The New York Times
Scientist at Work
Notes From the Field

AUGUST 5, 2010, 3:22 PM

Seasickness, and Mutualistic Bacterial Mats

By JEFFREY MARLOW

Jeffrey Marlow The Alvin submersible being lifted into the ocean. Support divers on top are poised to detach it from the crane.

Monday, Aug. 2

At 7:45 this morning, Alvin emerged from its hangar, creeping slowly along bolted tracks toward the A-frame crane that would hoist it off the back deck and into the northern Pacific Ocean. Inside the sub, two scientists, Abigail Green and Tony Rathburn, would help the pilot, Sean Kelley, cruise the seafloor in search of good samples with bacterial mats, clams, soft corals or other interesting life forms.

Back on deck, we bobbed over Hydrate Ridge South, watching Alvin sink out of view, and the familiar dread of impending seasickness flickered. Seasickness is the most common ailment on research cruises, and even though the seas have been relatively cooperative, the battle against nausea demands constant vigilance. People respond differently to a rocking boat, and everyone on board espouses his or her own personal voodoo: take half of a meclizine tablet with a glass of water, eat lots of goldfish crackers, spin around clockwise 14 times while reciting the Declaration of Independence. Oddly, our lab's preferred remedy is Preggie Pop Drops, sugary gems of deliciousness with a pregnant woman on the label.

The first batch of samples hit the deck around 2 p.m. These rocks were sent up on the gear elevator, a simple platform loaded by Alvin on the seafloor – a sub's version of checked luggage. As the crew hauled the elevator onto the port-side deck, the scientists salivated, notebooks at the ready.

Abigail Green A carbonate rock picked up by Alvin's robotic arm on the seafloor. The yellow bit on the left is bacterial mat, and the mushroomlike protrusion on the right is a deep-sea anemone.

Our group is most interested in bacterial mats, the slimy, gooey layers of single-celled organisms that coat some of the rocks Alvin picks up. Several years ago, researchers found that many of the cells around cold seep vents are engaged in anaerobic methane oxidation, essentially eating methane and spitting out other substances like hydrogen. On its own, this process isn't enough to make a living, but with a little help from another type of organism, everyone stays

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happy. A class of bacteria known as sulfate reducers use hydrogen and sulfate to generate more than enough energy for everyone. (As we process the mud and rocks brought up from the seafloor, the perfume of rotting eggs tells us we're on the trail of these sulfate-reducing bacteria.)

It's a very elegant mutualistic relationship: The methane oxidizers provide the raw materials, and the sulfate reducers produce the energy. And it's more than just a biological curiosity, since the system serves as a critical climate barometer. These deep-sea methane oxidizers eat about 80 percent of the methane squeezed out of the earth's crust at cold seeps around the world; without them, streams of methane would enter the atmosphere, intensifying global warming, possibly beyond repair.

It's now 1 a.m., and we've just finished processing the day's samples. The first day of sampling inevitably involves some measure of trial and error as we figure out the best way to slice and dice our samples and we all find our places in the process. The science team's mantra is to "treat every dive as if it's your last"; after all, we've spent years getting to this point, and we want to make the most of the opportunity to gather samples from this remarkable site. And if that means a few sleepless nights, then so be it.

Atlantis is now making her way toward Hydrate Ridge North, the other cold seep mound in the region, where we'll be diving for the next several days. The foghorn blares through the mist, and Alvin is illuminated dramatically on the aft deck, like a rocket ready for launching.

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