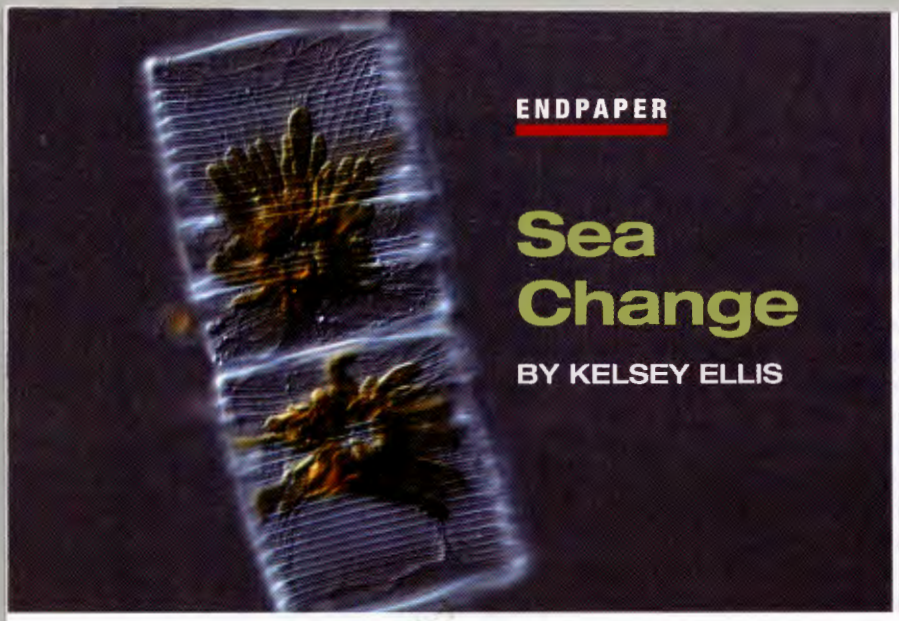

ADRIAN MARCHETTI

ENDPAPER

Sea Change

BY KELSEY ELLIS

Ocean diatoms Pseudo-nitzschia *(right) and* Striatella *(left)*

COLLEEN DURKIN

It's too early for science, I grumble to myself, opening the door of a laboratory refrigerator. I grab a handful of small flasks, shut the door, and trudge back towards the lab proper. I'll admit it—I've fallen into the monotony of day-to-day data collection and the grind of long-term graduate research. Yet on this early morning I'm supposed to greet one of our new undergraduate volunteers and get him enthused about marine science.

"Hey Dylan!" I say, "Ready to look at some diatoms?"

I place a flask underneath the microscope lens and gesture for Dylan to take a look. I zone out, waiting for him to finish so I can start the next item on my to-do list. But he just sits there, gazing intently into the microscope.

"Can you see anything?" I ask. Maybe I forgot to bring the water into focus or, god forbid, maybe he's fallen asleep? But Dylan glances up at me.

"Yeah," he says softly, moving the flask around to get a better look. "So these are diatoms?"

Under a microscope, you can see through the outer "shell" of a diatom—made of a silica-based material, strikingly similar to glass—and into the yellow-brown center of each single-celled, plantlike organism. Abundant in all aquatic environments, diatoms are one type of phytoplankton among many. Phytoplankton, from the Greek for "plant wanderer," get their energy from photosynthesis. That restricts ocean diatoms to the sunlit uppermost reaches of the ocean, where, in an average drop of water, you'll find thousands of them—and millions of bacteria. Diatoms and the bacteria that associate with them are the focus of my graduate career, and they consume my thoughts to such an extent that I've had dreams about them. The diatoms in our lab come in all shapes and sizes, from needlelike *Pseudo-nitzschia* [*see photograph above right*] to spherical *Thalassiosira* and the threateningly spiny *Chaetoceros*. Current research suggests that between 20,000 and 200,000 species of diatoms exist in the world—the uncertainty in these estimates speaks to how little we know about the ocean's incredible diversity.

Researchers used to think that bacteria and diatoms lived separate lives, with bacteria helping to decompose dead diatoms but otherwise leaving them alone. However, scientists discovered not long ago that a complex web of interactions exists between bacteria and diatoms. Bacteria associate with specific diatom species, in particular regions of the ocean, and the two groups provide each other with carbon or other nutrients the other needs to survive. My research focuses on vitamin B_{12}, which many diatoms require in order to grow and which is produced only by certain species of bacteria. Some diatoms have evolved the ability to bypass their need for B_{12} (though they grow better with it), but for those that have not, the abundance and type of bacteria in their marine neighborhood becomes an issue of life and death. Which diatoms flourish in specific regions of the ocean has far-ranging impacts on the environment, from changing the amount of diatom "food" available to other organisms to altering carbon dioxide levels in our atmosphere.

If we choose to look more closely, we see that the microscopic world exists in as much detail as our macroscale one. As I continue to watch Dylan watching the diatoms, I realize that it does a world of good to look deeply into a drop of water. Astronauts say that if every person on Earth were obligated to travel to the moon and see our planet from afar, the world would be a more cared-for place. You can see how connected we all are, trapped on our tiny hunk of rock. Now zoom in, over and over again, until you are inside the microbial world, and you see the same ideas of interconnectedness in miniature. If it takes some graduate-school monotony to make me realize that, I decide, it's a pretty fair deal.

Kelsey Ellis is graduate student in the Marine Science Department at the University of North Carolina, Chapel Hill. Ellis was one of fifty graduate students, chosen from more than 800 applicants across the U.S., to participate this past June in the Communicating Science workshop series, called ComSciCon'14, in Cambridge, Massachusetts.