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Scientist at Work
Notes From the Field

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Creepy Crawlies and Lady Gaga Heads

By JEFFREY MARLOW

Danwei Huang and Ignacio Carvajal; Copyright: Greg Rouse The tentacles of this cirratulid worm, collected by the Levin lab, are used for sensing the environment in search of food.

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It's dangerous to get complacent on a research expedition. Just when you start to take things for granted, just when you think you've got the sampling process down to the second (scoop, pour, put in freezer, repeat), something goes ever so slightly wrong.

Jeffrey Marlow Tony Rathburn examining samples picked up by Alvin.

Small problems can quickly become big problems, especially given our packed schedule and the isolation of the high seas. Atlantis's previous outing lost two days of sampling time when a team member fell out of bed and broke her nose. We've had a few moments of dread over the last few days, moments when a premature end to the expedition seemed like a real possibility. On Alvin's second dive, one of the robotic arms began leaking hydraulic fluid. On Tuesday, the A-frame crane temporarily froze, which would have grounded Alvin permanently. The elevator platform – full of samples collected yesterday – got stuck on the seafloor when remote-release protocols failed.

This morning, however, gave us the biggest scare so far, when Alvin engineers noticed electrolyte fluid bubbling out of the battery. David Walter, an Alvin pilot, explained that the sub needs to cycle its battery every so often during a dive to shake off debris. This process causes the battery to heat up and expand, possibly expelling the conductive electrolyte fluid. The pilots are trying to flush oil through the system to repair the damage, but if that doesn't work, it's back to port for a day or two to change the battery.

These mini crises draw out the cruise leaders – scientists, engineers, Alvin pilots – for consultation; meetings are often impromptu and brusque, occupying hallways or lab corners. Options are presented, a decision is made and second-guessing is discouraged. We've only got so much time at Hydrate Ridge, and we try to salvage whatever we can from compromised situations. After all, some samples are better than no samples at all.

Jeffrey Marlow Posts From Hydrate Ridge
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- Meet Alvin, the Deep-Sea Submersible
- Seasickness, and Mutualistic Bacterial Mats

During the dive delay, I wandered over to Lisa Levin's lab, a rustic blue-tiled pad complete

Danwei Huang and Ignacio Carvajal; Copyright: Greg

Rouse Euchelus, a grazer member of the gastropod class.

with a Ping-Pong table, a half-dozen microscopes, and rocks — rocks everywhere. Two graduate students, Ignacio Carvajal and Guillermo Mendoza-Tafolla, gave me a quick tour and explained what they'd been up to over the last few days while I had been preparing microbial experiments.

Danwei Huang and Ignacio Carvajal; Copyright: Greg Rouse From top to bottom: Parvamplustrum, a predatory gastropod that eats smaller organisms like foraminifera and other plankton; a chain of Thiomargarita bacteria, the largest known bacterium, which metabolize hydrogen sulfide into elemental sulfur, often storing grains of golden sulfur particles inside their cell walls; and Aplacophora, a mollusk that grows a fur of calcium carbonate needles and feeds on microbes.

The Levin group is interested in deep-sea ecology, so they're after anything larger than a microbe that's alive, and that usually means sponges, clams, worms and snails. A rock that most of us would relegate to doorstop duty is a veritable zoo to an ecologist. When each new rock comes up for processing, the Levin army attacks, armed with tweezers and superhuman eyesight. Promising organisms/balls of goo are then placed in seawater and cycled to the microscopes, where subsamples are taken for isotopic analysis (which provides clues about what the critters are eating) and genetic sequencing down the road. Finally, a portrait is taken, capturing these otherworldly creatures in remarkable detail.

Already, in the cruise's first three days, the Levin lab has processed 91 creepy crawly organisms and discovered a handful of new species. "This is our eighth trip to this area," Guillermo tells me, "and we're still finding all kinds of new species."

One of the remarkable things about life in the deep ocean is that it has to withstand enormous pressures. As any scuba diver will tell you, pressure goes up quickly as you descend in the water column, and at 700 meters, where Alvin is diving, there are more than 1,000 pounds pushing in on every square inch of surface area. This would not be a pleasant experience for us surface-dwellers, but deep-ocean organisms have evolved more stable cell membranes – strong enough to withstand extreme forces without snapping, but flexible enough to allow nutrients in and wastes out.

Jeffrey Marlow The two Styrofoam mannequin heads in the middle have descended to 800 meters beneath the surface of the ocean with Alvin.

Our favorite way to demonstrate the compressive effects of these high pressures is to send Styrofoam mannequin heads down with Alvin. They go down as your average life-size wig-holder and come back up looking like something out of a Lady Gaga video, shriveled and contorted.

By noon, Alvin was back in the water, a testament to our pilots' impressive troubleshooting skills, and another minor crisis faded. By 2 p.m., the elevator had surfaced, and we were soon back to sorting through the samples, tweezers in hand.

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