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WOODS HOLE *currents*



DIVE AND DISCOVER

WOODS HOLE *Currents*

Pages 2 to 12

"Dive and Discover" takes Web explorers to sea via the Internet. Read excerpts from the WHOI site and learn about its objectives and accomplishments.

WHOI Waypoints, Pages 13 to 20

- Endangered Right Whale Subject of Recent Grants
- Sears Bequest Endows Visitor Program
- Fornari and Huang Named Clark Chair Recipients
- Meteorological Society Honors Nelson Hogg
- Ketchum Award Goes to Nancy Rabalais
- Director Bob Gagosian Participates in World Economic Forum
- McLean Bequest Contributes \$5 Million to Institution
- WHOI Calendar
- Farrington Receives Awards, Testifies
- New Ocean Institutes Are Focus of Capital Campaign

COVER: Susan Humphris and Dan Fornari, originators of "Dive and Discover" Web expeditions, unload Alvin's basket during the first Dive and Discover cruise in January 2000. (Susan, a geo-chemist, says she would rather be pictured examining a rock!)

www.whoi.edu

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THE WOODS HOLE OCEANOGRAPHIC INSTITUTION is a private, independent, not-for-profit corporation dedicated to research and higher education at the frontiers of ocean science. WHOI's primary mission is to develop and communicate a basic understanding of how the oceans function and interact with the earth as a whole. The Institution strives to be a world leader in advancing knowledge about the oceans and explaining their critical role in the global environment.

DIVE AND

EXPEDITIONS TO THE

Expedition Location

Introduction

Daily Update

About the Cruise

Deeper Discovery

Mail Buoy

Expedition 1 ►

Jan. 12-22, 2000, Guaymas Basin

Expedition 2 ►

Jan. 26-Feb. 12, 2000, East Pacific Rise

Expedition 3 ►

Mar. 24-May 10, 2000, East Pacific Rise

Expedition 4 ►

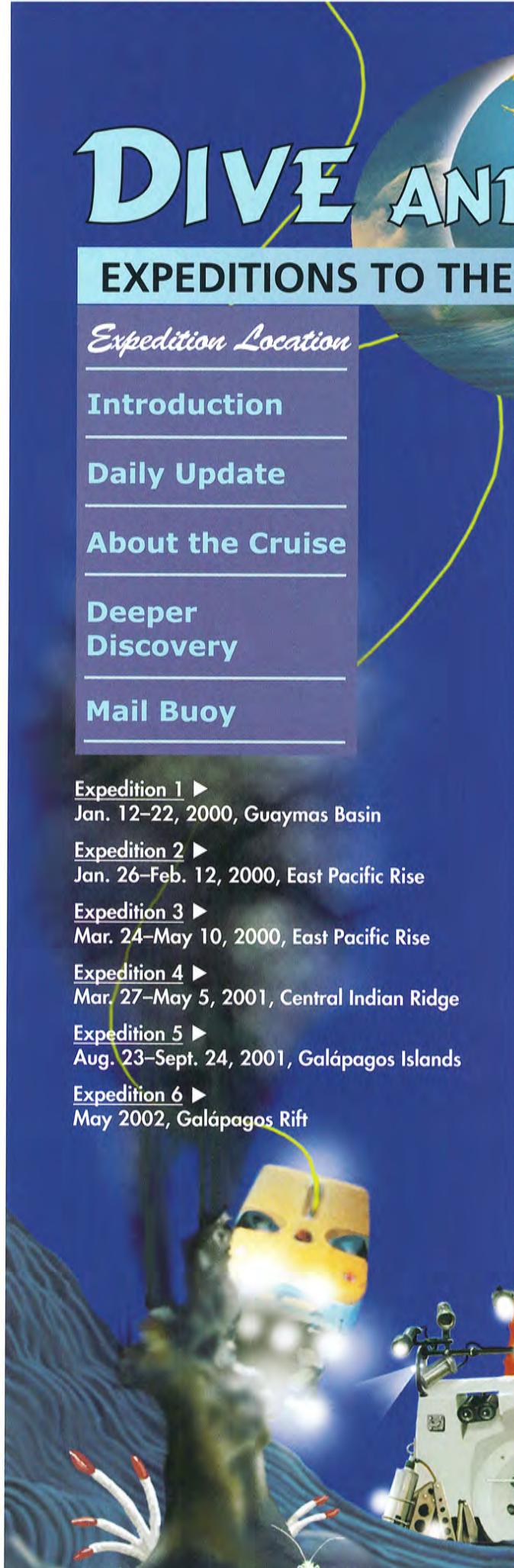
Mar. 27-May 5, 2001, Central Indian Ridge

Expedition 5 ►

Aug. 23-Sept. 24, 2001, Galápagos Islands

Expedition 6 ►

May 2002, Galápagos Rift



Join the current expedition

[Click HERE](#)

www.divediscover.whoi.edu

A WHOI-based Web site called "Dive and Discover" tells scientific stories in exciting, and innovative ways. So far, Dive and Discover explorers have participated in five mid-ocean ridge research expeditions, and there are more to come (see box on next page).

Using the Internet's "new media" technology, "Daily Updates" along with "pop-off" slide and video shows chronicle cruise events. "Deeper Discovery Infomods" explain concepts underlying cruise objectives, and the "Mail Buoy" invites questions from classrooms. Answers fly back in near real time. There's a daily "What's To Eat" feature, "Hot Topics" presents a variety of interesting subjects, and "Interviews" introduce scientists and crew to Web explorers.

This issue of *Woods Hole Currents* brings you excerpts from Dive and Discover, focusing on a 40-day Indian Ocean voyage aboard R/V *Knorr*. WHOI Senior Scientists Dan Fornari and Susan Humphris, the driving forces (along with Web Communications Manager Danielle Fino) for Dive and Discover were aboard, along with science writer Amy Nevala, who

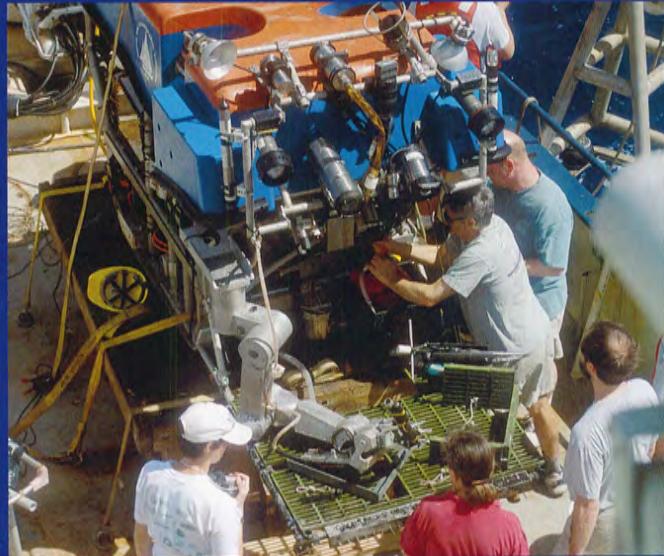
authored most of the Daily Updates, and Institution Web staff member Lori Dolby, who assembled the Web postings.

Fornari and Humphris discuss the motivation for

Dive and Discover on page 4, and you can learn about teacher/classroom involvement on page 10.

The Woods Hole Oceanographic Institution has been sharing the excitement of research at sea firsthand for more than a dozen years. The first venture into this style of communication began in 1989 with Bob Ballard's initial JASON

Project expedition to archaeological sites in the Mediterranean Sea. Several daily broadcasts, each lasting 40 minutes, were beamed from the contract vessel *Starella* via satellite to a downlink operated by EDS Corporation, transmitted to Turner Broadcasting in Atlanta for further production work, and then retransmitted to a network of museum sites where classes of schoolchildren gathered. It was a grand adventure: The remotely operated vehicle *Jason* made its first deep-water dives on this expedition, the WHOI Deep Submergence Laboratory was on a steep learning curve regarding ROV



Dan Fornari, center, and colleagues set up the remotely operated vehicle *Jason*'s equipment for surveying and sampling on the mid-ocean ridge.

command and control as well as cable dynamics, and their vehicle needed to perform on demand for this new approach to science communication.

Web projects like "Dive and Discover" and "Voyage to Puna Ridge" (described in *Currents* Vol. 8, No. 1, 1999) as well as today's JASON Project adventures now link directly with classrooms and individuals using the Internet. The next Dive and Discover expedition is scheduled to celebrate the 25th anniversary of the 1977 discovery of hydrothermal vents on the Galápagos Rift with a return voyage to that historic site (see page 12).

DIVE AND DISCOVER

Expeditions

Internet explorers can join Dive and Discover expeditions through daily updates while scientists are at sea, or they can follow their progress in "virtual time" by clicking through the archived postings from each voyage at: www.divediscover.whoi.edu. The first six cruises examine the mid-ocean ridge and deep-sea hydrothermal vent sites at various points along the ridge.

- Voyage 1 (Jan. 2000)—Aboard R/V *Atlantis* to the Guaymas Basin in the Gulf of California.
- Voyage 2 (Jan.-Feb. 2000)—Aboard *Atlantis* 500 miles south of Manzanillo, Mexico, to the crest of the East Pacific Rise.
- Voyage 3 (March-May 2000)—Aboard R/V *Melville* (Scripps Institution of Oceanography-SIO) for further exploration of the East Pacific Rise and the Galápagos Rift.
- Voyage 4 (March-May 2001)—Aboard R/V *Knorr* to the central Indian Ocean.
- Expedition 5 (Aug.-Sept. 2001)—Aboard R/V *Roger Revelle* (SIO) to the undersea volcanic slopes of the Galápagos Islands.
- Voyage 6 (May 2002)—Aboard R/V *Atlantis* for a new look at the Galápagos Rift, site of the hydrothermal vent discovery 25 years ago (see page 12).

Engaging Students and Public with Exploration and Discovery

By Susan Humphris and Dan Fornari

For the past 30 years, we have been unraveling the mysteries of the oceans and solving fundamental scientific problems related to how our dynamic Earth works. We have each focused on different aspects of seafloor spreading and, in particular, on mid-ocean ridges—Dan on the volcanic construction of the Earth's crust, and Susan on hydrothermal processes and the formation of mineral deposits.

Since we first sailed together in 1973 and for the next 20 years, our careers followed different tracks. Dan continued his research, spending considerable time collecting data on oceanographic cruises and making observations at the bottom of the ocean. While still maintaining a small research effort, Susan gained experience in education, teaching undergraduates and developing and running sea-going oceanography programs for grade school teachers.

In the early 1990s, our paths crossed again at WHOI. Both of us had come to believe strongly in the power of exploration and discovery to engage students in the process of science—a critical need, particularly for middle schools. In addition, we perceived that engaging people of all

ages in oceanographic research would lead to a citizenry more aware of how the earth works.

Space exploration captured the attention of the public, but oceanographers lagged in showcasing exploration of planet Earth. How could we contribute?

Both of us have spent many hours observing the seafloor and its landforms that dwarf any feature above sea level, even the tallest peaks of the Himalayas. Deep submergence vehicles routinely, almost daily, bring the cognitive human eye to the ocean depths. This, plus the burgeoning success and potential of the Internet, provided what we believed to be an ideal combination of content and dissemination capability. And so together we conceived Dive and Discover.

We secured initial support from the National Science Foundation, and the Institution provided significant cost sharing. The Dive and Discover Web site is targeted at middle-school students (Grades 6 to 8) and the general public. We find working with teachers and students enormously rewarding and look forward to sharing many more explorations through Dive and Discover.



R/V *Knorr* called in Port Louis, Mauritius, during Expedition 4 in the Indian Ocean.

DIVE AND DISCOVER™

EXPEDITIONS TO THE SEAFLOOR

Introduction

Expedition 4

March 27–May 5, 2001

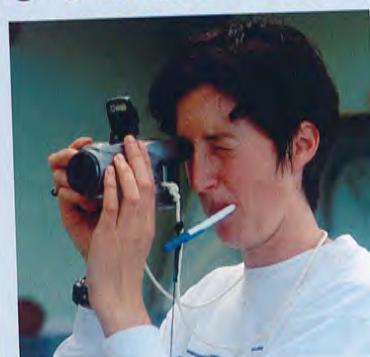
Dive and Discover's first expedition of 2001 was a 40-day-long voyage to explore for hydrothermal vents at the mid-ocean ridge in the central Indian Ocean, one of the most remote places on Earth. Like 16th century explorers who traveled across the Indian Ocean in search of new lands and exotic spices, the scientists and crew on Expedition 4 searched for new hydrothermal vent animals and ancient bacteria—missing links that can help explain how the fauna living at hydrothermal vents in the Atlantic and Pacific Oceans are genetically related.

Since hydrothermal vents were first discovered in 1977 on the Galápagos Rift, scientists have learned that communities of animals along the mid-ocean ridge are very different in the Pacific and Atlantic Oceans. Because deep water flows from the Atlantic, into the Indian Ocean, and then into the Pacific, the Indian Ocean provides the link. Would the same types of vent animals found at Atlantic and Pacific vent sites also inhabit Indian Ocean hydrothermal vents? How do these animals and their larvae migrate along the 60,000-kilometer- (36,000-mile-) long global mid-ocean ridge system, and how do they get across the deep fractures, or transform faults, that separate segments of the ridge crest? Are there specific genetic differences between vent animals and the bacteria they eat that can help explain how hydrothermal vent fauna first evolved, and how they relate to the evolution of early life on Earth?

A team of biologists, microbiologists, geneticists, chemists, and geologists from eight US universities and institutions set out from the Seychelles islands aboard the research vessel *Knorr* to seek answers to these questions. The scientists worked with the ship's crew and members of WHOI's Deep Submergence Operations Group (DSOG), using deep-sea vehicles that included the *Argo II* mapping system, the *DSL-120* sonar, and the remotely operated vehicle (ROV) *Jason* to survey and sample the hydrothermal vents. A conductivity/temperature/depth water sampling system was also important to the operations.

The first site visited was near 25°S where a team of Japanese scientists using ROV *Kaiko* discovered the Kairei Hydrothermal Field in August 2000, and Expedition 4 scientists went on to discover more new hydrothermal activity in the Indian Ocean.

This expedition took over five years to plan and organize. Join the scientists, technicians, and crew of R/V *Knorr* on this historic voyage as they Dive and Discover in the far reaches of the Indian Ocean.



Dive and Discover journalist Amy Nevala.
Lori Doherty

Dream Assignment

Geologists don't often leave messages on my home voice mail inquiring about my interest in reporting a hydrothermal vent expedition, so when WHOI's Dan Fornari called, my ears perked. A few months earlier, I had sent my clips to WHOI after seeing the Dive and Discover science writing position advertised on a journalism listserve. My stomach flipped as I scribbled the details of Dan's message: Six weeks at sea. Working aboard the 279-foot research vessel *Knorr*. Writing daily stories for a Web site aimed at eighth grade students. I saved Dan's message, hung up, and whooped with joy. This was the type of dream assignment I longed for when I became a science writer. Four months later, I stepped aboard *Knorr* and watched Mauritius fade to a dot as we sailed into the Indian Ocean. It was the last time we would see land for a month. As I stood on the deck gripping a notebook and camera, I wondered if Dan was worried that I had never spent more than a day of my 28 years on a vessel larger than my grandparent's pontoon boat.

—Amy Nevala

DIVE AND DISCOVER™

EXPEDITIONS TO THE SEAFLOOR

DAILY UPDATE: [Journal](#)

[Today's Weather](#)

[Interviews](#)

[Hot Topics](#)

April 5, 2001

Rocks and Repairs

Sideline with a broken thruster, ROV *Jason* returned to the ship after a night of scouting the black smoker chimneys we found yesterday. Sampling the rugged terrain around the chimneys requires maximum maneuverability with *Jason*.

The Deep Submergence Operations Group team worked since 4:30 this morning on the repairs so tonight *Jason* can again descend two and a half miles to continue hydrothermal vent exploration. Also heading to the bottom is the elevator, a platform loaded with 100 pounds of sampling equipment, water bottles, and blue coolers to stow animals.

Over the next few days, we will maneuver *Jason* to slurp shrimp, scoop mussels, and even catch crabs in fish-baited traps. Then the elevator will lift them to the surface.

Last night, we had a good look at the chimneys we are exploring, an area covering about half the size of a football field.

On the television monitors, five groups of black smoker chimneys were spotted swarming with thousands of busy shrimp, like bees on a hive. Four species of anemones, several snails, and an occasional crab passed before *Jason*'s cameras.

Using *Jason*'s temperature probe, the night watch found fluids with temperatures as high as 365°C (689°F) flowing from the hydrothermal chimneys. That's hot—about twice as hot as the temperature you would set to bake bread.

Today geologists began dredging the slopes around the site to collect samples of the chimneys' volcanic rock foundation. They dredge by dragging a large chain-link bag from the ship to scoop anything in its way. The rocks they collect help the scientists begin to paint a picture of the seafloor environment.

"Imagine being in a spaceship and dropping a garbage can down to Earth. You drag it along and catch a window frame, a church steeple, and a desk. From that you have to determine what Earth is like," said geochemist Susan Humphris.

April 6, 2001

Biological and Chemical Sampling at Chimney Site

When it came time to load water samples onto the elevator, *Jason* pilot Mark Bokenhofer had the difficult task of maneuvering *Jason*'s large metal claw to open one of the elevator's bins. From the ship's control van, Mark watched the monitor that showed the movements of *Jason*'s claw. For 20 minutes he struggled with a control stick to grasp a rope loop and lift the bin's top. "It wasn't this hard on the deck," Mark said after successfully completing the job.

To understand the challenge of piloting *Jason*, put on a pair of ski gloves, jump in the bathtub and thread a needle under the water. It is possible, but it takes time, persistence, and lots of practice.

BREAKFAST

Fresh fruit
Irish oatmeal
Sausage links
Sausage gravy
Frittata
Buttermilk biscuits
Waffles



What's to Eat?

LUNCH

French dip sub
French fries
Crab leg and watercress salad
Grilled Edam cheese on herb bread
Chips
Popsicles

DINNER

Salad
White snapper with butter-wine sauce
Sirloin steak
Broccoli
Baked potato
Yellow rice
Chocolate cake with vanilla ice cream

Hot Topics

Keeping the "Big O" Out of Alvin



Alvin pilot BLee Williams explains the dangers of using electricity in the "big ocean."



April 18, 2001

Minerals Form Before Our Eyes

Here in the Indian Ocean, when we watch the super-heated hydrothermal fluids gush from cracks in the seafloor and mix with the icy seawater, we are seeing the formation of new sulfide rock.

We learn from sulfides more about the origin of ores containing copper. Many ancient copper deposits now on land formed at the bottom of the ocean. "When we look at a hydrothermal vent, we are watching a mineral deposit forming before our eyes," said Geochemist Susan Humphris. "This tells us a lot more about how they form than by studying mineral deposits on land that are millions of years old."

Susan collects the sulfide rocks using ROV *Jason*. Once they are on board, Susan photographs, describes, and catalogs each rock. Some she cuts with a ceramic saw to share with microbiologist Anna-Louise Reysenbach (Portland State University). Anna-Louise grinds the rock and extracts microbial genetic material called DNA to determine what bacteria live on the chimney.

When the expedition ends, Susan will take over 250 pounds of sulfide rocks back to her lab for analysis with colleagues from Woods Hole and elsewhere.

April 20, 2001

New Hydrothermal Vent Field Discovered

Just before 2300 hours last night, ROV *Jason* climbed the steep, lower eastern wall of the Central Indian Ridge rift valley. Near 23°52'S, we saw on *Jason*'s remote video cameras the source of the hydrothermal plume that we mapped just a few days ago.

This new hydrothermal vent field is only the second active vent site identified in the Indian Ocean. Hundreds and thousands of husky *Rimicaris* shrimp crowd the black smoker chimneys as they forage. Delicate white anemones litter the vent bases. We see eel pouts, a type of ghostly-looking white fish, and yellow, orange, and white bacterial mats drape the site like floor rugs. We also had clear views today of gushing black smokers, white smokers and milder diffuse flows seeping out of ochre, yellow, and white vent mounds.

Tonight we celebrated the discovery with a cookout. Steward Mirth Miller, Cook Chris Poulin, and Mess Attendant Geryk Paige prepared a grilled feast that included ribs, fish, baked beans, and gooey brownies.

—Amy Nevala



Sea Legs

I earned my sea legs on the southern passage to Mauritius and did not suffer from seasickness for the remainder of the trip. The pattern for creating Dive and Discover each day was quickly set. I woke before seven for breakfast. En route to the galley I grabbed my notebook, pen, and camera from Dive and Discover headquarters, also known as *Knorr*'s lower lab. Over pancakes and oatmeal I eavesdropped on the scientists, hoping for a news thread that could spin into the day's journal. Mornings were spent wandering the ship searching for photo opportunities or interviewing scientists for the Daily Journal. Every few days I cornered a scientist or crew member for the Interview page. Web developer Lori Dolby and I worked feverishly to finish the slide shows, journals, and other accompanying text by 8 p.m., hoping to join a crowd of crew members and scientists for popcorn and a movie in the ship's lounge. (Usually we didn't make it.) By 10 or 11 p.m., I reviewed the final edits with Dan Fornari and Susan Humphris, then crashed in my berth, knowing that we would begin this process again the next morning.

—Amy Nevala



Elevator brings samples collected by *Jason* to the surface.
Lori Dolby

SeaNet Provides Vital Data Link Between Ship and Laboratory

Hundreds of watery miles separated R/V *Knorr* from land during the Central Indian Ridge expedition, cutting scientists and crew off from the transmission lines that link the land-based world to the Internet. Yet each day new stories, photographs, and even videos from the ship appeared on the Dive & Discover Web site, transferred via a communications system called SeaNet.

SeaNet utilizes high-speed satellite and other communications technology, as well as specialized software and hardware tools, to provide fast, affordable data transmission between ship and shore.

When SeaNet development began in 1995, one of the goals was to create an affordable data transfer system.



Gracious Accommodation

"How are the scientists treating you?" my dad wrote in an email half way through the expedition. "Are they too busy for your questions?" Quite the contrary, I responded. Without exception the two dozen scientists on board graciously accommodated my questions and interruptions as I searched for a compelling quote or snapped photos. I was often amazed by their energy, such as Shipboard Scientific Services technicians Amy Simoneau and Dave Sims, who stayed up late to send the new journals via SeaNet each night. Though we were thousands of miles away from our audience, Amy and Dave made sure the stories and photos transmitted for the next day's viewing. They never once failed to make this possible.

—Amy Nevala

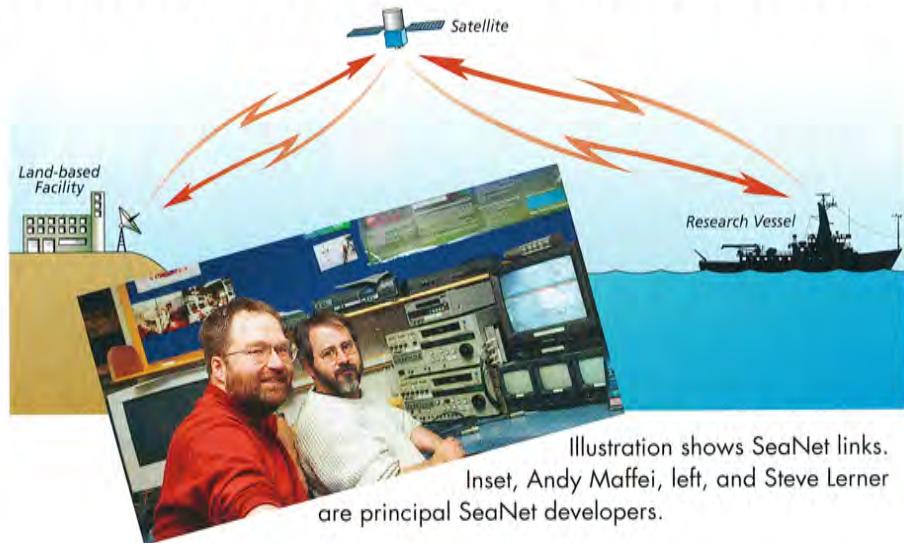


Illustration shows SeaNet links.
Inset, Andy Maffei, left, and Steve Lerner
are principal SeaNet developers.

The primary communication links to ships are satellites, which cost about \$10 per minute then, and now cost about \$5. To minimize costs, SeaNet's developers created virtual "DataPipes" that allow easy transfer of data files in a fast (64,000 bytes per second), compact form directly from the shipboard computer to onshore computers.

Each evening after the daily text, photos, graphics, and videos were prepared for Dive and Discover, WHOI Web developer Lori Dolby entered, coded, and formatted the information on her shipboard computer system. Then Web page data were combined into one "batch" and "compressed" to save time and money during satellite transmission. Finally, a shipboard technician logged into the SeaNet system, established a connection to a satellite, and transferred the files to shore, where they were immediately uploaded for viewing, allowing anyone with Internet access to participate in the cruise in nearly real time.

The cost of satellite communications prohibits doing this often or for long periods of time. However, as the cost of satellite time decreases and computer compression software improves, routine online access to the Internet

from ships will become feasible.

WHOI Research Engineer Steve Lerner and Senior Information Systems Specialist Andy Maffei led initial proof-of-concept testing for SeaNet with funding provided by Honorary Trustee and Executive Committee member George Moss and Corporation Member Joyce Moss. This led to further funding from the National Science Foundation (NSF) and the Navy to support a group of engineers and technicians from WHOI, the Lamont-Doherty Earth Observatory (LDEO), the Naval Postgraduate School, Joint Oceanographic Institutions Inc., and Omnet Inc. to continue development.

Today, WHOI, LDEO, and GeoProse Inc. support SeaNet operations on seven UNOLS (University National Oceanographic Laboratory System) ships. They are: *Atlantis* and *Knorr* (WHOI), *Melville* and *Roger Revelle* (Scripps), *Ewing* (LDEO), *Seward Johnson* (Harbor Branch Oceanographic Institution), and *Pelican* (Louisiana Universities Marine Consortium). With funding from the W. M. Keck Foundation, an innovative, new SeaNet system is also being built to travel with the next generation *Jason* vehicle, *Jason II*.

Photo and illustration by Joyce Doucette

DIVE AND DISCOVER™

EXPEDITIONS TO THE SEAFLOOR

Interview A.D. Colburn, Captain, R/V *Knorr*

Question: Do you have a favorite time of day aboard the ship?

A.D.: The end of the day. If you can hit the rack knowing it was a productive day, that it was safe, that everybody's OK, that things are going according to plan, then that's terrific.

Question: What advice do you have for students considering a career as a ship captain?

A.D.: It takes determination and you have to be able to take responsibility. The buck stops with you—successes and failures. You have to love it, want it, and continue to work for it. Also, anybody can become a sea captain. I know more and more women in very responsible positions on ships, including two relief captains.



Question: What did you think of the movie *The Perfect Storm*?

A.D.: I haven't seen it yet. I'm not superstitious, but tragedy at sea is not something I'm drawn to.

Interview Andy Bowen, Expedition Leader

Question: Describe your role on this expedition. What does an Expedition Leader do?

Andy (piloting Jason in photo): I help the scientists achieve their research objectives and teach them how the equipment works. We work together to try and make *Jason* and other vehicles do what the science party needs to accomplish their goals—to get a sample they want, or complete an experiment. For example, we'll use the sonar on *Jason* to locate the vents. I help the scientists understand a little more about what the sonar can achieve, what its capabilities are.



Question: You work long days preparing and caring for the equipment.

What's the longest stretch you've worked without sleep?

Andy: Thirty to 36 hours, something like that. It happens on occasion.

Question: I understand that you are building a new *Jason* at Woods Hole. Tell me about that?

Andy: This *Jason* has been in the field for about 10 years. Technology has changed a lot in that time, so even though this *Jason* has been upgraded and enhanced, we have reached the point where we need to redesign the vehicle using the latest technology. *Jason II* will have two manipulator arms instead of one and it will be able to carry more weight. We've got the design and a lot of the parts. We began putting the vehicle together last fall. It will be ready for testing in summer 2002.



What was it like?

What was it like, people still ask, spending a month at sea? I explain that the days we identified a new species or named a research site, it like winning the lottery. Other times it was like flipping burgers, as tedious as, well, watching blue waves from a ship for 30 straight days. Among the memories I have stored are watching white-tipped sharks chasing squid, seeing the full moon on the water, lingering over dinner in the galley, receiving emails from students and teachers, touching weird-looking snails, and holding glittering rocks. Sure, by the third week I was counting the days until we docked like everyone else on board. But I found myself growing strangely nostalgic about the ship. I would miss the galley's rubbery placemats that keep our plates from leaping from the tables and the tangy smell of diesel fuel and engine oil perfuming the decks. I would even miss my cozy top berth where without fail I whacked knees, elbows, and head climbing up and down. And I took satisfaction in the number of hits the Dive and Discover site received. I hoped our readers were enjoying the experience as much as I was.

—Amy Nevala



Lori Delaney

Water sampler/sensor package comes aboard R/V *Knorr*.

Dive and Discover: Connecting with

When one of Carolyn Sheild's seventh grade students at Clarke Middle School (Lexington, MA) asked her if what they saw on Dive and Discover was going to be on the nightly news, she knew she had the kids' attention. For Sheild, who has a degree in marine biology, seeing her students truly connect with science is exciting, and using near real time data as a classroom teaching tool is about as good as it gets.

Sheild is one of several hundred teachers who incorporated Dive and Discover's Indian Ocean cruise into their lesson plans with great success. The evaluations returned by those teachers described the powerful effect on students when teachers are armed with a content-rich, live-from-sea Web site. "The students have their imaginations fired in ways they have not for a long time," says Mellie Lewis, a middle school teacher at Atholton Elementary School in Columbia, Maryland. It's like all the pieces fall into place: The kids are more motivated when using computers in the classroom—clicking on slide shows, videos, and quizzes—and the teachers are empowered with cutting-edge research and a tremendous education tool brimming with material that measures up to educational standards. Lewis says, for her classroom, "It's high excitement and high learning!"

The students using Dive and Discover range from third graders to college students in classrooms from Washington state to a Native American reservation school in Arizona, from community colleges in California to landlocked classrooms in Tennessee. "It's fun, yet at the same time you are learning a lot from it," says Hyun Yui, one of Carolyn Sheild's students at Clarke Middle School. "And it's good because we're learning something recent, and not something that happened a long time ago."

To enhance the site's usefulness in the classroom, WHOI partnered with COSI Toledo, (Ohio's Center of Science and Industry in Toledo) to develop and distribute a free "educator's companion." The companion explains the science and technology behind the cruise and provides classroom activities to help students create their



Jayne Doucette

Lexington, MA, teacher Carolyn Sheild, right, and two students visit R/V Knorr in homeport with Susan Humphris, left.

own experiments. COSI reports that the educator companion was used by more than 10,000 students in 22 US states, Canada, Great Britain, Guam, and the Seychelles islands.

The site has given students a better understanding of the science and of what it's like to be a scientist working at sea. "I didn't think anything lived that deep or survived that pressure," said Elliott, a fifth grader in Mellie Lewis's class. "I didn't know how scientists collect data that deep in the ocean. After looking at the Web site, I saw that they used *Jason* and the *Argo II* mapping system. What surprised me was I thought it would be all facts and pictures. I didn't think they'd have slide shows and videos and activities. It was really good."

Hydrothermal Vent Story Available on CD

To commemorate the 25th anniversary of the hydrothermal vent discovery, WHOI is distributing a free CD that retells—in words, images, photos, videos, and audio interviews—the astonishing and often dramatic story of how hydrothermal vents were discovered in 1977 and how they revolutionized scientific thinking. To receive a free copy of the CD, "The Discovery of Hydrothermal Vents," contact: Stephanie Murphy, Information Office, MS#16, Woods Hole, MA 02543. Email: samurphy@whoi.edu and telephone 508-289-2271.

Students and Teachers

For teachers like Mellie Lewis and Carolyn Sheild, sparking that enthusiasm is just the beginning. "The kids went home and asked their parents if they knew what chemosynthesis is, and most of them didn't," says Lewis. "So the kids were able to teach their parents, and it became a family thing. I wasn't just educating my 20 kids—it went beyond that."

From all reports, teachers of even the youngest students participating in Dive and Discover found the experience useful. But how much could third graders understand about ocean research? "They thought it was just so incredible, that we're talking to people waaaay over here on the other side of the world, and their experi-

ences are very different from what we're having here—they're just wowed by it," reports Jill White, who teaches at the Harding School in Corvallis, Oregon.

Thank you for having such a great Web site. My 8th grade students (all 158 of them) have been following the daily updates and slide shows. They especially love the slide shows! Thank you for making it interesting and educational at the same time.

—Laura Crosby, teacher

White also noted a benefit for teachers using the site in the classroom: the chance to learn about cutting edge research and the opportunity to become more familiar with a technology their

students have grown up with.

"The children are so in tune with technology—they think, 'Oh, yeah well sure, they can put this camera down and it can collect all these images and information.' For me it's amazing—I'm 50 years old and I think this work is really incredible."

—Stephanie Murphy

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Email Responses
March 29, 2001

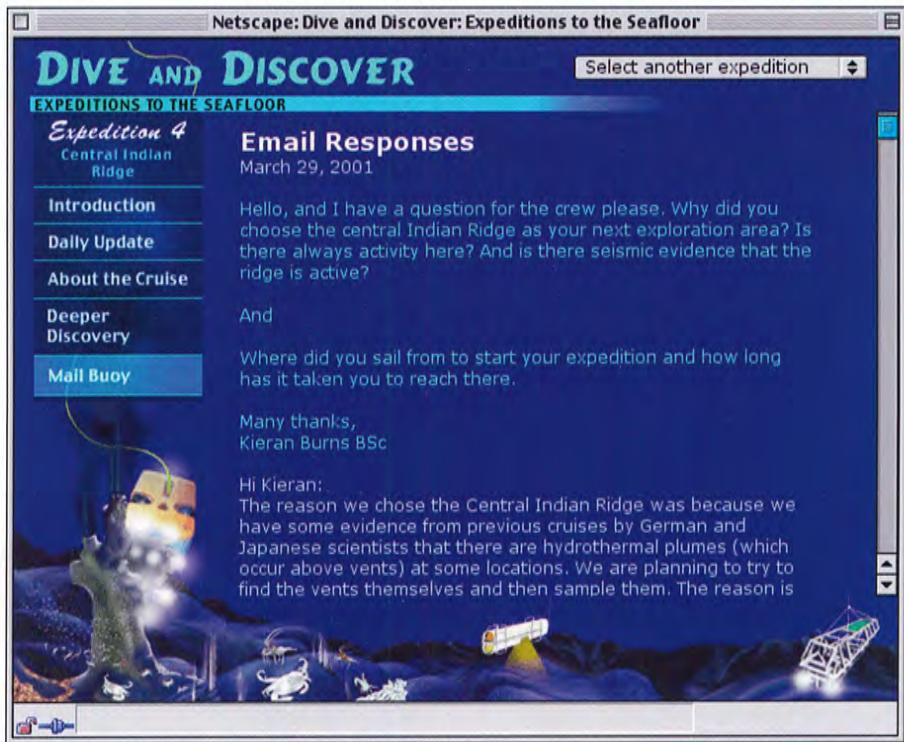
Hello, and I have a question for the crew please. Why did you choose the central Indian Ridge as your next exploration area? Is there always activity here? And is there seismic evidence that the ridge is active?

And

Where did you sail from to start your expedition and how long has it taken you to reach there.

Many thanks,
Kieran Burns BSc

Hi Kieran:
The reason we chose the Central Indian Ridge was because we have some evidence from previous cruises by German and Japanese scientists that there are hydrothermal plumes (which occur above vents) at some locations. We are planning to try to find the vents themselves and then sample them. The reason is



A rare opportunity

I suspect that the general public viewed oceanographic research as I did — glossy and seductive, brimming with *National Geographic*-type moments as our ship raced the ocean, whales spy-hopped off the bow, and orange sunsets capped our days. There were moments of that, but I quickly discovered that this watery utopia also included seasickness, sharks, and 16-hour work days. Initially I was self-conscious of my rookie sailing status and intimidated by the scientists and the research institutions they represented, from Harvard to the Monterey Bay Aquarium Research Institute to Woods Hole. But I knew from questions my well-meaning friends emailed that I had a rare opportunity to educate the public on the real story behind oceanography. The challenge, I realized, was huge. "Heard you are at sea for a month, drinking margaritas and getting a tan, have fun!" wrote a cousin in an email. This was after a college roommate asked how my lanky frame fit into the ship's submarine. Thankfully, the questions the students began sending proved engaging and thought provoking. I knew we had a good audience for Dive and Discover.

—Amy Nevala



Shrimp swarm around an Indian Ocean vent site.

WHOI

Dive and Discover—A Winning Web Site!

Presenting a Web site like Dive and Discover is a complex process, depending for success on a team of people with a variety of skills.

Dive and Discover founders Humphris and Fornari worked first with Web Communications Manager Danielle Fino, Illustrator Paul Oberlander, and Senior Science Editor Lonny Lippsett to determine what Web site elements would best communicate daily science activities and their underlying concepts. They also wanted to depict life aboard ship and the interesting personalities involved in the expedition.

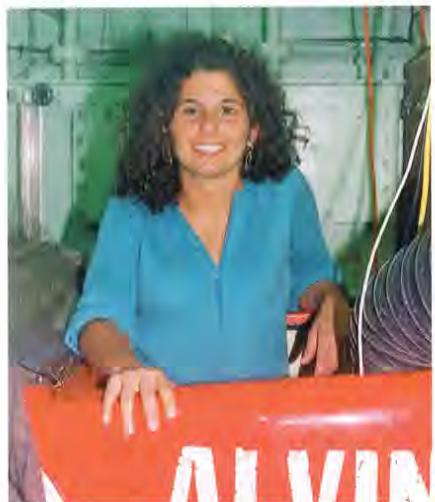
Eventually, the team expanded to include most of the scientists and crew aboard the research vessel as well as other shore-based participants. With each expedition, the team tested and refined the site, incorporating valuable lessons learned along the way and fine-tuning the roles that need to be filled.

Having a seasoned science writer on board the ship to focus on presenting the researchers' daily findings in easily comprehensible and engaging

ways frees scientists to focus on their work. A scientific illustrator can help enormously to communicate concepts with images. Commitment from scientists involved at sea is, of course, es-

sential. Outreach to teachers begins long before the expedition to provide them time to work deep-sea exploration into their curricula and to ensure the lively addition of regular questions and comments during the cruise. Staff at Ohio's Center of Science and Industry (COSI) contributed important expertise and experience in working with teachers and linked Dive and Discover with their network of classrooms.

Dive and Discover has won numerous awards, including nomination for a Webby Award (the Oscar of the Web) in the science category. It reached a huge audience with a maximum of 170,000 hits on March 26 during Expedition 4. Other accolades include selection by *Scientific American* as one of the Web's 50 "greatest hits" and one of the top five sites in earth and environmental science. It was cited as one of the Eisenhower National Clearinghouse's "digital dozen" for science resources, and a "Web Sources" review in the American Geophysical Union's *Eos* called it "a virtual treasure chest of deep sea science and classroom resources."



WHOI Web Communications Manager Danielle Fino, captured here on a visit to *Alvin* during the second Dive and Discover expedition, was honored as the principal designer of two of the five Web sites on the final list for the 2001 Webby Award in the science category. Both Dive and Discover and the Institution's general Web site were nominated.

E. Paul Oberlander

Sixth Expedition to Feature Return to Galápagos

Twenty-five years ago, scientists diving in *Alvin* found seafloor hydrothermal vents for the first time and—to their great surprise—unpredicted colonies of unknown animal communities clustered around the vents. Together the vents and animal communities constitute one of the major scientific discoveries of the 20th century.

A 12-day research voyage is scheduled aboard *Atlantis* May 24 to June 4, featuring WHOI's deep submergence vehicle *Alvin* and the autonomous underwater vehicle *ABE*, to

celebrate this anniversary. Scientists will study how Galápagos vent animal communities have changed over 25 years, and expand their geological and biological investigations into still-unexplored areas of the Galápagos Rift. Ship schedules are subject to change, so readers are encouraged to watch the Dive and Discover Web site, where final dates for the cruise will be posted.

Senior Science Editor Lonny Lippsett is scheduled to be aboard *Atlantis* to work with Dan Fornari, Susan Humphris, co-chief scientist

and WHOI biologist Tim Shank, and other scientists, some of whom were on early vent cruises. They will send daily updates along with interviews and the other features that are now a regular part of Dive and Discover to WHOI, where Graphic Designer Katherine Joyce, Danielle Fino, and other members of the Web team will post them for Internet explorers.

This research voyage is funded by the National Oceanic and Atmospheric Administration's Ocean Exploration Office and the National Science Foundation.



Carol Kall/Carcson

Engineer Alex Shorter manipulates the acoustic tag delivery pole in an attempt to tag a North Atlantic right whale.

Endangered Right Whale Subject of Recent Grants

Foundation and corporation grants are supporting two WHOI projects aimed at a better understanding of threats to the North Atlantic right whale, considered the most endangered marine mammal. Its population totals only about 300 individuals.

The David and Lucile Packard Foundation and the Mitsubishi International Corporation have recently awarded grants to support this work. In the Packard Foundation project, scientists are examining complex interactions among population dynamics, habitat characteristics, and environmental stresses (especially noise) that influence population success and

habitat quality. Mitsubishi International contributed to a WHOI/New England Aquarium joint initiative to determine how whales respond to different underwater sounds and the feasibility of alerting the animals to a ship's presence.

There is growing evidence that noise pollution from increased shipping and intense sounds of military sonar experiments may evoke profound behavioral responses, even fatal strandings of some whale species. Using noninvasive tags they developed largely with funding from the Office of Naval Research, Research Engineer Mark Johnson and Senior Scientist Peter Tyack collect critical data on what the animals hear and how they respond vocally to the sounds. The sophisticated digital acoustic tags allow the scientists to track the animals' movements while they dive and forage for food. Through analysis of these data, they can relate the whales' behavioral responses to the sounds of other whales or the presence of noise—especially human-produced sounds.

The tag is temporarily attached by a suction cup device on the back of the whale. After a few hours of traveling with the animal, the tag auto-

matically releases and floats to the surface for retrieval along with its digitally recorded information about the whale's behavior.

Addressing the declining populations of right whales, Senior Scientist Hal Caswell and MIT/WHOI Joint Program student Masami Fujiwara recently constructed a population



Carol Kall/Carcson

Alex Shorter resets an acoustic tag at the end of the delivery pole.

model showing that the survival probability for right whale mothers may be a critical factor for the species' survival. Right whale mothers are not living as long as they once did, so they do not have the opportunity to reproduce often enough for recovery of this endangered popula-

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Carol Kall/Carcson

Senior Scientist Peter Tyack (seated on left) and members of his scientific party watch a whale submerge after attaching an acoustic tag to its back.



Carol Knoll Carlson

A right whale surfaces.

Endangered Right Whale

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tion. "Because the population is so small, the death of a single breeding female represents a significant mortality rate," Caswell says. "Just preventing the deaths of two females a year, and maintaining survival of the rest, can make a huge difference."

Tyack is the lead investigator on the Mitsubishi Corporation project. He is working with MIT/WHOI Joint Program student Susan Parks and Joint Program graduate Doug Nowacek, who is now a National Research Council Postdoctoral Fellow in the WHOI Biology Department.

Their findings indicate that right whales have very sensitive hearing, can localize sounds extremely well, and retain spatial memory of a sound source after the sound is turned off. Their research also shows that right whales are buoyant enough to float passively when ascending to the surface. Reduced maneuverability during this free ascent may not allow them to change direction when they hear an oncoming vessel, indicating significant risk of vessel collision or towed net entanglement.

Both studies are providing new approaches to understanding the behavior of marine mammals, and the results may provide critically important information for their conservation.

Sears Bequest Endows Visitor Program

A program to encourage exchange of information between the Woods Hole Oceanographic Institution and nations where ocean science information is difficult to obtain has been established with a bequest from marine biologist Mary Sears. It will support four awards annually for travel, living expenses, laboratory space, and equipment for visiting scientists, technicians, and librarians. The fellowships may also be available to WHOI scientists and technicians for collaborative work in less affluent nations. The first Mary Sears Visitor Program awards will be announced in the next few months.

Mary Sears, who died in 1997, was a scholar, a leader in both marine science and her community (including 21 years on the local school board), and a mentor to many. When she completed her Ph.D. in biology at Radcliffe College in 1933, a woman stood little chance of making a name for herself in the male-oriented science of oceanography. Nevertheless, Mary Sears began her career as assistant to her mentor, Henry Bryant Bigelow, noted Harvard biologist and first WHOI Director, working with him both in Woods Hole and Cambridge. She joined the war effort in 1942, or-

ganizing and heading the new Oceanographic Unit of the Navy Hydrographic Office as what former Scripps Director Roger Revelle called the "first Oceanographer of the Navy" (a title now held by an admiral!).

While pursuing plankton research, she began her major contribution to



Mary Sears's office in the Bigelow Laboratory was bursting with oceanographic manuscripts and biological samples.

oceanography in 1953 as a founding editor of *Deep-Sea Research*. She was also a founding editor of *Progress in Oceanography* and editor of several books that are considered milestones in documenting the history of marine science. Revelle described her as "the conscience of oceanography who initiated and maintained an uncompromising standard of excellence in scientific publications about the oceans.... She

played a major role in creating the present world community of oceanographers from numerous countries and almost as many specialties."

"We are proud that this Institution will perpetuate the work and interests of such an important contributor to ocean science," Director Bob Gagosian said. "The Mary Sears Visitor Program allows us to form and maintain strong ties with colleagues outside the United States and to support educational and scientific advancement in other countries."

Fornari and Huang Named Clark Chair Recipients

Dan Fornari and Rui Xin Huang were awarded the Institution's W. Van Alan Clark Chairs for Excellence in Oceanography last October. Fornari, a Senior Scientist in the Geology and Geophysics Department and Chief Scientist for Deep Submergence, and Huang, a Senior Scientist in the Physical Oceanography Department, were cited as innovative thinkers who take risks and question widely held conventional wisdom.



The question most people ask about Dan Fornari is: When does he sleep? The second question is: When is he going to let anyone else sleep?

"He has an energy level beyond anything human," says colleague Susan Humphris, who has watched Fornari work 20-hour days during research cruises. "He is completely tireless."

If a science team needs an unusual data set, Fornari works with the deep submergence operations team to develop new processing techniques. If researchers need a better view of the seafloor, he will write a proposal for funding and push the operations team to build a better camera or instrument.

"We see a lot of scientists who don't take advantage of all of the opportunities handed to them on a research cruise," says veteran *Alvin* pilot Dudley Foster. "But not Dan. He improvises and he always works to get better images and data sets. He burns the candle at both ends, and expects others to do so as well. Because of his perseverance and persistence, we have moved farther and faster in deep submergence than we ever

would have without him."

In the early 1990s, the University-National Oceanographic Laboratory System recommended to WHOI that it should hire a scientist to oversee deep submergence operations. Ocean scientists wanted a communicator who could bridge the gap between scientists and engineers. What they got was a persistent, provocative ad-

vocate who has given researchers better access to the seafloor and pushed them to do better science when they get there.

When he is not pushing the limits of submarine technology and operations, Fornari is a prolific marine geologist. He has participated in more than 40 major oceanographic research cruises and published more than 75 papers on hydrothermal systems, fast-spreading ridges, and seafloor volcanism.

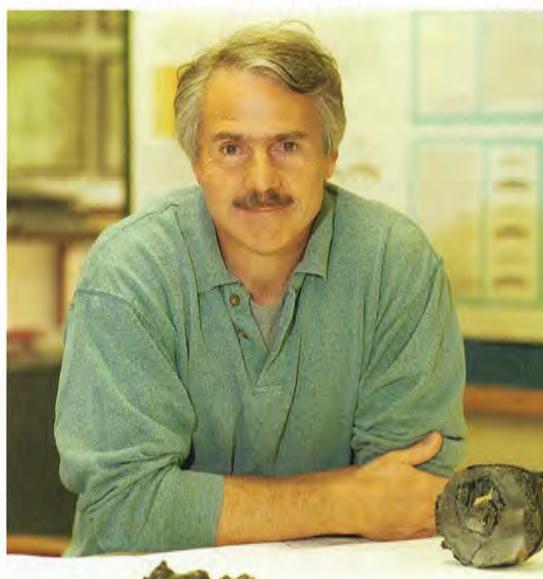
Colleagues unanimously praise Fornari's generosity and his genuine interest in helping other scientists even when he is swamped with his own projects. "What I admire most about Dan is his tireless ability to help others in their research," notes Associate Scientist Maurice Tivey. "Dan has always encouraged collaboration with many colleagues from different disciplines."

In the past few years, Fornari has also assumed the role of public advocate for ocean research. He served on President Clinton's Panel on Ocean Exploration, a group working to rekindle national interest in ocean sciences. With Susan Humphris and Danielle Fino, he also helped conceive and develop the "Dive and Discover" Web education program (see pages 2 to 12), which offers students and the public an opportunity to join research expeditions online.



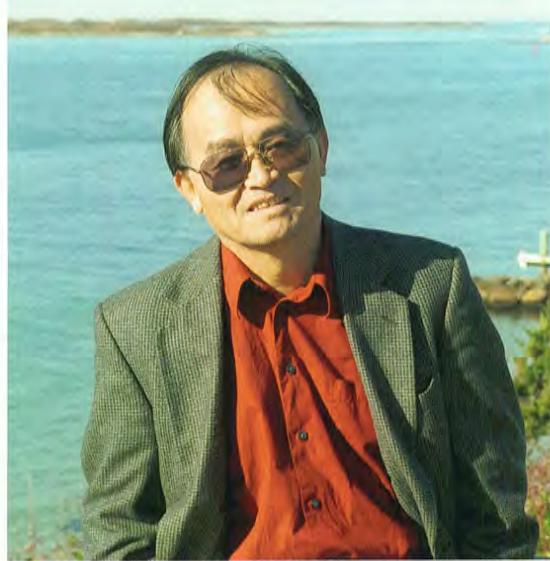
Energy, enthusiasm, determination—nearly everyone who knows Rui Xin Huang chooses such words to describe him. Kirk Bryan, who worked with Huang on ocean modeling at the

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Dan Fornari

Tom Kleindinst



Rui Xin Huang

Tom Kleindinst

Clark Chair Recipients Named

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Geophysical Fluid Dynamics Laboratory at Princeton in the mid-1980s, remembers arriving at the lab on Monday mornings to find Huang waiting for him. "He would talk to me for two or three hours about all the work he did over the weekend," Bryan recalls. "All I could usually say was that I had mowed the lawn." Twenty years later and pushing 60 years of age, Huang still seeks out colleagues for those Monday morning briefings.

Huang is a pioneer in the study of the theory of the wind-driven thermocline, the layer of rapid decrease in temperature with depth that separates warmer water near the ocean surface from colder, deeper water. Discontented with simplistic models that represented the ocean as a series of distinct, stratified layers, Huang produced the first analytical model to include a continuous—and much more realistic—flow of the thermocline. "It was an extremely hard mathematical problem," says long-time WHOI colleague Joe Pedlosky. "He persevered when others didn't."

Huang's tenacity was forged through years of struggle. Born in China in 1942, he earned a degree in fluid mechanics from the University of Science and Technology in 1965. After becoming a research assistant in the Institution of Mechanics at Academia Sinica in Beijing, Huang and his family were oppressed during the tumultuous Cultural Revolution. "I lived in fear," Huang recalls. "I was denied any promotion for 15 years because I wrote manuscripts raising serious questions about classic theories. I was not allowed to pursue my own research interests or change my job. How I loved to do scientific research, but I was denied the opportunity."

When the political upheaval quieted in the late 1970s, Huang began graduate school and dreamed of studying in the United States. In 1980, his dream was realized, but brought its own trials. He had to leave his wife and son behind in China to enter the MIT/WHOI Joint Program. Though he had already done more work in China than many Ph.D.s in America, he was willing to start over to achieve his doctorate. "He went to a hard school of life that most of us are fortunate to avoid," says Pedlosky. "But instead of breaking him, it strengthened him."

In the 20 years since he came to the United States, Huang has written or contributed to at least 60 papers, focusing on theories and models of oceanic circulation. He has tackled many of the classical problems that are crucial to understanding the impact of the oceans on climate. "His theories and models are years ahead of existing practice," notes WHOI colleague Ray Schmitt. "He is thinking more deeply about the underpinnings of ocean physics than anyone else in the world right now."

Despite his struggles, Huang remains "a warm and lively personality, with a wonderfully optimistic view of things," according to Bryan. His family was reunited in the late 1980s, and Huang is now revered by many oceanographers in China. He has adopted Woods Hole as his second home, "in this land of opportunity" as he calls it. And nowadays, his struggles are mostly self-made. "I am haunted by the unanswered questions and the oversimplified answers," Huang says. "I have always wanted to pursue the truth." He knows firsthand that truth can be liberating.

—Mike Carlowicz

Meteorological Society Honors Nelson Hogg

Senior Scientist Nelson Hogg was honored in January with the 2002 Stommel Award from the American Meteorological Society, the nation's leading professional society for scientists in the atmospheric and related sciences.

The Stommel Research Award, named for another WHOI scientist and long-time Hogg colleague, the late Henry Stommel, is presented for outstanding contributions to the advancement of the understanding of the dynamics and physics

of the ocean. The citation for Hogg reads, "for elucidating the structure and dynamics of the ocean circulation through observation, analysis, and theory."

Henry Stommel, who died in 1992, was considered by many the world's leading physical oceanographer. "Having worked closely with Hank Stommel for many years, it is an especially meaningful award for me," Hogg said of the honor. "I am sure that he would be very pleased."

Hogg, a 1971 graduate of the MIT/WHOI Joint Program in Oceanography, joined the Institution staff in 1973. His research interests range from general ocean circulation with special emphasis on the deep flow beneath the thermocline to the dynamics of low-frequency motion and the effects of topography, wave motions, and mixing processes on abyssal flows.



Dave Gray

Ketchum Award Goes to Nancy Rabalais

Professor Nancy Rabalais of the Louisiana Universities Marine Consortium was cited January 16 for her leadership in the science and implications of coastal anoxia (lack of oxygen in coastal waters) when she received WHOI's 12th Bostwick H. Ketchum Award. The award was presented by Director Bob Gagosian on behalf of the Coastal Ocean Institute and Rinehart Coastal Research Center.

During the award ceremony at the Clark Laboratory, Rabalais discussed "Mississippi River and Coastal Water Quality: Linking the Gulf of Mexico with the Continent." She said that the Mississippi River system drains a huge part of America's heartland, carrying both dissolved nutrients and the suspended sediments that build the Mississippi delta. The nutrient content in river waters has been increasing over recent decades, largely due to farming practices upstream. In recent summers, an ocean region roughly the size of New Jersey has become anoxic—that is, biological processes triggered by excess nutrients have depleted subsurface waters of the oxygen that supports animal life. As a result, mobile organisms tend to evacuate this region every summer, leaving a large "dead" zone.



Tom Kleindast

Nancy Rabalais displays her Ketchum Award medal following presentation ceremonies in Clark 507.

Rabalais described documenting the connection between year-to-year changes in the size of the anoxic zone and the amount of nutrients carried by the river, how these excess nutrients affect the ocean offshore of Louisiana and Texas, and how this effect is changing with time. Extending her laboratory and field work into coastal management, Rabalais has gone into the heartland to talk with policy makers, farmers, and fertilizer manufacturers,

ers' organizations in order to encourage measures that will help to improve the ocean's health.

Nancy Rabalais earned a Ph.D. degree in zoology from the University of Texas at Austin, and B.S. and M.S. degrees in biology from Texas A&M University, Kingsville. Since 1983, she has been affiliated with the Louisiana Universities Marine Consortium, where she teaches marine science. She also teaches in the Department of Oceanography & Coastal Sciences at Louisiana State University. Rabalais was named a 1999 National Oceanic and Atmospheric Administration Environmental Hero for her Gulf of Mexico work, and she is currently Chair of the Ocean Studies Board of the National Research Council.

The Ketchum Award was established in 1983 in tribute to the late Bostwick H. "Buck" Ketchum, an internationally respected oceanographer who was associated with WHOI for 40 years. His pioneering research provided the basis of our understanding of productivity of the oceans. In later years he turned his attention to the effects of human activities on the coastal zone. He retired in 1977 as Associate Director of the Institution and died in 1982.

Director Bob Gagosian Participates in World Economic Forum

Director and President Bob Gagosian was invited to participate again this year in the World Economic Forum, moved for 2001 from Davos, Switzerland, to New York City to signal Forum members' determination to "tackle head-on the extraordinary challenges faced by the world after the attacks of September 11." Objectives of the meeting, held January 31 to Febru-

ary 4, included promoting greater international cooperation to reverse the global economic downturn, eradicate poverty, promote security, and enhance cultural understanding worldwide.

The annual gathering and a variety of activities intended to "improve the state of the world" are funded by 1,000 of the world's foremost corporations. The Forum was incorporated in 1971.

Delegates this year included the heads of 30 governments as well as 75 ministers and cabinet members from various countries.

One of few representatives of academia attending, Gagosian served as a facilitator for three Forum workshops that considered the economic, environmental, and other consequences of global climate change.

McLean Bequest Contributes \$5 Million to Institution

Noel B. McLean presided over an extensive period of WHOI's growth as Chairman of the Board from 1961 to 1973. He worked closely with Director Paul Fye to move WHOI into new academic areas and to insure its future. Highlights of his term included purchase of the Quissett Campus, establishment of the joint education program with the Massachusetts Institute of Technology and the marine policy program, and the addition of the research vessels *Atlantis II*, *Knorr*, and *Gosnold*, the submersible *Alvin*, and a DC-4 type aircraft to the fleet.

The Institution continues to benefit from his devotion to ocean science. Early this year, upon settlement of his wife Marion's estate, a charitable remainder trust and her bequest brought more than \$5 million in unrestricted funds to the Institution.

This bequest is the culmination of the McLeans' long association with the Institution. Noel McLean joined the Associates as one of the original members in 1953 and served as their president from 1955 to 1961. He was elected a member of the Corporation

in 1954, a Trustee in 1960, and Chairman of the Board the following year. Other areas of growth during his tenure as Chair included a doubling of the number of WHOI personnel, a near tripling of operating funds, a sixfold increase in endowment fund market value, and a tenfold increase in real property holdings. The Redfield Laboratory and the Iselin Marine Facility were constructed and other buildings were designed and initiated during his term.

After 1973, Noel McLean continued to serve the Institution as member and chair of several committees. In 1980, as part of WHOI's 50th anniversary celebration, the newly constructed geosciences laboratory was dedicated to Noel McLean, "disting-

guished industrialist to whom all of marine science is deeply indebted for his unusual interest and leadership in expanding man's knowledge of the ocean in all its facets." The McLean Laboratory provided critical new laboratory space that was integrated with archiving facilities for the



Elizabeth Fye

Noel McLean boards R/V *Knorr* for a 1980 WHOI Associates trip to the America's Cup opening race in Newport, RI.

Institution's extensive collection of rocks, sediment cores, and other deep-sea samples as well as the data library that includes charts and maps, deep-sea photographs, and other data taken at sea. A 1991 addition to the building houses the Na-

tional Ocean Sciences Accelerator Mass Spectrometry Facility.

Noel McLean was with the Bendix Aviation Corporation from 1927 to 1946, serving as General Manager of the Philadelphia plant and later of the company's marine division. He then became Executive Vice President and Director (and later President and Chairman of the Board) of Edo Corporation, a supplier of highly engineered products to governments and industry worldwide.

His services to oceanography were recognized in 1967 with the International Oceanographic Foundation's Gold Medal, and he received the Navy's Distinguished Public Service Award in 1972 "for outstanding service to the United States Navy in the fields of sonar development, anti-submarine warfare technology, and oceanographic research."

WHOI 2002-2003 Calendar of Events

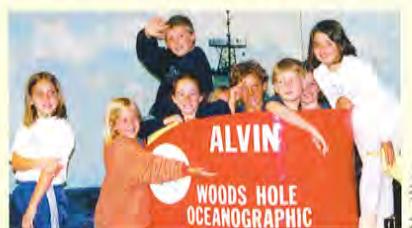
June 21, Associates Science Supper

August 2, Retirees Annual Gathering

September 27, Associates Afternoon of Science

March 2003, Expedition to the Seychelles and Madagascar

For information, contact Lesley Reilly, 508-289-3313 or lreilly@whoi.edu



A school group enjoys Extreme Deep in North Carolina.

The museum exhibit "Extreme Deep: Mission to the Abyss," featuring WHOI's deep-sea exploration capabilities, shows at Philadelphia's Museum of Natural Sciences until early May, then opens at the US Space & Rocket Center in Huntsville, Alabama, in June, and moves to Space Center Houston in October.

Farrington Receives Awards, Testifies

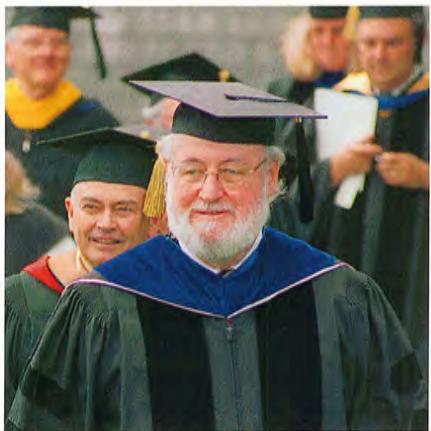
Vice President for Academic Programs and Dean John Farrington recently received two awards and testified before a congressional committee.

In April of last year, Farrington was selected by US Geological Survey colleagues as an "Ambassador for Science," recognizing him "for leadership in promoting science and its use in sound decision making."

Farrington chaired the National Research Council Committee on Risk Management Strategies for PCB-Contaminated Sediments, and he testified on the committee's report in July before the House Subcommittee on Water Resources and Environment.

In September, Farrington was awarded the New England Aquarium's David B. Stone Medal, which recognizes outstanding leaders in marine conservation and science throughout the world for "distinguished service to the environment and the community."

Farrington has spent most of his career at WHOI, beginning with a 1971 postdoctoral appointment. His scholarly interests include organic geochemistry, biochemistry, and environmental quality issues.



Joyce Dooches

Dean John Farrington leads the academic procession at the 2000 graduation.



Photo Op, Inc.

Associate Scientist Darlene Ketten responds with thumbs up to a Congressman's comment during testimony before a House Committee last summer on the possible effects of low-frequency sonar on marine mammals. Senior Scientists Bill Curry and Bob Weller also lent their expertise for congressional events during 2001.

Ocean Institutes Are Focus of Campaign

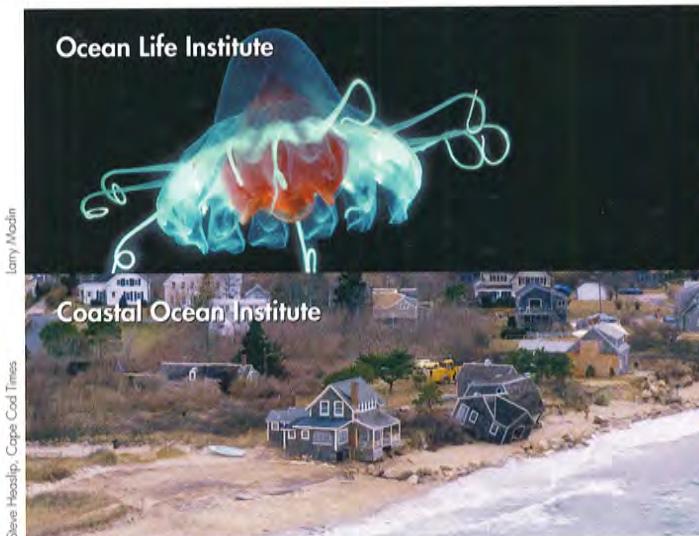
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committees were appointed along with three to four research fellows each for the Coastal Ocean Institute (directed by Ken Brink), the Deep Ocean Exploration Institute (Susan Humphris), the Ocean and Climate Change Institute (Bill Curry), and the Ocean Life Institute (Larry Madin). The research fellows were selected from applications submitted by members of the WHOI scientific and senior technical staffs based on scientific leadership, interest in interdisciplinary research, and willingness to communicate the importance of Institute-sponsored research to the public and policy makers.

In addition, 24 research proposals

were funded with subjects ranging from groundwater discharge into estuaries and seafloor systems for monitoring earthquakes to studies of propulsion and swimming energetics in cod larvae and a new technique for extracting historic sea surface temperature data from corals.

Funds raised in the early "quiet" period of the campaign total \$56 million. Campaign literature produced to date includes two booklets featuring large photographs called "Perhaps our planet should be called Ocean" and "Exploring Planet Ocean." Four issues of *Oceanus* magazine, each featuring one of the Institutes, are in preparation.



NASA
William Reeve and Stephen Low,
Stephen Low Productions

New Ocean Institutes Are Focus of Capital Campaign

The Woods Hole Oceanographic Institution launched a new initiative in the year 2000, establishing four "Ocean Institutes" that will focus on critical ocean-related issues that have substantial impact on society.

According to Director and President Bob Gagosian, "The Ocean Institutes' mission is to bridge the gap between *having* information about the ocean and *making it available* and useful to those who can best utilize it—to save lives, enhance our quality of life, stimulate economic growth, and educate the public on the importance of the oceans for the world's future.

"The Institutes will bring together the best minds, combining the various scientific disciplines as appropriate to answer important questions about our planet's future."

First Two Years of Campaign Yield \$56 Million

Both endowment and current funding for the Ocean Institutes are the focus of the campaign. A recent anonymous \$28 million gift inspired by the Ocean Institute concept set a new standard for Institution private support.

Eight leadership gifts over \$1 million each have also been received. In addition, a Henry Luce Foundation grant targeted to "Strengthening the Connection Between Oceanographic Science and Public Policy" will support activities designed to integrate the work of scientists and policy makers. These outstanding gifts, which will be detailed in WHOI's next *Report to Donors*, provide a firm foundation for the important activities of these new endeavors. During the Ocean Institutes' first year, four Senior Scientists were named Institute Directors, and advisory

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