

Ishmael's Plankton Net: Teaching Marine Science Aboard the Historic *Charles W. Morgan*

by Alexandra McInturf

On a humid morning last July, 20-year-old Molly Weiner stands at the pier of Boston's National Historical Park, unfazed by the juxtaposition of the historical vessels and the modern instruments before her. Visitors mill about, excited by the newly arrived *Charles W. Morgan*, which floats behind the *USS Constitution*. This is a unique opportunity to view the *Morgan*, the oldest commercial sailing ship in the United States, docked beside the *Constitution*, the oldest commissioned warship in the world. With the sound of sea chanteys in the background and the sight of several small whaleboats in the water, Molly finds herself in a living time capsule. She pulls out her yellow notebook, records the date, time and GPS location of the ship, and then she prepares to drop a rubber bucket over the side of the pier into Boston Harbor. A visitor with children stops by to observe. "What are you doing?" he asks. Accustomed to such questions, Molly responds with one enthusiastic word: "Science!"

Gathering a small crowd, she continues collecting data next to the *Morgan*, explaining each step aloud. Taking out a handheld YSI meter and leaning out over the side of the pier, she measures temperature and salinity from the surface down to six meters. She then records light attenuation with a small white Secchi disk. From a bucket of harbor water she gathers a sample to record chlorophyll-A with a fluorometer. Finally, visitors watch as she drops and raises a cylindrical fine-mesh net into the water ten times, filtering the harbor's plankton into a cod-end jar. Setting the net on the pier, she unscrews the jar, caps it, and places it aside to take back to the lab. Beside her findings in the notebook she records observations of cloud cover, air temperature, and wind direction.

Next, Molly gathers her gear into a duffel bag and walks up the gangway and on to the *Morgan*. Onboard, the ship's deck is crowded. Parents lift up small children to peek into a large wooden barrel that used to hold whale oil. Others glance skyward, admiring the rigging and inhaling the smell of wood and rope. Molly greets crew members as she navigates through the crowd to



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Alongside a small whaleboat in Boston Harbor, Molly Weiner writes her observations in her yellow field notebook.
Photo Credit: Alexandra McInturf

the center of the ship. She places the bag and notebook in the chicken coop beneath the carpenter's bench, beside the tryworks, one of many indicators that the *Morgan* was not exactly designed for modern-day science. However, lack of a sterile lab environment is a small price to pay for the opportunity to do research on a piece of living history.

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A Historic Vessel in the Modern Age

The last of the American whaling fleet that dominated New England waters in the 19th century, the *Charles W. Morgan* was built and launched in 1841. It sailed on 37 voyages until 1921. After an 80-year career, the ship was preserved and exhibited at Colonel Edward H.R. Green's estate in South Dartmouth, Massachusetts. After Green's death, the ship came to Mystic Seaport in Connecticut, where it has remained docked since 1941 as a National Historic Landmark.

In 2008 the Seaport began a six-year restoration of the ship, using historically appropriate materials and techniques.

This past summer, the restored *Morgan* made its way down the river for the first time in 73 years, outbound to sea for the "38th Voyage." Between May and August 2014, the ship visited several New England ports.

Data Collection and Research

For Molly, data collection of the waters at the *Charles W. Morgan's* ports of call became routine, but for those who surrounded her beside Boston Harbor and elsewhere - in anticipation of viewing a museum piece - scientific sampling beside a historic vessel appeared a novel concept. Lisa Gilbert, professor of oceanography at the Williams College-Mystic Seaport

Maritime Studies Program and a specialist in marine geology and geophysics, created the summer's science plan. Many basic scientific processes, from observation to navigation, were useful to the 19th-century voyager in the era of Melville's *Moby-Dick*, and so for Gilbert, science was a clear way to both revive an important aspect of maritime history and stimulate interest and discussion about larger global ocean issues.

"Nineteenth-century whalers made careful observations of where and when they sighted whales, and of the ocean conditions," Gilbert said. "On the 38th Voyage we made some traditional observations, with traditional tools alongside modern scientific equipment. It is interesting to compare what we can still learn from basic methods and what new technology helps us see what the early American whalers could not."

The scientific process of collecting data on the voyage was only one part of defining the *Morgan* as a vessel of education and an inspiration for current generations. Part of the greater education of the 38th Voyage was the sheer experience of being at sea. With Molly, Gilbert's research assistant, in charge of data collection at several of the ports, Mystic Seaport invited visiting scientists, painters, historians, and scholars to conduct individual research projects during separate legs of the voyage. A diverse interdisciplinary range of 80 "38th Voyagers" and distinguished guests sailed, including Sylvia Earle, artist Evan Turk, and three Williams-Mystic alums who are now, respectively, a science writer, a graduate student in fisheries policy, and a digital librarian in maritime history. When the *Morgan* visited Stellwagen Bank



Dave Grant, one of the 38th voyagers, hauls in the plankton net at Stellwagen Bank. © Mystic Seaport, DA Murphy

National Marine Sanctuary, Gilbert relied on the voyagers and museum staff onboard over the entire summer to gather hourly samples when the ship was underway, similar to the data that Molly was collecting in port.

Meanwhile the 38th Voyagers conducted a variety of science projects on their own. Anne DiMonti of Rhode Island Audubon, for example, sought to “go back to the roots” of marine science by observing natural whale behavior, while testing temperature, salinity, water clarity, and plankton composition to determine the habitat of the whales on Stellwagen Bank. Brian Corbett, an engineer at Tetra Tech, Inc., created a GIS map of the voyage and digitized nineteenth-century nautical charts to compare with modern-day geography. Dave Grant from the American Littoral Society collected plankton samples to identify copepods that serve as food for humpback whales.

University of Connecticut-Avery Point professor Michael Whitney released student-designed surface ocean drifters to track the currents connecting Stellwagen Bank to other areas of the North Atlantic in order to compare the data to historic observations and climate models.

Gilbert and Molly were joined at the beginning and end of the voyage by Jim Carlton, a familiar face onshore. Carlton, director and professor of marine sciences at Williams-Mystic, is widely recognized for his expertise in global marine bioinvasions. He saw the *Morgan* as “a novel platform to replicate what may have been a very common thing in the nineteenth century.” Carlton placed 12 fouling panels on the stern of the ship before the hull went into the water in 2013. His goal, he explained, was to determine what

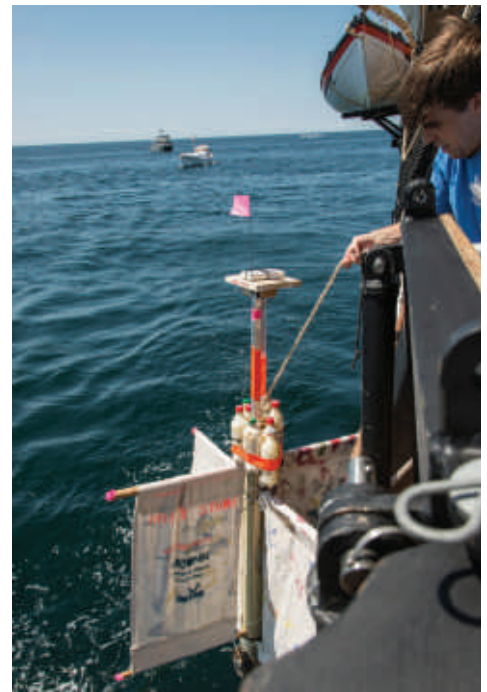
sorts of organisms move around New England and came back with the *Morgan* on the voyage. After the ship moved from Mystic to New London, Williams-Mystic and University of Connecticut divers removed six of the 12 already-fouled panels to determine what the *Morgan* would be carrying with her on the voyage. Six blank panels were also added to document what the vessel would pick up en route. These were retrieved at the end of the 54-day voyage.

“On a first pass inspection,” Carlton said, “the ship picked up an impressive fouling fauna, including the prominent invasive Japanese seasquirt *Didemnum vexillum*, which was in the process of smothering native barnacles on the panels.”

Inspiration for Future Generations

Molly spent her final summer days in Gilbert’s lab. She worked back through the data from each port, reliving the 38th Voyage with each page of her yellow notebook. As she reflected, she found that its influence was surprisingly complex. “There was a small-scale impact in terms of the community of the 38th Voyagers and the crew on the ship,” she said. “There were a lot of people who weren’t science-based, and it was really awesome having artists, for example, doing our sampling.” Through many different vectors, the 38th Voyage taught connections between maritime history and marine science.

“Observational science is still a relevant field,” Molly said. “I think a lot of kids in our generation forget



Mike Whitney, UConn Marine Sciences, deploys drifters for current experiments on Mystic Seaport’s *Charles W. Morgan*. © Mystic Seaport, Andrew Price

that there are still things to learn using basic tools. We are adding a lot of cultural information behind the science to show future generations that science has meaning in any context.”

With nitrate samples to defrost and analyze and plankton sample identifications to triple check, Molly is counting on future Williams-Mystic students to continue the analysis of the voyage.

Looking back, Gilbert emphasized the importance of viewing this voyage from both a cultural and scientific perspective. “The *Charles W. Morgan*’s 38th Voyage is a humbling reminder of why so much of the ocean is still unknown,” she said. “Among all of the other messages of this voyage, the ship made history this summer as a platform for both traditional and modern oceanography, contributing to knowledge about our changing oceans in 2014.”



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