

SEA Semester



Following SEA

2013-2014 Annual Report Issue, Winter/Spring 2015

SEA Semester Goes Global

ON THE COVER: Summer Session Historic Seaports of Western Europe students in Lisbon pose in front of a monument called 'Padrao dos Descobrimenetos', inaugurated in 1960 during the Salazar regime.

PICTURED: The first SEA Semester: The Global Ocean class in Barcelona, October 2014.



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With generous support from so many in the SEA community who made donations to the New Directions campaign, three *SEA Semester: The Global Ocean (GO)* voyages were planned and offered during the 2014-2015 academic year. The first GO, C-255, took place in Spain during fall 2014 and the second, S-256, took place in New Zealand, also in the fall. These accounts were written on the SSV *Robert C. Seamans* by the GO faculty while in New Zealand waters during S-257, SEA's third GO voyage.

SEA Semester Goes Global

Mary Malloy, Ph.D.
Professor of Maritime Studies
Director of the Global Ocean program

The *Robert C. Seamans* has just left the Bay of Islands, New Zealand—a destination I had long wished to visit—and the reality of the place far exceeded even my most exuberant expectations. We followed in the wake of the *Endeavor*, the *Beagle*, and the *Charles W. Morgan*, to a place visited by more than a thousand Massachusetts whaleships in the nineteenth century. The locals were pleased to see a vessel with a home port from our state on the stern after an absence of many decades.

Chuck Lea, Elliot Rapport and I taught the core courses in the first GO offering in Spain last fall with class C-255, and worked with Erin Bryant and Skye Morét both then and now in filling out the faculty roster. Students taking The Global Ocean are required to take three core courses, *Maritime History and Culture*, *Oceans and Global Change*, and *Leadership in a Dynamic Environment* and may also choose two electives from a choice of five.

One of the goals of GO was to create a “Learning Community” of students looking at a big topic from multiple disciplinary perspectives across several courses, and I feel that we have achieved this. (The Association of American Colleges and Universities has identified this process as one of the essential learning outcomes of a Liberal Arts education.) Our intellectual framework for the GO program uses the ten metrics of the Ocean Health Index (OHI), and these have worked well for us in running the same program in places as different as Spain and New Zealand. They are designed to provide a way of measuring human impacts on coastal and marine environments and are nicely interdisciplinary, which was important to us in designing this program.

We've been close to full enrollment in all three of our GO classes this year with students reporting that a choice of elective offerings and new destinations was what attracted them to SEA Semester: The Global Ocean. We look forward to offering three more GO programs in academic year 2015-2016.

Professor Malloy writes
 “Two of our new courses have replaced longstanding staples of the SEA curriculum. *Leadership in a Dynamic Environment* replaces *Nautical Science*; and *The Ocean and Global Change* has replaced *Introduction to Oceanography*. These are best described by the people who teach them and I am grateful to my colleagues Elliot and Chuck for contributing the following.”
 (see sidebars)

Leadership in a Dynamic Environment
Captain Elliot Rappaport, W-79

The best leaders engage a flexible approach to solving problems. Complex tasks require good planning in advance, and enough talent and communication to make effective adjustments as things change along the way. The SEA ships have always been a sailing laboratory for such leadership, and with the advent of the Global Ocean curriculum, a formal syllabus now offers credit directly for the time that students spend standing watch, learning to work and manage the ship.

Leadership in a Dynamic Environment (LDE) begins ashore with a seminar on the modern academic language of leadership and management. Students learn about how effective teams are built and led. Case studies are used to examine how human actions affect results, and to demonstrate how plans can be developed around desired outcomes. A special emphasis is placed on Bridge Resource Management (BRM), a set of guiding principles developed over the last 20 years to improve the performance of navigational crews in the maritime industry.

On the ship, students are immediately faced with the challenge of forming a functional crew. They are given progressive responsibility for tasks with real consequences and gain alternating experience in supporting and leadership roles. Eventually, all will take turns in the executive role of Student Watch Officer, reporting directly to the captain and chief scientist. Throughout, the professional crew serve as mentors, role models, and facilitators. This process is not new to SEA Semester, but its built-in requirements for effective teamwork make it the ideal field element for the LDE curriculum.



US Ambassador to Spain, James Costos, visits the SSV Corwith Cramer in Barcelona and declares the students to be “Junior Ambassadors.”

SEA Semester Goes Global

Feb 26 Eat, Sleep, Sail
 Hayden Harding, C Watch, Bryant University



One month ago we were confined to our cottages in Woods Hole waiting out a blizzard that put New England under a record amount of snow. Fast forward to yesterday evening and we were getting ready, yet again, for a different kind of weather event. Forecasts told of an approaching cold front with strong southerly winds to follow. The evening started quietly, as the setting sun filled the cloud-spotted sky with colors of orange, and Lauren, our multi-talented steward, played her musical stylings on a violin.



Container library in Auckland, New Zealand.

Blog entries are posted online every workday to chronicle the voyages. See www.sea.edu/sea_currents



Marae at Waitangi, New Zealand.



The Global Ocean students present their projects on the quarterdeck for the course The Ocean and Global Change onboard the SSV Corwith Cramer, November 2014.



Global Ocean (GO) Voyages A Pictorial Essay

The SSV Corwith Cramer passes 'Ireland's Teardrop' – the Fastnet Rock and Lighthouse near Cork, Ireland after a transatlantic voyage from Woods Hole.



Oceanography in The Global Ocean **Chuck Lea, Ph.D.**

The behavior of the oceans in a world of change is a central feature in understanding of our planet and its future. This fact is at the core of Oceanography in the Global Ocean curriculum where one course looks at the changing nature of the vast marine world in the 21st century. *The Ocean and Global Change* course moves from information concerning the physical, chemical and biological operations of the oceans and atmosphere to student-led presentations focusing on specific challenges resulting from climate change, fishing, and pollution. Can the oceans continue to provide important amounts of human food while not changing marine ecosystems beyond recovery? Will humans manage their by-products without poisoning the air and sea and creating environments where only bacteria live?

At sea, students taking *Directed or Practical Oceanographic Research* pursue the data for projects proposed onshore, while all stand a lab watch to develop an understanding of the information gathered underway. These data are applied to the categories of the Ocean Health Index and serve as a basis of comparison across different locations and time. The amount of plastic we collect with our nets informs the Pollution Index, while Carbon Sequestration can be indicated by the amount of plankton we collect. Research students can lead the way providing context and analysis to a broad range of ocean questions. Indeed the behavior of humans and the behavior of the oceans are now linked in a way that requires interdisciplinary study.

Breaking News:

New study in *Science* calculates amount of plastic waste going into the ocean

The Annual Meeting of the American Association for the Advancement of Science (AAAS) was held on February 11, 2015 in San Jose, California. At the invitation of AAAS, a new study published in the prestigious journal, *Science*, was presented as the first press event of the day.

Kara Lavender Law, co-author of the study, spoke to the press about the research. “With our students I have sailed and sampled both the Atlantic and Pacific Oceans for plastic debris, and for the past 8 years I have been actively researching the sources, distribution, and fate of plastic in the ocean.

Why do we care how much plastic is in the ocean? While I would argue that any plastic in the ocean is too much plastic, we ultimately want to know how this contaminant is affecting the ocean, and marine life, in particular—not only sea turtles, whales and seabirds, but also animals at the base of the food web all the way up to what we call seafood.”

Millions of tiny bits of plastic swirl around the ocean, carried far offshore by ocean currents and with few clues about their origin. It has long been suspected that much of this plastic started out as trash on land, but exactly how much un-captured plastic waste is making its way from land to ocean has been a decades-long guessing game. Now, a team of researchers working at the National Center for Ecological Analysis and Synthesis (NCEAS) at University of California-Santa Barbara has put a number on the global problem.

The study, co-authored by Kara Lavender Law, principal investigator of the NCEAS marine debris working group, reported in the Feb. 13 edition of the journal *Science*, found between 4.8 and 12.7 million metric tons of plastic entered the ocean in 2010 from people living within 50 kilometers of the coastline. That year, a total of 275 million metric tons of plastic waste was generated in those 192 coastal countries.

Jenna Jambeck, an assistant professor of environmental engineering at University of Georgia and the study’s lead author, explains the amount of plastic moving from land to ocean each year using 8 million metric tons as the midpoint: “Eight million

metric tons is the equivalent to finding five grocery bags full of plastic on every foot of coastline in the 192 countries we examined.”

Law, a research professor at SEA explains that, “Until now, we have been estimating the amount of plastic pollution in the ocean by taking a ship far offshore, towing a plankton net, and counting each individual piece of plastic collected. This is a very tedious and expensive task.” Now, researchers have taken a different approach and instead estimated the amount of plastic waste entering the ocean.

To determine the amount of plastic going into the ocean, Jambeck “started it off beautifully with a very grand model of all sources of marine debris,” said study co-author Roland Geyer, an associate professor with the University of California-Santa Barbara’s Bren School of Environmental Science and Management, who teamed with Jambeck and others to develop the estimates.

They began by looking at all debris entering the ocean from land, sea and other pathways. Their goal was to develop models for each of these sources. After gathering rough estimates, “it fairly quickly emerged that the mismanaged waste and solid waste dispersed was the biggest contributor of all of them,” he said. From there, they focused on plastic.

Plastic pollution in the ocean was first reported in the scientific literature in the early 1970s. In the 40 years since, there have been an increasing number of reports of plastic debris found everywhere from beaches to deep-sea sediments and in Arctic sea ice. But until this study, there were no rigorous estimates of the amount and origin of plastic debris making its way into the marine environment from land.

But knowing how much plastic is going into the ocean is just one part of the puzzle. With between 4.8 and 12.7 million metric tons going in, researchers like Law are only finding between 6,350 and 245,000 metric tons floating on the ocean’s surface.

“This work gives us a sense of just how much we’re missing,” Law said, “how much we need to find in the ocean to add up to the total. There is a lot of plastic sitting on the bottom of the ocean and on beaches worldwide. Right now, we’re mainly measuring plastic that floats, and only in relatively few locations.”

SEA scientists and undergraduate students in the SEA Semester program continue to add to long-term data sets of floating plastic debris in both the Atlantic and Pacific Oceans. “The several thousand SEA Semester students who have collected and counted plastic debris since the 1980s have been essential contributors to our understanding of the scale and scope of this pollution problem,” said SEA president Peg Brandon. “Not only are students sailing to regions never before sampled for plastic debris on our newly expanded trans-Atlantic and South Pacific cruise tracks, but they are gaining a first-hand understanding of the human impact on the oceans.”

Jambeck forecasts that the cumulative input of plastic waste to the oceans will equal 155 million metric tons by 2025. The planet is not predicted to reach global “peak waste” before 2100, according to World Bank calculations.

“We’re being overwhelmed by our waste,” she said. “But our framework allows us to also examine mitigation strategies like improving global solid waste management and reducing plastic in the waste stream. Potential solutions will need to coordinate local and global efforts.” ■

Plastic debris on a beach in Haiti.

Photo/Timothy Townsend



Law describes the implications of this new study.

The calculations are sobering. Having sailed in the Atlantic and Pacific where floating microplastics accumulate and observing the problem first-hand, I knew the number had to be big. But the magnitude is hard to fathom. Our low-end estimate is equivalent to the amount of tuna fished from the ocean in a year. We are taking out tuna, and putting in plastic.

Thus, the discrepancy between what we know is entering the ocean and what we can account for from ocean measurements is huge. Our input estimate is robust, so the question becomes, where is all the plastic going?

We know that not all plastic floats, so certainly some amount of the missing plastic is suspended in the water column, or sitting on the seafloor. Plastic is also found on beaches worldwide in forms ranging from massive derelict items, such as the docks that appeared on the U.S. Pacific coast after the 2011 Japanese tsunami, to lost fishing buoys and nets, to everyday items including cigarette filters, bottles, and food packaging. And microplastics, smaller than your pinky fingernail and potentially microscopic, are found in all these places where marine animals, ranging from marine worms and barnacles to seabirds and whales, are eating them.

We don't yet have a grasp of how much of the "missing plastic" is in each of these marine reservoirs—deep sea, shorelines, and biota. Why does it matter? We need to know

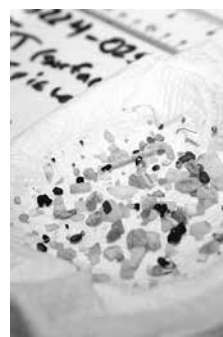
where it is because animals have to first encounter plastic in order to be put at risk.

While plastic may have a variety of harmful effects, ingestion is probably of highest concern. We know that eating plastic can be harmful—it can cause injury and contribute to starvation. Think, for example, of the shocking photos of dead albatross chicks stuffed full of plastic. We also know that plastics are manufactured with a wide variety of additives, some of which may be toxic, and that plastics also act as sponges for persistent toxins already present in seawater, such as DDT and PCBs. In the laboratory it has been shown that these toxins can transfer into animal tissue after plastic has been eaten, although we do not yet know how much of a risk this poses to animals in the ocean. This is an active area of research because there is rising concern about the potentially harmful effects of microplastics to marine animals, as well as to food safety and human health.

In short, if we want to understand the risks to marine animals, and humans through seafood, we need to first get a handle on how much plastic there is, what form it takes, and where it is in the ocean, so that we can evaluate the quantity of plastics exposure to a particular animal or species. If there is no exposure, there is no risk. This study shows that there is far more plastic in the ocean than we can currently account for. Now we have to find it. ■



SEA Research Professor of Oceanography Kara Lavender Law co-authored the study revealing that 8 million metric tons of plastic enter the oceans per year.



Microplastics sample collected onboard the SSV Robert C. Seamans using a surface plankton net towed in the North Pacific Ocean. Photo/SEA, G. Proskurowski

The 192 countries with a coast bordering the Atlantic, Pacific, and Indian oceans, Mediterranean and Black seas produced a total of 2.5 billion metric tons of solid waste. Of that, 275 million metric tons was plastic, and an estimated 8 million metric tons of mismanaged plastic waste entered the ocean in 2010. Graphic/Lindsay Robinson/UGA

Jambeck, J. R., R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan and K. L. Law, 2015. Plastic waste inputs from land into the ocean. Science 347, 768-771. doi:10.1126/science.1260352.



2013-2014 ANNUAL REPORT



Susan E. Humphris, Chair
Board of Trustees, March 2015

Over the last year, I have been privileged to watch a sea change at SEA as it has become more global in its reach. Through the considerable talent and hard work of SEA's faculty and staff, new programs have been implemented and new ports have been explored, putting SEA on a new course for the future.

SEA's newest semester program, The Global Ocean, has now been offered three times, and its focus on coastal landscapes and marine environments has proven adaptable whether in Spain or New Zealand. With its three core courses and a choice of electives, it is proving popular with students even though the logistics of multiple offerings are complex. Early feedback from faculty, students, alumni, parents and sending institutions has been excellent, and the program was recently recognized by Tall Ships America as the 2014 Sea Education Program of the Year—a significant honor!

This summer, we can look forward to other exciting programs. The SSV *Corwith Cramer* will make a 4-week Transatlantic Crossing, and then will offer the Historic Seaports of Western Europe program. The SSV *Robert C. Seamans* will be in Hawaii for the Aloha 'Aina: People and Nature in the Hawaiian Islands program and will then head to the Phoenix Islands for the Protecting the Phoenix Islands (PIPA) program. If you know of a student who might be looking for a summer program, please send them our way!

The portfolio of programs that SEA now offers and the range of courses available to students all revolve around the relationship between humans and the oceans. While educating students so they can make informed decisions to ensure a sustainable future, SEA also contributes scientifically to our knowledge of the oceans. In February, a paper in the journal *Science* co-authored by Kara Lavender Law found between 4.8 and 12.7 million metric tons of plastic entered the ocean in 2010 from people living within 50 kilometers of the coastline. By collecting data to address human impacts on the environment, SEA is fostering responsible stewardship of the oceans.

Of fundamental importance to SEA's success is its ability to offer college credits. I am delighted to report that we have signed a new affiliation agreement with Boston University, which has been our school of record since 1974. The agreement runs through August 2018 and includes recognizing SEA Semester as an official BU study abroad program for the first time.

Of course, none of this would have been possible without the generous support of all who have contributed to SEA over the last year. In particular, I know many of you reached out with additional gifts to the New Directions campaign that supported the planning and preparation necessary to implement The Global Ocean and other new programs and to send our ships to new destinations in the Pacific and Atlantic Oceans. Your continuing support is critical to enabling SEA to offer the best undergraduate ocean-based programs—thank you for all that you do for SEA.

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 Kara Lemma
 Rachel Philbrick
 Robert and Anne Pickart
 Virginia Pillsbury, W-79
 Charlie and Cecily Pilzer
 Roger, W-113, and
 Sandra Pinnicks
 Julie Pivor
 Adam Porter and
 Elizabeth Jakob, W-63
 Kenneth, W-43, and Judy Potter
 G. Michael and Shannon Purdy
 Ella Quintrell, W-41
 Scott Rachlinski and Rebecca
 Arenson-Rachlinski, C-106
 Jason Rebillot and
 Elizabeth Ellwood, W-162
 Kimberly Reed, S-236
 Dwight Reese, W-41
 William and Karen Regan
 Sara Rhoades
 Leyana Romain, C-247
 Hal, W-38, and Lisa Rose
 Stephen Ruane, S-178, and
 Lauren Gilbert, S-190
 Carl Safina
 P. Scott Sakamoto and
 Lori Petitti, W-48

Jeremy, W-75, and
 Dianne Salesin
 Anne Samuel, C-159
 Matthew Sarver and
 Lauren Morgens, C-158
 Jane Sattler
 Peter and Karin Savio
 Kenneth Schmitt
 Allison Schumer, W-25
 Schwab Charitable Fund
 Robert and Stella Mae Seamans
 Edward and Joan Shankle
 Carolyn Sheild, W-77
 Morgan Simmons, C165
 Margaret Smith
 Nathaniel Smith, C-222
 Reid, C-161, and Franki Smith
 Ian Smithgall, S-209
 Thomas and Barbra Smithgall
 Adam Woodward and
 Valerie Solar Woodward, W-115
 Bryan, C-183, and
 Rebecca, C-183, Sparkes
 Robert and Cynthia Spencer
 Patricia Sprague
 Fred and Kathleen Stadel
 Margaret Stark-Roberts
 Neal and Carol Steingart
 Carl, W-84, and
 Elizabeth, W-84, Stevens
 Alton Straub, W-105, and
 Jennifer DeVoe
 Elizabeth Strojny, C-172 *
 Thomas and Lisa Sturtevant
 Paul and Lenore Sundberg
 Juris Svarcbergs and
 Nancy Reyes-Svarcbergs
 Philip and Joan Swanson
 Zoltan Szuts, C-164
 Allison Taylor, S-186
 Holly Taylor, S-212
 John, W-35, and Elisabeth Taylor
 Michael and Ann Taylor
 Todd, C-104, and Ulrike Taylor
 James Thomson, W-162
 Gary, W-68, and Melanie Tisdale
 Paul, W-11, and
 Karen Toczydlowski
 Stephan, C-142, and
 Bonnie Tompsett
 Greg and Mary Toney
 Chris Tonkin and Sarah Bixler
 Tulsa Community Foundation
 Joseph Twichell
 Robert, W-88, and Jill Ultan
 The Vermont Community Foundation
 Dennis and Gina, C-167, Voskov
 John, C-113, and Susan Waldren
 Daniel Walker
 Douglas and Catherine Wall
 Ryan, C-190, and Lindsey Walsh
 Brian, W-114, and
 Rebecca Watson
 Thomas Weschler
 E. Douglas and Barbara White
 Anthony and Rhoda Whittemore
 Charlie Wilber and Mollie Kabler
 Anthony and Leslie, W-36, Will
 Thomas and Alice Willey
 Richard Wilson
 Theodore and Linda, W-52, Witte
 Eric and Sandra Wolman
 Kristina Wood, W30
 John and Pauline Woodward
 George and Katharine Woodwell
 Keith and Kathryn Zammit
 Keith Zeitlin and Patricia Buckley,
 W-147

New Summer Sessions

Two new Pacific SEA Summer Sessions debuted in 2014. These programs were developed in response to the growing number of undergraduates looking for academic credit during the summer.



Protecting the Phoenix Islands (PIPA)

This 8-week summer session welcomes students to explore one of the last coral wildernesses on earth through one of two academic tracks: science or policy. The Phoenix Islands comprise the Pacific's largest marine protected area (MPA) and were recently named a UNESCO World Heritage Site. Students join marine scientists from SEA, the New England Aquarium, and Woods Hole Oceanographic Institution on one of the first research voyages to the Phoenix Islands Protected Area (PIPA), a region of the world which remains largely unexplored and unvisited.

During the first two weeks on shore in Woods Hole, students begin a survey of large-scale marine conservation efforts around the world. They use PIPA as a case study for the state of current international ocean conservation efforts while developing their own research project in either ocean science or conservation policy.

Students join the SSV *Robert C. Seamans* for a six-week research voyage from Hawaii to American Samoa. They first cross the Equator in a 2-week, 1,600 mile voyage to the Phoenix Islands. The next three weeks are spent in PIPA, documenting the oceanic ecosystem around this archipelago: something that has only been done once before. Working side by side with experts, students provide real-time data that lays the groundwork for an effective conservation plan. A final leg to American Samoa rounds out the voyage.



Aloha 'Aina: People and Nature in the Hawaiian Islands

Aloha 'Aina, a Hawaiian conception of 'love of the land,' describes a deep and enduring relationship between Hawaiian people and the land and ocean resources that sustain them. In this service-based program, students see Aloha 'Aina in action, combining traditional and western environmental approaches, working with community leaders, ocean resource managers, and coastal stakeholders as they implement actions to sustain marine environments. The program weaves together traditional Hawaiian knowledge, values, and practices with contemporary western science, instrumentation, and ecosystem management.

Students spend just over two weeks on shore at Hawaii Pacific University while conducting field work at multiple sites throughout the islands. They then travel throughout the Hawaiian archipelago aboard the SSV *Robert C. Seamans* for ten days, engaging with community-based projects that are developing innovative solutions to land-based pollution, over-fishing, and climate change adaptation. Students develop scientific expertise on the key biophysical processes that support ocean resources and coastal cultures, and a rigorous understanding of the unique combination of social, ecological, and policy dimensions of marine resource management emerging in the Hawaiian Islands.

A week-long final symposium at Hawaii Pacific University's Hawaii Loa campus allows students to present their policy recommendations to a panel of experts while wrapping up the program.

Thank you! SEA is very grateful to Dr. Lew Stern of Stern Consulting for his generous work with SEA leadership during the exciting launch of our new programs and destinations in 2014.



Tall Ships America Selects SEA Semester: The Global Ocean

At its annual conference in Philadelphia held early in February, Tall Ships America selected SEA Semester: The Global Ocean as its 2014 Sea Education Program of the Year. This prize is awarded annually to a program offered by a current member of Tall Ships America which has significantly contributed to the educational credibility of programs under sail. SEA's President Peg Brandon, W-48, was at the conference and accepted the award on SEA's behalf.

Shipboard Science

By Jason Clermont



Above: Students bring the shipek grab—containing a seafloor sediment sample—back on board the SSV Corwith Cramer.

Below: A student under the careful watch of Assistant Scientist Abby Cazeault, C-226, readies a Sea Bird Electronics CTD for deployment on SSV Robert C. Seamans.

Bottom: The water sampling “carousel” complete with oceanographic sampling sensors and a set of Niskin water sampling bottles is deployed from the SSV Corwith Cramer.



Even after being at Sea Education Association for close to two years, I am still amazed at the amount of science we can pack on board the SSV *Corwith Cramer* and the SSV *Robert C. Seamans*. Working alongside SEA’s talented scientists, SEA Semester students have the opportunity to deploy and utilize a variety of modern (as well as tried-and-true) oceanographic gear from a truly unique platform.

The *Corwith Cramer* and *Robert C. Seamans* are rare breeds indeed, being sailing vessels that also boast a full complement of oceanographic instrumentation and equipment—most of which is the same as found on board other world-class research vessels. The types of oceanographic equipment SEA Semester students are exposed to runs the gamut from simple plankton nets to complex profiling sensors. Acoustic Doppler Current Profilers (ADCP), sub-bottom profiling systems, a profiling “carousel” containing instruments capable of logging various physical and chemical attributes as well as “Niskin” bottles for sampling water at specified depths, sediment sampling equipment, an underwater HD camera-equipped ROV, and various sampling nets are but a brief introduction to the suite of oceanographic sampling equipment carried on board SEA vessels.

Our vessel-based laboratories are also fully functioning scientific labs with various equipment and instruments for in-situ analysis, as well as data recording and analysis. Wet chemistry analytical techniques, analysis of primary productivity, and logging of data via computer-based software suites all take place in the cozy confines of our floating laboratories. The labs on both ships also feature a continuous surface seawater sampling system that provides real-time data and logs data on a variety of oceanographic parameters once every 60 seconds!

The deck machinery—equipment like the hydrowinch, the hydrowire, J-frame, and BT-winch—also plays a critical role in our science operations. Before coming to SEA, I had the opportunity to go to sea as part of the science team on research vessels from other institutions. Aside from handling the actual science gear, the science party was fairly limited in what role we could play in deck operations. We certainly were not permitted to operate deck gear such as the J-frame or hydrowinch. It never ceases to amaze me that during a SEA Semester, not only do scientists get the opportunity to learn to operate these pieces of equipment, but so do students!

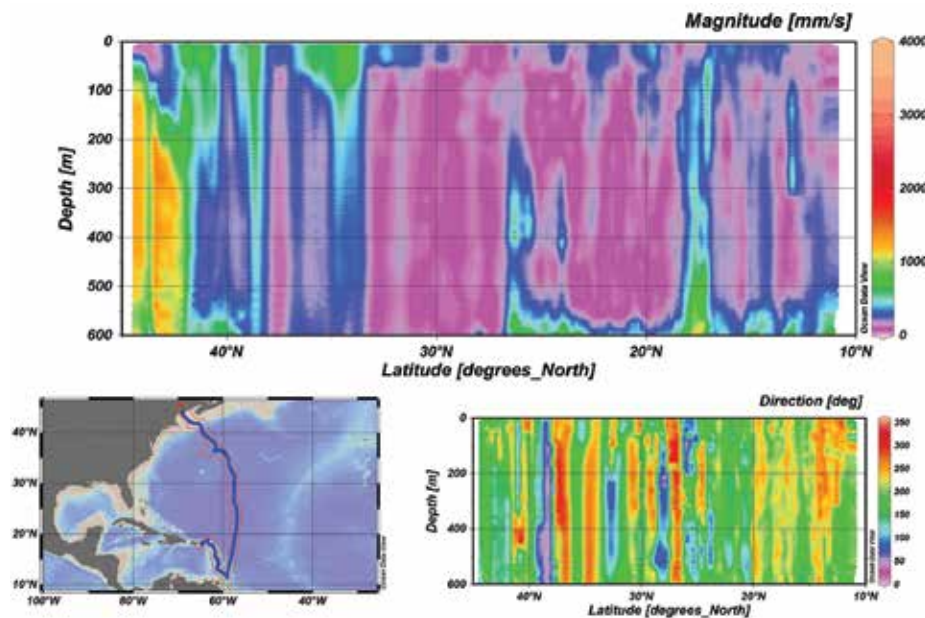
The ability to expose SEA Semester students from a variety of different disciplines to world-class oceanographic research has many advantages for both SEA and the students.

Jason Clermont is Sea Education Association’s Technical Science Coordinator. He holds a M.S. in Biology from East Carolina University and has a keen interest in all aspects of marine science. He has spent an extensive amount of time on the water conducting science from a variety of platforms—from small skiffs in the sounds of North Carolina to large commercial fishing vessels in the Bering Sea.



Such exposure can inspire students towards a career in marine science, as well as motivating those not previously inclined to study marine science to take up the issue or incorporate lessons learned into future career paths. Exposure to how marine science is conducted can also aid in disseminating ocean-related information to the public—a role of interest to SEA Semester students.

What does the future hold for scientific capabilities on board the *Corwith Cramer* and *Robert C. Seamans*? New cruise tracks, coupled with strategic partnerships such as the Ocean Health Index, have opened up new and exciting prospects for collaboration, educational opportunities, as well as novel oceanographic investigations. We are constantly looking towards the future to identify new and better ways SEA can play a role in identifying and overcoming the challenges facing the world's oceans—and evolving scientific capability is likely to play a role in these new directions. Be it a new pH probe to measure the extent of ocean acidification at depth or a more intuitive controller for our ROV, we are constantly striving to keep SEA at the forefront of oceanographic science to inspire and empower our students. ■



Graphical representation of Acoustic Doppler Current Profiler data showing the magnitude of ocean currents encountered during a SEA Semester cruise from Rockland, ME to St. John, USVI.

SSV *Corwith Cramer* SSV *Robert C. Seamans* Oceanographic Equipment List

Winches / Wire Handling

- Markey DESH-4 Electric Hydrographic Winch with 5000m 1/4" 3x19 wire rope
- Markey DEBT-3 Auxiliary "enhanced BT" Winch with 1/8" wire rope
- Hydraulic J-frame and Dynacon electronic metered wheel

Acoustics

- Knudsen Model 3260 Chirp sub-bottom profiling system, 2-7 kHz;
- Acoustic Doppler Current Profiler (RDI Ocean Surveyor 75kHz)
- Hydrophone

Physical / Chemical / Biological

- Water sampling Carousel- Sea Bird Electronics(SBE) 32-16 with:
 - 2.5-L Niskin Water Sampling Bottles
 - SBE 90208 Auto Fire Module
 - Seabird SEACAT Profiler Model SBE 19plus v.2 CTD
 - PAR sensor
 - Seapoint in-vivo chl-a fluorometer
 - Wet Labs CDOM fluorometer
 - Wet Labs transmissometer
 - SBE43 oxygen sensor
- RBR towed CTD with optional Sea Ppoint in-situ fluorometer
- YSI handheld Salinity-Conductivity-Temperature meters
- Ocean Optics USB2000 digital spectrophotometer
- Aquabotix Hydroview ROV (200ft rating, color cameras and HD video)
- Secchi Disk

Nets

- SeaGear 200, 333, 1000 μ m mesh Plankton nets
- SeaGear 333 μ m mesh Neuston nets (1m wide by 0.5m high)
- SeaGear 63 μ m Phytoplankton nets
- Tucker Trawl multiple opening/closing net
- MOCNESS with 9 net, 333 μ m mesh, 1/4 m2 opening (*Robert C. Seamans* only)
- Star-Oddi Centi-TD (temperature/depth) logger

Sediment

- Shipek Sediment Grab
- Gravity Corer
- Fisher Sediment Scoop

Lab Equipment

- Zeiss stereo dissecting scopes
- Zeiss/Nikon compound scope with epifluorescence capability
- Motic Camera for digital photomicrographs
- Orion 3-star benchtop pH meter
- Clean flowing seawater system with:
 - SBE45 thermosalinograph
 - Seapoint chlorophyll-a fluorometer
 - Wet Labs CDOM fluorometer
 - Wet Labs Transmissometer
- Desktop and laptop computers, printers, wireless network, automatic data backup

Hand Over the Watch!

Share your love of SEA and SEA Semester by "handing over the watch" to the next generation of SEA alumni!

Do you know a college or high school student who is bright, inquisitive, loves the ocean and has a thirst for adventure?

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Knowing the Ropes

By Richard W. Murray, W-71



When I arrived in Woods Hole in the summer of 1983 for W-71, I had little idea of what awaited me. I was familiar with Woods Hole Oceanographic Institution (WHOI) and the general community since my family had been traveling to and from Martha's Vineyard for many summers. And, as a Geology major at Hamilton College, I had already decided to pursue "soft rock" geology while in college, ideally involving the ocean in some way.

But I had little expectation of the SEA experience itself. I had read the brochures—this was, of course, long before the internet—and had already applied, so I knew the generalities. Cory Cramer (founder of SEA) was family friend as well, so my family knew the overall picture. Anything beyond that, however, was unknown. Little did I know that SEA would change my life as much as it did and that, virtually my entire life since then, SEA would figure so prominently in my personal and professional growth.

SEA alumni are everywhere in the ocean sciences and in the general populace as well. I've been stopped on the street by people who see my SEA baseball cap and tell me that either they or their son/daughter "did SEA" and how much better off they are for it. At every step of my career I have interacted with SEA alumni, one of my nephews is "one of us," and my growing children are destined to be SEA alumni in some 10 to 15 years.

After graduating from Hamilton and nearly continuously dreaming of being at sea while watching the snow fall in upstate New York, I moved to pursue my PhD at UC Berkeley. While at sea conducting part of my PhD research, I drew heavily upon my SEA experiences. In fact—and this is still true today—the strong sense of self from having successfully completed SEA's challenging academic and sea-going experience was essential for my entry into the sea-going oceanographic community.

I have been a professor at Boston University (BU) since 1992 and spent a cumulative total of two years on various research cruises—since my SEA experience was more than 30 years ago that means nearly 7% of my life since has been spent out of sight of land. Time at sea includes two wonderful trips on the *Cramer* as Co-Chief Scientist on special courses for BU marine science majors. On one trip, Dr. Kara Lavender Law, sea-going SEA faculty, re-instilled in me a passion for teaching—simply by being around her—as she and I taught and sailed side-by-side. Captain Rappaport and Mary Malloy further reminded me how SEA can reach out and influence students in ways at once overt and subtle. On another research cruise I was fortunate to be Co-Chief Scientist on the *JOIDES Resolution* for Integrated Ocean Drilling Program Expedition, targeting the climatic evolution of the Asian Monsoon. Problem-solving on the fly while responsible for a research mission involving over 100 persons drew upon the same skills first learned on the *Westward* off Sable Island. By a quirk of fate, for my most recent cruise I was the Chief Scientist on WHOI's famed RV *Knorr* on her last full scientific expedition. Last fall, *Knorr* sailed in and out of Woods Hole and, in so many ways, aspects of my sea-going career have not strayed far at all. Indeed, on *Knorr* during that cruise were four other fellow SEA alumni.

I am currently on leave from BU and spending several years in Washington, DC at the National Science Foundation (NSF) where I am the Division Director of Ocean Sciences. In this capacity, I lead a team of dedicated professional ocean scientists who oversee more than \$360M of research activity each year. Being responsible for a budget of that scale is not without challenges and, at times, is not for the faint-hearted, particularly in this political and financial climate. Once again, my SEA experience some 30 years ago prepared me well. "Situational awareness," "knowing the ropes," "one hand for you, one for the ship," these apply as much in the boardroom as they do at sea. SEA truly prepares one for life, wherever it may lead. ■



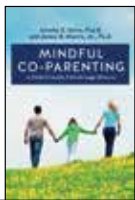
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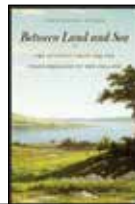
Jeremy Gaies, W-61
Mindful Co-Parenting



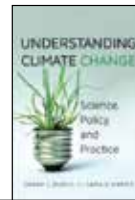
Luanne Rice, W-25
The Night Before



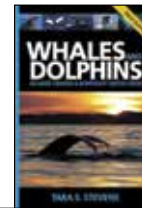
Ellen Prager
 Former
Oceanography
 Faculty
Shark Rider



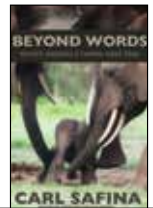
Christopher Pastore, C-141
Between Land and Sea



Sara Harris, Former
Oceanography
Faculty
 co-author
Understanding
Climate Change



Tara Stevens, C-203
Whales and Dolphins
(Field Guide)



Carl Safina
SEA Overseer
Beyond Words

ARMIN E. ELSAESSER FELLOWSHIP OPPORTUNITY!

SEA is pleased to announce we are accepting preliminary proposals for the 2015-2016 Armin E. Elsaesser Fellowship. The Fellowship program, established in 1987, is in memory of Armin E. Elsaesser III—sailor, educator, and adventurer—who sailed on several *Westward* cruises and taught Maritime Studies on shore. With his strong curiosity and sense of adventure, Armin inspired SEA students and staff alike.

The goal of the Armin E. Elsaesser Fellowship is to help one or more individuals each year to follow a dream that has been elusive because of the demands of work or study. The successful project will involve active investigation into an area of personal interest and should reflect a creative and independent approach to the pursuit of knowledge. SEA alumni, faculty, staff, and past employees are eligible for the Armin E. Elsaesser Fellowship. Awards range from \$3,000 to \$7,000 for projects that are at least one month in duration and involve any marine or maritime field that is not directly related to the applicant's current professional activities. Winners will be chosen by a competitive selection.

Preliminary proposals should be no more than two pages and should outline the project and preliminary budget. Applicants should also include a short biographical sketch. Proposals must be submitted by June 30, 2015 to the address below. SEA's Fellowship Committee will review the proposals and a small number will be selected for submission of a more detailed proposal. The final decision will be announced in the fall of 2015. Proposals should be emailed to elsaesser@sea.edu or mailed to Elsaesser Committee, SEA, PO Box 6, Woods Hole, MA 02543.

Please support the 2014-2015 Annual Fund www.sea.edu/give