-scale photographs of the underwater environment. The effort comes in capturing many hi-resolution images and stitching them together into one large-format image for analysis. Although the technology exists to solve this problem, Sandin's lab is in need of added resources to completely build a functional version of this system.

Compound microscope and imaging software **$10,000-$20,000**

Sandin has a functional dissecting microscope and a basic compound scope for fish dissections and preparations for lab analyses, but lacks a coupled microscope/computer system to modernize his lab, making it much more efficient for graduate students and technicians.

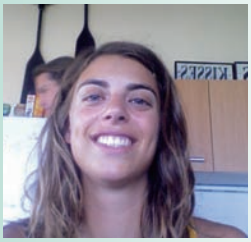
Otolith polishing tools **$9,000**

Part of Sandin's fisheries research depends on learning about the life history characteristics of many species of tropical fish. The Sandin lab has an active group studying the age and body-size relationships for a number of species, but their work could be greatly accelerated with more modern equipment. They are in need of a polishing wheel to automate the preparations of otoliths (fish ear bones), a step essential in estimating fish age.

Advanced computing facilities **$15,000**

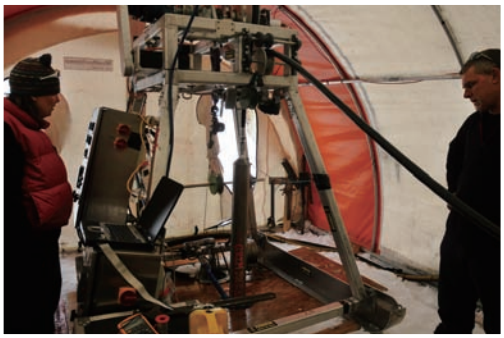
Members of Sandin's lab currently work on individual laptops and desktop computers. They are in need of more advanced computing support to manage the large volumes of videographic and photographic data. Additionally, the large volumes of quantitative data (and tailored statistical analyses) depend on sufficient processing power. Sandin hopes to expand his lab's computing resources to address these pending needs.

Securing donations to support Scripps students remains an ongoing priority.



DISAPPEARING ACT

Tali Vardi, a Scripps graduate student with Stuart Sandin, studies the population dynamics of the coral *Acropora palmata*. *A. palmata*, or the Elkhorn Coral, was once the dominant reef-building coral in shallow reef environments throughout the Caribbean. Since the 1980s it has suffered a 97% decline in abundance throughout its range and was included on the U.S. Endangered Species List in 2006. Unlike most other endangered species, Elkhorn Coral is a clonal and colonial organism that relies primarily on asexual reproduction. These life history aspects along with its status as endangered make Elkhorn Coral's population biology a scientific challenge that is critical to coral reef conservation.



Helen Amanda Fricker

Associate Professor

Cecil H. and Ida M. Green Institute of

GEOPHYSICS AND PLANETARY PHYSICS

HIGH SEAS – GLACIAL LAKES AND SEA-LEVEL RISE

How does global warming affect glaciers and ice sheets?
What can ice sheet processes tell us about sea-level rise?

One of the most dramatic consequences of global warming will be sea-level rise, and scientists predict that changes of only a few inches in ocean levels will push coastal cities underwater and disrupt entire ecosystems.

Scripps Oceanography geophysicist **Helen Amanda Fricker** is using satellite observations to study the effects of climate change on the Greenland and the Antarctic ice sheet and to understand the processes driving these changes.

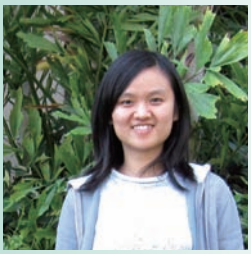
During her investigations, Fricker discovered a complex system of active liquid water lakes that exist beneath the Western Antarctic ice sheet. Discovery of this subglacial plumbing system has added a new piece to the already complex ice sheet puzzle. Fricker is part of a larger project to drill into one of these lakes and determine how they interact with the ice sheet.

But these lakes are more than just new scientific avenues to measure global sea-level rise. A pristine ecosystem untouched by humans offers new opportunities for the discovery of unique life forms that may live in these lakes. Fricker and her colleagues' subglacial exploration could lead to discoveries that may help scientists understand the origins and future of life on our planet.

In order to advance their understanding of ice sheet processes, Helen Amanda Fricker and her research team require modern equipment and field tools:

WISH LIST

Two Iridium 9555 satellite phones and service	**$6,000**
Two hand-held GPS Solara Field Tracker 2100s plus SMS service	**$4,000**
Panasonic Toughbook or similar computer Rugged laptop needed for field work	**$3,500**
Stand alone license for Matlab Computing software for field work	**$2,500**
Canon digital cameras/video For field work	**$2,000**



GREENLAND MELTING

Linghan Li, a Scripps graduate student in Helen Amanda Fricker's lab, is focusing her research on surface meltwater lakes in Greenland. Using laser altimeter data from NASA's Ice, Cloud, and land Elevation Satellite (ICESat) and satellite images, Linghan is studying the drainage and filling of Greenland's surface meltwater lakes. She accomplishes this by detecting large elevation changes through ICESat repeat-track analysis. Linghan is combining ICESat data and satellite images to estimate the volume of water contained in the lakes.

Securing donations to support Scripps students remains an ongoing priority.

Dave Stegman

Assistant Professor of Geophysics

Cecil H. and Ida M. Green Institute of

GEOPHYSICS AND PLANETARY PHYSICS

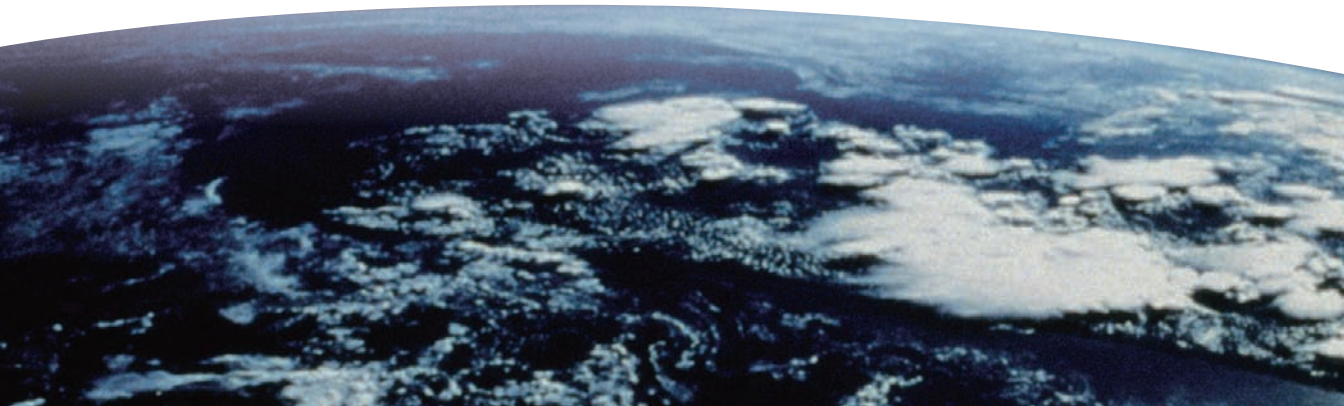
PLATES AND PLANETS – CLUES TO THE ORIGINS OF EARTH

How do planets evolve? Why is plate tectonics unique to Earth?

Scripps Oceanography geophysicist **Dave Stegman** is peering billions of years back into Earth's early history to reveal some of our planet's most elusive mysteries.

Using state-of-the-art supercomputers and advanced four-dimensional visualization, Stegman is modeling the tectonic plates that move continents around Earth to better understand the dynamic forces and tectonic stresses on the surface that control the size and magnitude of natural hazards, such as earthquakes and volcanoes.

Through his research, Stegman aims to address many of Earth's most important geodynamic events over the past 200 million years, including a 35-million-year phase during the age of dinosaurs when the Earth's magnetic field stopped reversing. Some of the questions he hopes to answer, include: what caused plate tectonics to begin and is it required to initiate and sustain life?



In order to advance their geophysics and tectonics research, Dave Stegman and science team require a series of high-tech tools and equipment:

WISH LIST

Website support **$15,000**

Support for development and maintenance of "The Life Tectonic" website, a highly interactive and collaborative site for promoting Stegman's research activities and for providing educational outreach.

Highly interactive parallelized display **$20,000-$30,000**

The massive amounts of numerical data generated in large-scale computer simulations are simply incomprehensible in their native form and must be rendered using computer graphics. The challenge is to visualize the fine-scale structures of a 3-D model evolving over time without losing sight of the larger picture. The Optiputer technology, developed by UCSD's Calit2, utilizes off-the-shelf hardware to create ultra-high resolution computer screens (several 100,000 pixels). Arrays of high-definition flat screen monitors are virtually stitched together into a single, seamless display (a "super" monitor) and deliver new levels of capability for scientific visualization.

High performance computing storage system **$30,000-$40,000**

Numerical simulations of the deep Earth generate unprecedented amounts of model output ("data") that need to be available for scientific interrogation. Proper storage and curating are essential to ensure the integrity of previous simulations. An HPC cluster requires a matched storage system on which the computational results can be archived. Network Attached Storage and Storage Array Networks provide the necessary infrastructure for proper data management.

Personal supercomputer **$115,000-$230,000**

The latest in "green" computing is a low-power CRAY CX-1(000) with over 200 cores paired with NVIDIA co-processing GPU cards, yet are small enough to eliminate the need for large specialized rooms with raised floors and increased air-conditioning capacity. This computational workhorse would support most of the research activity in Stegman's group for 3-5 years.

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THE FARALLON PROJECT

Robert Petersen, a Scripps graduate student in geophysics, is working with Dave Stegman to understand how subduction of a tectonic plate, known as the Farallon plate, has profoundly influenced the tectonic evolution of western North America since the Cenozoic (65 million years ago to present). Robert will employ state-of-the-art numerical modeling and scientific visualization tools to investigate how subduction of the Farallon plate controlled much of the overlying tectonics, including formation of the San Andreas Fault, volcanism relating Yellowstone and the Snake River Plains of Idaho, and uplift of the Colorado Plateau. This effort will pioneer a new conceptual model for this region and draw attention to the novelty and power of this type of approach towards generating new insights into Earth's tectonic evolution.

Greg Roberts

Associate Research Atmospheric Scientist

CLIMATE, ATMOSPHERIC SCIENCE, AND PHYSICAL OCEANOGRAPHY

UP IN THE AIR – PUTTING AEROSOL TRACKING TOOLS TO THE TEST

How do aerosols impact clouds and precipitation?
What can this tell us about climate change?

The uncertainty of the impact of anthropogenic aerosols has proven to be one of the biggest obstacles to understanding global climate change.

Aerosols, including those emitted as air pollution, can alter the earth's energy budget and disrupt the natural processes by which rain-bearing clouds form. It is believed that increasing amounts of soot and other aerosols in the atmosphere have altered rainfall patterns in key mountain regions. They can also lead to brighter clouds which may lessen the effect of global-warming gases. Such climate impacts are still poorly understood, in part, because there are so few in-situ observations and the magnitude of these aerosol effects varies regionally.

To address these challenges, Scripps Oceanography atmospheric scientist **Greg Roberts** is developing small unmanned networks for aerosol measurements. These networks are the future of in-situ atmospheric observations because they will dramatically increase spatial coverage, reliability, and cost-efficiency. Use of miniaturized instrumentation for autonomous unmanned aircraft and remote sites developed by Roberts are already improving scientists' understanding of the earth's atmosphere.

Roberts is also leading efforts to directly measure the chemistry of cloud-active particles by coupling nascent technologies developed at Scripps Oceanography and Colorado State University. This collaborative effort will help determine the sources of cloud condensation nuclei using chemical tracers during a field project that studied precipitation in California's Sierra Nevada Mountains.

In order to advance their aerosol research, Greg Roberts and his science team require modern equipment for analysis and fieldwork:

WISH LIST

Multi-channel analyzer **$4,500**
Used for analysis and calibration of optical particle counters developed for cloud condensation nuclei instruments.

Mixed signal oscilloscope **$7,000**
Electronic test equipment that allows multiple signal voltages to be viewed and analyzed.

Environment test chamber **$17,000**
A tabletop environment chamber with precise temperature and humidity control for calibrating and testing instrumentation before field experiments.

Spectrum analyzer **$19,000**
Device used to examine the spectral composition of electromagnetic radiation–especially important for deploying instrumentation in unmanned aircraft.

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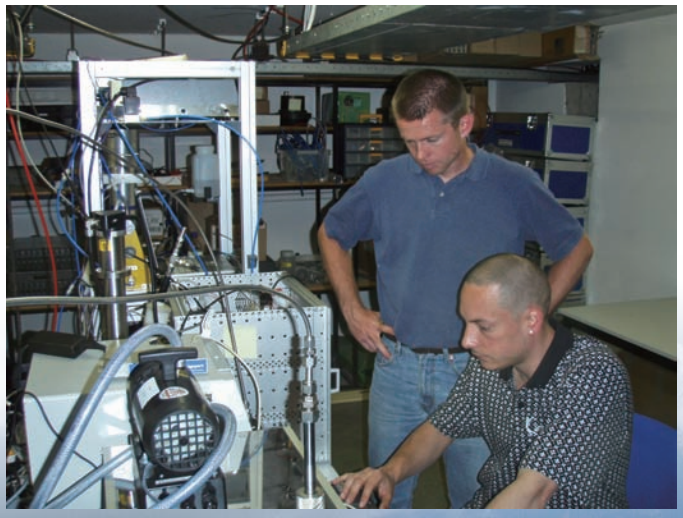

Mark Ohman

Professor of Biological Oceanography

INTEGRATIVE OCEANOGRAPHY DIVISION

Photo by Robert Todd

PLANKTON ECOSYSTEMS – THE FUTURE OF MARINE FOOD WEBS

How will ocean food webs respond to climate change and human interventions? How do physics and biology interact to modify ocean communities?

Life in the open ocean follows different "rules" than on the seafloor or on land. The freely drifting plants and animals of the ocean known as plankton are in constant motion, influenced by ocean currents, changing dissolved oxygen, ocean acidity, marine debris, and other factors. Because of their close connection to the physical environment around them, many types of plankton are bellwethers of a changing climate, serving as early sentinels of changes to ocean ecosystems.

The laboratory of **Mark Ohman**, Scripps Oceanography professor of biological oceanography, is tackling these issues on several fronts. These studies are connected to the California Current Ecosystem Long Term Ecological Research site, and make use of the world-class Scripps Zooplankton Collection.

One graduate student in Ohman's lab is using ocean gliders to assess whether ocean fronts and eddies are "hotspots" of biological activity in the ocean where plankton production is elevated, or the plankton are able to aggregate. Such hotspots are thought to attract many fish, marine mammals, and seabirds.

Another graduate student is conducting experiments to figure out why jellyfish populations bloom and why jellyfish sometimes dominate in ocean conditions when other types of animals do poorly. Yet another graduate student is working to understand the accumulation of plastic debris in the North Pacific Ocean Gyre and the effects this plastic soup may have on zooplankton and other invertebrates of the open ocean.

In order to advance their ocean food web studies, Mark Ohman and his science team require funding for advanced technology and student support:

WISH LIST

Graduate student support **$50,000**
SEAPLEX leader Miriam Goldstein is seeking support for her next year's research, including graduate stipend and tuition.

ZooScan technician **$40,000**
A novel instrument (ZooScan) is used to image and measure thousands of particles of plastic debris, but qualified technical support is needed to carry out the analyses.

Dissolved oxygen controller **$66,000**
A dissolved gas measurement/controller device will make it possible to measure the consequences of low dissolved oxygen on jellyfish feeding and growth.

HPLC recording integrator **$10,000**
A functioning digital integrator and software for our High Performance liquid chromatography system is needed.

Spray ocean glider **$90,000**
This autonomous, robotic glider will enable new studies of the three-dimensional structure of ocean fronts and their effects on ocean plankton. Spray gliders are designed and built at Scripps.

FTIR analytical expenses **$10,000**
Analytical facility charges to characterize plastic particles by Fourier Transform Infrared Spectroscopy.

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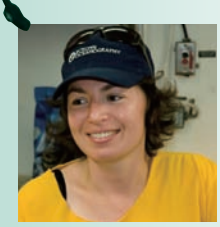
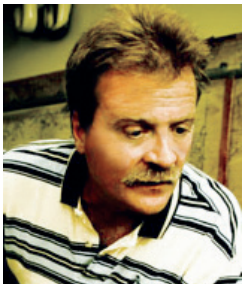


GARBAGE PATCH KIDS

Miriam Goldstein, a Scripps graduate student working with Mark Ohman, is studying the impact of plastic debris on zooplankton and plastic-associated marine invertebrates in the North Pacific Ocean Gyre. Dubbed the "Great Pacific Garbage Patch," the debris at the center of the North Pacific Ocean has the potential to damage marine life and alter the biological environment. Miriam is seeking to understand whether plastic debris is harming the planktonic community or transporting potentially invasive species. In August 2009, Miriam served as chief scientist on the student-run Scripps Environmental Accumulation of Plastic Expedition (SEAPLEX), which explored the problem of plastic accumulation in the North Pacific.



Neal Driscoll

Professor of Geology

GEOSCIENCES RESEARCH DIVISION

Photo by Jenny E. Ross

GEOHAZARDS – ASSESSING A GLOBAL THREAT

Why is the southern San Andreas Fault 100 years overdue for a large earthquake? Will cliff and beach erosion increase as a result of rapid sea-level rise?

The catastrophic impacts of the Dec. 26, 2004, Indian Ocean 9.0-magnitude earthquake and consequent tsunami brought into sharp focus the need to understand potential geohazards.

Scripps Oceanography researcher **Neal Driscoll** and his research group aim to understand natural hazards and how they initiate and evolve so that knowledge can be applied to develop strategies for hazard risk assessment and mitigation. They have developed state-of-the-art instrumentation and technologies to investigate the structure and evolution of continental margins as well as the physical processes controlling geohazards such as earthquakes, slope failure, and volcanic eruptions.

Rupture direction on large faults such as the San Andreas plays a major role in the predicted magnitude of ground shaking. What controls this process? What is the frequency of earthquake recurrence for major fault systems in California? How do faults move? How does strain travel among neighboring fault systems in the Californias? Answers to these questions will improve seismic hazard identification and help develop improved quantitative models—necessary first steps toward developing strategies for minimizing geohazards.

Additionally, Driscoll's research group is interested in determining how coastal regions will be impacted by larger storms and the rising sea levels predicted by global warming researchers. With nearshore regions facing increased pressures from fisheries, land development, and contaminated runoff, scientific understanding of depositional and erosion processes of coastal cliffs and beaches has become even more vital.

In order to advance their geohazards research, Neal Driscoll and his team of outstanding graduate students require updated tools and resources:

WISH LIST

Shallow water survey vessel **$200,000**
Used to map the seafloor and subsurface structure to examine the link between geology and biohabitats as well as to access geohazards.

New LIDAR system **$125,000**
High-resolution terrestrial LIDAR is an ideal tool for acquiring a quantitative time series of sea cliff morphology.

New vehicle and trailer for the LIDAR system **$15,000**
An ATV with a flatbed to secure the LIDAR system is needed for rapid response and to access the nearshore region to acquire quantitative data along the cliffs. A trailer is needed to transport the vehicle up and down the coastline.

Sedigraph grain size analyzer **$65,000**
Grain-size data is acquired to determine how much sand a coastal slope collapse failure adds to the total mass of a beach.

Multibeam software and processing computer **$7,500**

Securing donations to support Scripps students remains an ongoing priority.

EROSION ON THE RISE

Elizabeth Johnstone, a Scripps graduate student in Neal Driscoll's lab, is focusing her research on cliff and beach erosion in Southern California. Sea level is rising at an unprecedented rate of three millimeters per year due to global warming and raises concerns about the stability of beaches and adjacent sea cliffs. Liz is using ground-based 3-D laser scanning (LIDAR) to quantify the erosion rate of the sea cliffs through time. The LIDAR data, together with sediment grain size analysis of cliff failures, allow Liz to define the volume of sand liberated by cliff erosion that remains on the beach. Liz has been examining the fate of 10 failures in a 6.5-kilometer stretch of coastline in the Oceanside Littoral Cell to assess their impact on the total quantity of coastal sediment.

About Scripps Institution of Oceanography

Since 1903, Scripps Institution of Oceanography at UC San Diego has built a legacy of exploration and discovery, leading efforts to fully investigate the oceans, solid earth, and atmosphere. Scripps scientists have sailed to tropical islands and ventured under polar ice, observing environments and their inhabitants, collecting specimens and samples, and recording voluminous data for laboratory analysis. Today, Scripps is an international leader in seeking scientific understanding of the global oceans, an effort that connects scientists with leaders in industry and policy to address concerns that will impact the life of our oceans and the destiny of our planet.

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How to support the Krinsk Research Advancement Initiative at Scripps

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Scripps Development Office
Scripps Institution of Oceanography
9500 Gilman Dr., # 0210
La Jolla, CA 92093-0210

CONTACT:
Anne Middleton
858-534-6945
amiddleton@ucsd.edu

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"Knowing is not enough, we must apply.
Willing is not enough, we must do."

—JOHANN WOLFGANG VON GOETHE

Dear Friends,

In its 107-year history, Scripps Institution of Oceanography at UC San Diego has made the world both better and more aware. The contributions of its scientists and their students are sometimes heralded but more often intangible.

A scientist can devote years of his or her life in pursuit of a single piece of knowledge critical to a larger set of knowledge that affects us and generations to come in starkly relevant ways. A researcher's skills and selfless devotion to a task is rewarded in the pursuit of discovery rather than the attainment of recognition.

These pursuits are unpredictable. They diverge as the data arrive. If the tools are not at hand to pursue paths less traveled and previously unnoticed, discovery stalls. We are pleased and honored to join you in this research advancement initiative, instituted to provide the most tangible of support — in the form of equipment and supplies and student stipends, upon priority and emergency — to some of the world's most dedicated and hardworking new scientists and graduate students.

We recognize and thank you for your participation in this venture, which will be perpetuated in this listing as well as a testimonial plaque on the Scripps campus in La Jolla. Please help us grow the list!

Sincerely yours,

Marcy and Jeffrey Krinsk

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UC San Diego

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