



WOODS HOLE

PEP

www.woodsholediversity.org

Woods Hole Partnership Education Program (PEP)



Woods Hole Diversity Advisory Initiative

Marine Biological Laboratory

NOAA National Marine Fisheries Service

Sea Education Association

United States Geological Survey-Woods Hole

Woods Hole Oceanographic Institution

Woods Hole Research Center

PEP is a project of the Woods Hole Diversity Initiative, a multi-institutional effort to promote diversity in the Woods Hole science community.

PEP is a program for undergraduates who want to spend a summer gaining practical experience in marine and environmental science. Designed primarily for students entering their junior or senior year, PEP consists of a four-week course and a six-to-ten week research project, both offered in the sea-side village of Woods Hole.

PEP is a diversity program that welcomes students from all backgrounds. Students from minority populations under-represented in science, technology, engineering, and mathematics (STEM) are especially encouraged to apply – this includes African American, Hispanic, Native American, Alaska Native, and Asian Pacific Island students.

The 2009 PEP class was composed of sixteen students from a wide range of backgrounds. Some grew up in big cities in the Northeast and others hail from small towns on the Pacific Coast or in the Deep South. Some attend Historically Black Colleges and Universities (HBCUs), while others study at small private colleges and large state universities. Some of the inaugural PEP students are biology majors, while others major in environmental science, marine science, or chemistry.

2009 PEP Colleges and Universities

Arkansas State University (2)
City University of New York
Delaware State University
Humboldt State University (2)
Juniata College
Morgan State University
Savannah State University (2)
Syracuse University
University of New England (2)
University of Maryland Eastern Shore (2)
University of Massachusetts, Boston

Ethnically, then 2009 PEP students identify themselves as: Japanese American, mixed, Indian of Guyanese descent, Native American, Hispanic, Mexican American, African American (2), Caucasian (2), Black (2), West Indian (2), declined to identify (2).

What PEP Offers

PEP students take a four credit course in marine and environmental science, offered through University of Maryland Eastern Shore and taught in Woods Hole by research scientists from the Woods Hole science institutions.

The 2009 course (“Topics in Ocean and Environmental Sciences: Global Climate Change”) consisted of modules in biology, geology, chemistry, physical oceanography, and resource management. The course began June 2 and ran mornings and afternoons through June 30 on the Sea Education Association campus, which is where the students lived for the first month of the 2009 program. In addition to the lectures and field activities, course director Dr. Ben Gutierrez (USGS) organized career-development seminars in which working scientists talked with the students about the ins-and-outs of research careers.

At the conclusion of the course, the students joined research laboratories to work with research mentors on projects in their areas of interest. 2009 students worked with scientists at USGS, WHOI, MBL, and NEFSC. Some projects involved work at-sea. Others involved data gathering in marshes north of Boston or fields and forests on Martha’s Vineyard. One student studied marine mammal noises while another built shelters for crustaceans in the Woods Hole Science Aquarium. Some students worked with data from the Arctic while others studied microscopic animals from deep sea vents or larval shellfish from New England waters.

PEP covers tuition and fees for the course, travel to and from Woods Hole, and housing and meals throughout the summer. PEP also provides a stipend (\$2,000 in 2009) for students who complete both the course and the research project.



PEP 2009 Student Projects and Mentors:

Christina Guidoboni, University of New England
“Technology & Methodology of Image Analysis as it Relates to Atlantic Goosefish (*Lophius americanus*)”
(Jay Burnett, NOAA)

Zak Balmuth-Loris, Syracuse University
“The Effects of Internal Waves Down in Panama”
(Scott Gallagher, WHOI)

Reaz Kahn, University of Massachusetts, Boston
“Developing Low Cost and Practical Devices to Measure Surface/Bottom Ocean Currents”
(Jim Manning, NOAA)

Stephanie Hayes, University of New England
“Behavioral Implications of the Addition of Housing on Various Crustaceans”
(Rachel Metz, NOAA)

Shamgan Perkins, Savannah State University
“Seasonal Trends Present at Isla Canales de Tierra, Panama Using the Marine Observatory PLUTO”
(Scott Gallagher, WHOI)

Jordan Aoyama, Juniata College
“Sounds of the Deep”
(Sofie Van Parijs, NOAA)

Samara Lawrentz, University of Maryland Eastern Shore
“Fecundity and Histology of the Monkfish”
(Anne Richards, NOAA)

Sam Matulich, Humbolt State University
“Age/Growth Analysis of Yellowtail Flounder from Mark-Recapture Study”
(Larry Alade, NOAA)

Adrienne George, Delaware State University
“Ecology of Deep-Sea Hydrothermal Vents”
(Lauren Mullineaux, WHOI)

Joe’Ella Caddle, University of Maryland, Eastern Shore
“Eel Pond: A Brief Historical and Ecological View”
(Joel Sohn, Harvard)

Rosalinda Gonzalez, Humbolt State University
“Enhanced N₂O Fluxes in Coastal Wetlands Due to Nitrogen Enrichments”
(Serena Moseman, USGS)



Amias Polk, Arkansas State University
“Nitrogen Cycling in the Northeastern Amazon of French Guiana as Assessed by Stable Isotopes”
(Maureen Conte, MBL and J.C. Weber, MBL)

Myrna Gatica, City University of New York
“Glacier-Derived Dust as an Iron Source to the Gulf of Alaska: A Satellite Perspective”
(John Crusius, USGS and Andrew Schroth, USGS)

James Shelton
Arkansas State University
“Soil Respiration Analysis on Martha’s Vineyard”
(Jim Tang, MBL)

Melissa Pinard, Morgan State University
“Ocean Acidification Impacts on Larval Shell Formation”
(Anne Cohen, WHOI and Dan McCorkle, WHOI)

Sanya Compton, Savannah State University
“Estimating the Economic Effects of Shoreline Change Due to Sea Level Rise in Coastal Massachusetts”
(Porter Hoagland, WHOI)

Who Hosts PEP, and Why

Known in some circles as a marine science village, Woods Hole is actually a world center for a variety of scientific disciplines: marine biology, fisheries science, oceanography, environmental science, neurobiology, and biomedicine, to name a few. While the village plays a leadership role in many areas of science, it has not been a leader in the effort to bring diversity into the marine science community. Recognizing that the Woods Hole science community must become more diverse if it is to play a leadership role in science in the 21st century, the leaders of the village's six largest science institutions agreed in 2004 to begin working together to make the community more welcoming and to recruit and retain talent from minority populations that are historically under-represented in science.

The joint effort to make the village's scientific community more diverse is led by the Woods Hole Diversity Initiative (WHDI). In 2006, the WHDI's Diversity Advisory committee (WHDAC) released a series of recommendations (commonly known as The Roadmap) listing actions the Woods Hole institutions could take, individually and collectively, to make the village more welcoming and to recruit and retain students and employees from under-represented minority groups.

One Roadmap recommendation (4.b.) called on the Diversity Initiative partners to "develop outreach/mentoring/intern programs. . . by making a concerted effort to attract individuals from under-represented groups. . . and to offer them support (both housing and funding) to be in Woods Hole."

Looking to commit its time and energy to a project that would have tangible, measurable benefits, the WHDAC decided to develop an educational program that focused on undergraduates. Under the leadership of the NEFSC's Dr. Ambrose Jearld, Jr. and George Liles (both NOAA National Marine Fisheries Service), a WHDAC sub-committee developed a plan for a program (PEP) to offer students from under-represented minorities the opportunity to study, conduct research, and receive training in their areas of interest, working in labs with leading researchers in marine and environmental sciences. PEP provides a first-hand introduction to emerging issues and real-world training in the research skills students need to advance in science, either as graduate students or bachelors-level working scientists.



Interestingly, these types of opportunities have always existed in the village. Many scientists working in Woods Hole today studied here as students, or studied with mentors who work in the village. But while a handful of colleges and universities have provided a steady stream of talent over the years, students and faculty at many U.S. universities do not have Woods Hole colleagues and Woods Hole connections. In a world where word-of-mouth inevitably plays a major role in shaping career decisions, communities that do not already have Woods Hole connections are not likely to send their talent here to train and to work.

Some Woods Hole science institutions have made efforts over the years to attract students and researchers from under-represented minority populations, but these efforts have had little success and the village today is not appreciably more diverse than it was 40 years ago. At all levels, from lab technician up through senior scientist and institutional leadership, Woods Hole science institutions have few African American, Hispanic, or Native American employees.

When the WHDAC decided to develop an educational program for undergraduates, the committee began by seeking expert guidance. Over a period of two years, the committee brought in scholars and administrators from institutions that have built successful diversity programs. By studying successes at other institutions, the WHDAC compiled a list of salient features of successful diversity programs, and those features became the framework of the Partnership Education Program.

Woods Hole Diversity Initiative Partners

- Marine Biological Laboratory
- NOAA National Marine Fisheries Service
- Sea Education Association
- United States Geological Survey-Woods Hole
- Woods Hole Oceanographic Institution
- Woods Hole Research Center

Topics in Ocean and Environmental Sciences: Global Climate Change

Course Director

Dr. Ben Gutierrez, USGS

Course Administrators

Dr. Paulinus Chigbu, UMES; Dr. Ambrose Jearld, Jr, NOAA Fisheries; George Liles, NOAA Fisheries

Instructors

Beatriz Pena-Molina, WHOI; Kristin Pangallo, WHOI; Dr. Serena Moseman, USGS; Dr. Michael Fogary, NOAA Fisheries

Course Coordinator

Claudia Flores, USGS

Invited Seminar Speakers and Guest Lecturers

"The Cold North – A Hotspot of Climate Change"
Pieter Beck, Woods Hole Research Center

"Changing Climate and Land Use in the Amazon Basin"
Eric Davidson, Woods Hole Research Center

"Forests of the Amazon Floodplain"
Toby McGrath, Woods Hole Research Center

"Marine Organic Geochemistry"
Dan Repeta, Woods Hole Oceanographic Institution

"Paleoclimatology: Revealing the Earth's Secret Past"
Heather Benway, Woods Hole Oceanographic Institution

“Climate Change and the Future of Oceans in the 21st Century”

Scott Doney, Woods Hole Oceanographic Institution

“Variability in the Arctic”

Marie-Louise Timmermans, Woods Hole Oceanographic Institution

“Wintertime Research in the North Atlantic: Fighting the Elements”

Bob Pickart, Woods Hole Oceanographic Institution

“The Atlantic Meridional Overturning Circulation: A Fluid Particle Perspective”

Amy Bower, Woods Hole Oceanographic Institution

“Trace nutrient limitation of marine primary production”

Erin Bertrand, Woods Hole Oceanographic Institution

“Studying The Ocean’s Biological Pump”

Andrew McDonnell, Woods Hole Oceanographic Institution

“Rapid Climate Warming and Ecosystem Response on the West Antarctic Peninsula”

Hugh Ducklow, Marine Biological Laboratory

“Climate Change Science and Education in the Arctic”

R. Max Holmes, Woods Hole Research Center

“Larval ecology of invertebrates in the coastal ocean”

Jesus Pineda, Woods Hole Oceanographic Institution

“Anthropogenic Carbon in the Oceans & Numerical Models”

Naomi Levine, Woods Hole Oceanographic Institution

“Earth’s Dynamic Ice: The Meltdown”

Richie Williams, U.S. Geological Survey

“High-Resolution Sea-floor Mapping” –

Jane Denny, U.S. Geological Survey

“Population Biology and Management”

Gary Shepherd, NOAA-National Marine Fisheries Service

“Application of Mark-Recapture in Fisheries”

Larry Alade, NOAA-National Marine Fisheries Service



- recruitment that relies on networking rather than simply posting
- a community that is welcoming and inclusive
- a critical mass of students
- careful, thorough mentoring that can address a range of needs and concerns
- adequate financial support for the program
- adequate financial support for students who need income from summer jobs

The PEP planners became aware early on that the new program faced some unusual challenges. Because PEP is hosted by a consortium of institutions, the program planners had to consider the administrative mechanisms of seven institutions, some large and some small, some public and some private, and each with its own method of raising money, spending money, applying (or not applying) overhead, recruiting faculty, matching students with mentors, signing students into labs, etc. In the process of fulfilling institutional requirements, we discovered that the Woods Hole science community is in fact not one community but at least six communities, and perhaps more. Additionally, planning had to solve obvious problems such as finding housing for students in Woods Hole in the summer, developing a 200 or 300 level course, and orchestrating student services for a collection of students who would be affiliated with seven different institutions.

Some of the hurdles were cleared when one of the partner institutions, Sea Education Association (SEA), under the leadership of SEA President John Bullard,

committed to housing the students and providing an array of student services. Being an institution that focuses on undergraduate education, SEA has a fully-appointed campus with student residences, lecture halls, classrooms, laboratories, a library, and a computer facility. SEA also had in place a team of student services professionals with expertise developing undergraduate orientation programs, supervising daily student life, serving as Residence Advisors, providing technical support to students and faculty, and generally helping students make themselves comfortable on campus and in the broader Woods Hole community. The on-campus component of the program, which lasted until the course ended and the students moved to private residences, was essential to getting the students off to a good start in their Woods Hole experience.

Lessons Learned: Results of the 2009 Program

At the close of the 2009 program, the PEP organizers are convinced that PEP is a successful and important project that should be continued in 2010 and far beyond. We believe that PEP will, over time, help to change the face of Woods Hole. Further, we believe that PEP contributes to the body of information about successful diversity programs, and that the Woods Hole diversity program can serve as a model for multi-institutional programs elsewhere. An ongoing PEP program will bring the Woods Hole scientific community into a leadership role in the effort to bring diversity to the marine sciences.

Specifically, the inaugural PEP experiences demonstrates that:

- A consortium of institutions can run a program that doesn't belong to any one institution but belongs to all. PEP was developed as a Stone Soup program: none of the institution partners had the resources to run the program itself, but once seed money was in place the institutions stepped up with some additional financial support and a lot of in-kind support. Individuals also stepped up to participate – offering to host and mentor students, to teach, to give talks and seminars. PEP demonstrates the power of collaboration.
- The PEP structure (a combination of course work and project work) can work in a multi-institution program in Woods Hole. Based on comments from research mentors and PEP students, we may need to extend the length of the research project component, and we definitely need to look for research projects that include as much field work as possible. But the overall strategy of offering course work and research experience, supplemented by seminars, is a winner.



- Mentoring is key. PEP students are pioneers who come to blaze a trail in Woods Hole. They need mentors who are sensitive to the challenges that minorities face living and working in communities that do not have a lot of diversity. At the same time, PEP students are in some ways typical undergraduates, with all the academic naïveté of any other group of undergraduates. Although they have

declared science majors, they may have little sense of what will be expected of them in graduate school and what they will have to do to succeed in science. PEP students need the kind of mentoring that undergraduates everywhere need: advice about what is expected of science students, how to find internships and graduate positions, how to give presentations, etc. It is critical that students understand the culture in which they hope to work. In mentoring PEP students this year, the PEP staff became aware that the Woods Hole science culture varies significantly from institution to institution, and from lab to lab within the same institution. Senior scientists from different cultures have different expectations of what their undergraduate students will contribute to a project, for instance. Scientists trained in Asia, Europe, and North America may each have different assumptions about the extent to which a student will work on his or her “own” project, for instance. Likewise, a scientist who brings his or her lab to Woods Hole for the summer and a scientist who works year-round in the village may have different assumptions about the appropriate pace at which a lab operates. Students encountering research labs for the first time may need a mentor from outside the lab to help them understand the culture of the lab in which they are working.

- Recruitment through networking works. The 2009 PEP experience proves that we can bring to the village a more diverse student body and, presumably, a more diverse workforce – if we work at it. The signers of the 2004 Diversity Initiative Memorandum were on target in noting that “homogeneity among people is self-perpetuating and that in order to

increase diversity, we will have to increase our efforts beyond what they are now.” Continued success for PEP will depend on active recruitment. Those of us who work in Woods Hole like to think that we are a world famous community – and in some spheres we are. But when we asked the 2009 PEP students what they knew about Woods Hole before they applied, most of our first class told us that they had never

“The Federal Government and Ocean Conservation”

Brad Barr, NOAA-National Marine Fisheries Service

“Fisheries Stock Assessment Models” and “Climate Disruption: Impacts on Northeast Fish Stocks”

Steve Cadrin, NOAA/University of Massachusetts, Dartmouth

“Climate Disruption: Impacts on Northeast Fish Stocks” and “The Interface between Fisheries Science and Management”

James Weinberg, NOAA-National Marine Fisheries Service

“Science & Ecosystem Based Management”

Jason Link, NOAA-National Marine Fisheries Service

“Achieving Environmental Change: New Bedford Wastewater Case Study”

John Bullard, Sea Education Association
Panel Discussions/Workshops

1. “What do Scientists do Everyday?”

Bill Waite, U.S. Geological Survey; Chris Reddy, Woods Hole Oceanographic Institution; Mak Saito, Woods Hole Oceanographic Institution

A panel discussion to provide students an opportunity to see what scientists do on a day-to-day basis. In addition, the discussion also highlighted some unforeseen skills that the panelists needed to develop as professional scientists.

2. “Public Speaking”

Ben Gutierrez, U.S. Geological Survey

A brief introduction describing the importance of public speaking to scientists. The discussion also provided some tips and examples of things to think about when putting together a presentation. This workshop was followed by two opportunities for one-on-one discussion of students work on their own research presentations

3. “Pursuing Graduate School”

Aeyisha Brinson, NOAA-National Marine Fisheries Service; David Walsh, The Woods Hole Group; Ben Gutierrez, U.S. Geological Survey

A panel discussion focused on having a frank and informal discussion about embarking on a career in science through going to graduate school or the private sector.

continued



2009 Woods Hole Diversity Celebration

“Dreaming Globally: The Only New World Requires Turning Down the Heat”
George Woodwell, Founder and Director Emeritus, Woods Hole Research Center

“Who is the Scientist?”
Steven Shapin, Franklin L. Ford Professor of the History of Science, Harvard University

“The History of Science from an East Asian Perspective: Science, State and Society in China, 1400-1900”
Benjamin Elman, Professor of East Asian Studies and History, Princeton University

heard of Woods Hole before someone urged them to consider applying. If we want to be a more diverse community, we have to work at letting people know that Woods Hole is a good place to study science. The 2009 students have said that they will spread the word back on their campuses, and we look for more applications from the schools where we found the 2009 students.

- PEP was designed not as a once-in-a-lifetime experience, but rather as a program that would put students on paths that lead to further opportunities in marine and environmental science. The institutions participating in PEP hope that some PEP students ultimately will return to Woods Hole to continue their careers in the village. In this PEP introductory year, SEA offered scholarship support to PEP students who want to continue their Woods Hole experience with a semester at SEA. Happily, the effort to bring students back is already bearing fruit: a number of 2009 PEP students have applied for SEA’s SEA Semester program and others have inquired about summer intern programs at WHOI and NOAA’s Northeast Fisheries Science Center.
- Despite a long history of being a homogenous community (in terms of ethnicity), the Woods Hole science community does welcome – and even embrace – students from different backgrounds. As word of the 2009 program spread, many individuals asked to be involved in the program, as teachers, lecturers, or research mentors. The students were welcomed into the community and had access to the variety of informal activities that have always been part of a Woods Hole summer of science. One scientist took PEP students sailing and another took them fishing. PEP students spent time with Woods Hole scientists and their families on the softball field, in church, and on the back porch—all of the places where students and scientists form the kinds of relationships that bring students back for further study and, eventually, for jobs.

PEP was formally evaluated by Dr. Emorcia Hill, Director of Research and Evaluation, Center for Study of Diversity in Science, Harvard Medical School, who interviewed students, research mentors, course faculty, and program staff. Hill’s report, which is pending as of this writing, will guide the planning of the 2010 program. In summary notes and highlights, Hill observes that the

2009 students rated the program highly, especially the research component. The students also gave high marks to PEP for skill development, networking, and social aspects of the program. Hill’s evaluation highlights some of the salient features of the PEP model and recommends that mechanisms and structures be put in place to ensure PEP’s survival.

Support for PEP comes from. . .

Major financial support for PEP in 2009 came from NOAA and the Northeast Fisheries Science Center, which is part of NOAA’s National Marine Fisheries Service. The USGS and the Woods Hole Diversity Initiative also contributed, and some expenses were covered by participating labs. The WHDI partner institutions contributed varying amounts of in-kind support, including staff time, vessel time, facility use, etc. SEA made a major in-kind contribution in providing staff time and expertise in student services and financial management. A financial report for 2009 and plan for 2010 is pending, and it will show that the true cost of the program is between \$200,000 and \$300,000 per year. In 2009, more than half the cost of the program was covered by in-kind contributions, a funding strategy that can work for a pilot program but that must change if the program is to achieve long-term stability.

2010 PEP

The WHDAC is planning PEP 2010, and we hope to announce the second year-program and call for applications in December. We expect to keep the same basic structure, offering a course and a research experience. In preparing for the 2010 program, the PEP planners will continue to work on recruiting a wide range of Woods Hole scientists, teachers, and staff, recognizing that the effort to make our community more inclusive must be broad based and should involve as many people in the community as possible. PEP is an education and training program, but it is also a program about meeting people and finding opportunities, and we are working to provide future PEP students an introduction to the most exciting science and scientists in the village.