

# A summer of science by the sea

WHOI Summer Student Fellowship program offers a taste of the research life

It's no surprise that the Summer Student Fellowship program at Woods Hole Oceanographic Institution (WHOI) is one of the most sought-after gigs for undergraduate science majors around the world. It's a chance to spend a summer living in a picturesque seaside village on Cape Cod, which also happens to be home to one of the world's premier centers for ocean science research, engineering, and education.

Launched in 1959, the highly selective program has just celebrated its 50th anniversary. It brings bright, talented students to Woods Hole to learn more about ocean science, attend lectures by Woods Hole scientists, and get paid to conduct independent research working alongside world-class scientists. After the summer, the Summer Student Fellows (SSFs) leave with a better understanding of what studying for a Ph.D. and being a professional scientist are all about.

Several current WHOI scientists were SSFs once upon a time and now advise SSFs themselves.

"Before coming to Woods Hole, I had only seen the ocean once in my life," said former SSF Hanumant Singh, now an associate scientist in the WHOI Applied Ocean Physics & Engineering Department. "I remember thinking, 'This is what I really want to do, and I'm getting paid for it!' I still think the kids feel that way. They're just so excited, and a lot of them end up coming back here."

Lauren Mullineaux, a senior scientist in the WHOI Biology Department, remembers that her SSF advisor, geologist Pat Lohmann, "made a really nice balance between guiding me and giving me some freedom to explore, and I've tried to follow that model when I mentor my own students."

At the same time, SSFs also "bring new

ideas into the lab, and they help us out with projects," she said. "It keeps our science moving forward and our lab group lively."

## Right off the boat, right on a boat

The 28 Summer Student Fellows in 2009 were a dynamic group of seniors and recent graduates with majors ranging from mechanical engineering to geology to history. They came from as close by as Boston and as far as Canada, Thailand, and the



Undergraduate students from around the country and the world took part in the 2009 WHOI Summer Student Fellowship program, which celebrated its 50th year.

United Kingdom, and all shared a passion for science and a keenness to dive into whatever their advisors gave them.

Some students had aspired to work at the Oceanographic since childhood, while others stumbled upon the program last spring. But by summer's end, each found himself or herself immersed in life at WHOI.

"If you had to be anywhere for an REU [Research Experience for Undergraduates], this is one of the best places to be," said SSF Rose Kantor, a biology major at Carleton College. She started her Summer Student Fellowship with marine chemist Tracy Mincer on a research cruise to Clayoquot Sound off Vancouver Island to collect samples of marine particles and study how bacteria communicate via chemical signaling called quorum sensing.

Another SSF, Ellie Bors from Oberlin College, went on a voyage with her advisor, biologist Tim Shank, to the Mariana Trench in the western Pacific Ocean on board the research vessel *Kilo Moana*. The cruise marked the first deployment of *Nereus*, WHOI's new hybrid remotely operated deep-sea vehicle. She also wrote a blog called *In An Octopus's Garden*.

Garrett Mitchell from the University of Maryland worked in the lab of marine volcanologist Adam Soule, developing a photomosaic of seafloor images from the southern Mid-Atlantic Ridge, the site of a recent undersea volcanic eruption.

## Stimulating the inner nerd

The SSFs live together in cooperative housing called the Barn in the village of Woods Hole and on Oyster Pond near the WHOI Quissett campus, giving them a chance to socialize and exchange ideas with one another.

"All the students are from totally different backgrounds with this one common interest," said Willy Goldsmith, a Harvard undergraduate who worked with basking sharks in biologist WHOI Simon Thorrold's lab.

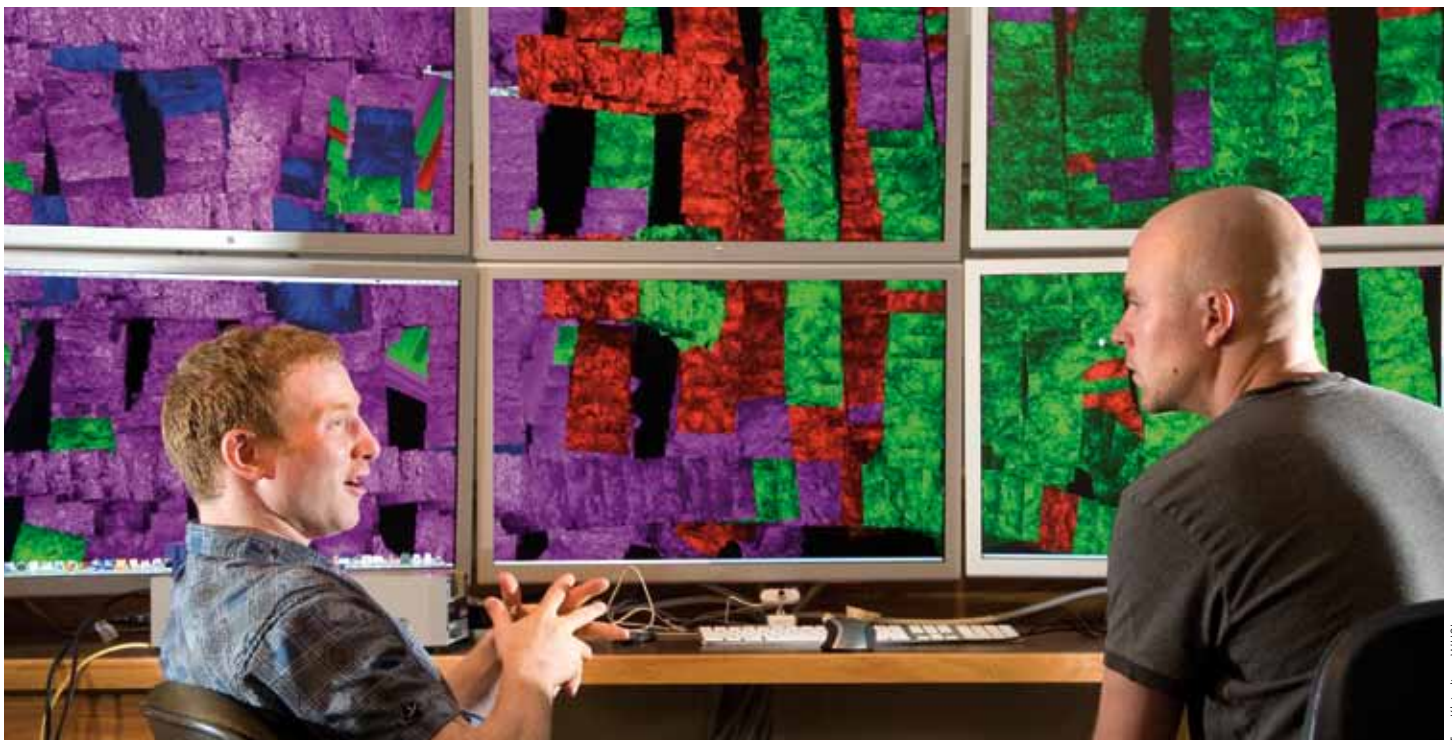
"It's been so fun getting to interact with people my age who are interested in the same things," said Tara Hetz, from St. Lawrence University. She worked on lobster fisheries with research specialist Hauke Kite-Powell in the WHOI Marine Policy Center, who was once a Summer Student Fellow.

"You can totally nerd out and people love it," Bors said. "I don't feel like I bore people!"

Sam Zipper, a recent Pomona College graduate, also enjoyed living at the Barn with the other SSFs, who "always had something fun that they want to do," as well as getting to experience Cape Cod.

Reflecting on their summer experiences,

Tom McInnes, WHOI



Tom Kleindinst, WHOI

Garrett Mitchell (right) from the University of Maryland worked with WHOI volcanologist Adam Soule to develop a photomosaic of images from the southern Mid-Atlantic Ridge, the site of a recent undersea volcanic eruption. He color-coded the mosaic to highlight different kinds of lava formations.

the SSFs gave long lists of highlights. Abigail Labella and Cara Manning said they learned techniques that most students wouldn't learn until graduate school. Gar Secrist, who graduated from Maryville College in May, enjoyed WHOI's rich intellectual atmosphere.


"I've been able to talk to my roommates and go to lectures," he said. "It's really exciting to see the broad range of things being worked on here."

Most SSFs ended the summer with stronger ideas about their interests as scientists and their future career plans, as well as a keener sense of the state of our world's oceans and humans' relationship to them.

Being at Woods Hole "definitely has broadened my perspective on how interconnected things in oceanography are," said Kantor. "You can study all kinds of processes that connect."

"It has definitely been good to experience what working at a research institution is like," said Zipper. "It's maybe the most fun summer of my life so far."

—Mally Anderson

 See audio slideshow at [whoi.edu/oceanus/ssf](http://whoi.edu/oceanus/ssf)

### Garrett Mitchell

For Garrett Mitchell, an interest in oceanography arose not in a university classroom but on a surfboard in the waters of California. Living there while taking a few years off from school, he became an avid surfer and diver and decided to turn a hobby into an academic pursuit.

At the University of Maryland, College Park, Mitchell earned degrees in geology and geography and spent time studying ocean mapping, particularly of mid-ocean ridges. In the fall, he will return there to study for his master's degree in geology.

This summer, he worked in the lab of marine volcanologist Adam Soule, developing a photomosaic of images from the southern Mid-Atlantic Ridge, the site of a recent volcanic eruption (see cover). In 2006, the WHOI autonomous underwater vehicle *ABE* collected hundreds of images from around an unexplored region of the mid-ocean ridge with the hopes of using the physical appearance of the seafloor, rather than its bathymetry (or depth), to create a new way to study how lava flows create features on the seafloor.

Mitchell's task was to organize and color the images collected by *ABE* according to

the lava flow structures he observed in each photo. He prepared the images to be sent to the University of Girona in Spain, where special software refined the images and created a workable map of the eruption zone. He also studied how the lava flows affected where hydrothermal vents were distributed in the area.

"The photomosaic of images is a new tool for studying mid-ocean ridge processes," he said. "It's still a frontier science, so there are a lot of questions we're going to have to answer."

Mitchell hopes to pursue similar ocean-mapping projects in his future career, which includes plans to study for a Ph.D. in oceanography. He is especially interested in using mapping to study seafloor morphology and dynamics at the boundaries of Earth's tectonic plates. He thinks that similar techniques could be used to study marine geohazards affecting the offshore oil and gas industries.

Mitchell's SSF experience brought him deeper into the inner sanctums of his chosen field. "I was reading a book the other day," he said, "and the author just walked into my office."

—Mally Anderson





Abigail Labella from American University collects samples of fish to learn how their genes function when they are exposed to pollutants such as bisphenol A, a compound found in many plastics, and diethylstilbestrol, a synthetic estrogen.

## Abigail Labella

Abigail Labella sums up her daily life as a biology SSF in a single maxim: “When the fish call, you can’t really say no!”

Whereas many of us struggle to remember to feed a single pet goldfish, Labella enjoyed the responsibility of looking after an entire laboratory’s worth of fish. “I plan my life around fish feeding and fish collections,” she said.

Labella spent her summer in biologist Ann Tarrant’s lab, studying genes that regulate endocrine hormone pathways in fish that were exposed to chemicals such as bisphenol A (BPA), a potentially hazardous compound found in many plastics, and diethylstilbestrol (DES), a synthetic estrogen.

In the lab, Labella measured how genes are expressed, or activated to produce proteins, in killifish exposed to BPA and in zebrafish embryos exposed to DES. She traveled to Scorton Creek in Sandwich, Mass., and New Bedford Harbor to collect the fish samples.

The independence afforded SSFs at WHOI has been Labella’s favorite aspect of her project, as well as the opportunity to learn new techniques. “We’ve been injecting embryos with a microscopic needle to knock down genes, which is a tool that I can use a lot,” Labella said.

She also had high esteem for her SSF colleagues, whom she described as “impressive” and “really willing to share what they’re doing” in their own projects, as well as for her lab mates. “Lab work can be really fun when everyone has a positive outlook and a sense of humor,” she said.

Labella, a native of Ballston Spa, N.Y., is a senior at American University, where she majors in biology and minors in physics. She is also a devoted ultimate Frisbee player, both at American and in Woods Hole.

Her SSF experience solidified Labella’s ambition to continue studying marine genetics in graduate school. She acquired her interest in genetics in college, but she has wanted to be a marine scientist since childhood. After shadowing a marine biologist in sixth grade, Labella knew that WHOI was the perfect place to pursue this interest.

“I’d always wanted to come here and find out what it’s like,” she said, “and I’ve realized that I really do enjoy working here.”

—Mally Anderson

Tom Kleindinst, WHOI



Tom Kleindinst, WHOI

Eleanor Bors from Oberlin College participated in the first research cruise of a new WHOI deep-sea exploration vehicle called *Nereus*. Back in Woods Hole, she worked on genetic methods for identifying larvae of animals at seafloor hydrothermal vent sites.

## Eleanor Bors

While her Oberlin classmates accepted their diplomas at their graduation ceremony back in Ohio, Eleanor Bors instead found herself aboard the research vessel *Kilo Moana*, almost 200 miles off the coast of Guam. It was an opportunity too good to pass up.

The voyage marked the first field deployment of *Nereus*, WHOI's new hybrid remotely operated vehicle, capable of diving far deeper than any other current vehicle. Its target was the Challenger Deep in the western Pacific Ocean—at about 11,000 meters or 6.8 miles deep, the deepest recorded point in the ocean.

*Nereus* provided an exciting opportunity to investigate previously unexplored territory for WHOI scientists—including Bors' advisor, biologist Timothy Shank.

"Deep-sea biology is what I've been drawn to most—it's kind of a frontier of marine science," said Bors, who earned degrees in biology and cello performance from Oberlin. "Some of the species we observed may never have been collected

before," she said, including sponges and stalked anemones.

Back in Woods Hole, Bors worked on genetic methods for identifying larvae as part of a study of how worm communities recolonize hydrothermal vent sites after volcanic eruptions. Organisms like these have evolved fascinating and specialized mechanisms to survive in such extreme conditions. Bors continued work on this project into the fall.

A Seattle native, Bors has always loved being near the ocean, which steered her toward marine science. While this summer marked Bors' first research cruise, she had plenty of opportunities to find her sea legs while earning her sailing certification on 25-foot keelboats and traveling the Atlantic on the Sea Education Association's *Corwith Cramer* in high school.

In addition to deep-sea biology, Bors has a keen interest in environmental policy and its relationship to science; she is considering a future in one or both fields. This was one of the many subjects Bors has discussed in her summer blog, *In an Octopus's*

*Garden*, which provides an insider's account of life as an SSF.

Outside the lab, she enjoyed "nerding out" and exploring Cape Cod with her peer fellows and sailing in knockabout races in the waters off Woods Hole.

—Mally Anderson

*Summer Student Fellowships have been funded by the National Science Foundation, as well as by the U.S. Geological Survey, The John M. Alden Fund, The Arthur Vining Davis Foundations Fund for Summer Student Fellowships, New England Farm & Garden Association, Inc., Exxon Mobil Upstream Research Company, The Christopher Haebler Frantz Fund, The AOP&E and G&G Alumni Fund, The Carl and Pancha Peterson Endowed Fund for Support of Summer Student Fellowships, The Lawrason Riggs, III Memorial Fund, The Richard Vanstone Fund, The Homer Ewing Fund, The C. Russell Feldman Fund, The William D. Grant Fund, The Earl Hays Memorial Fund, The Noel McLean Fund, and The Virginia Walker Smith Fund.*