

The Importance of Being There

Except for the first one, the comments that follow were collected from benthic scientists during various polls and discussions conducted in the course of designing a new *Alvin*.

I believe firmly that a good instrument can measure almost anything better than a person can, if you know what you want to measure—but people are so versatile, they can sense things to be done ... I find it difficult to imagine what kind of instrument should have been put on the Beagle instead of Charles Darwin.

—Allyn Vine, Woods Hole Oceanographic Institution (1956)

The view is great from ROV monitors, but there is no replacement for being there and taking in the panoramic, 3-D view from Alvin's windows. My first Alvin dive to a hydrothermal vent field was a mind-expanding, career-changing event; I can visualize its physical dynamics like only those who have been there can. This experience/realization is renewed with every Alvin dive that I make, and I see it in the eight-hour intellectual transition that each of my students has undergone with his or her first Alvin dive. It is the most amazing educational experience that most of us will ever have; it fairly breeds creative and energetic scientific thinking. Likewise, I would predict that the best ROV pilots started out as human-occupied submersible pilots or at least have been down in one.

—Jim Cowen, University of Hawaii, SOEST

We were able to see, explore, and sample very fine differences in sediment cover, and subtle variations in flow morphology that are proving to be accurate and robust as we collect an ever increasing array of geochemical data on the samples. The submersible dives were used in concert with 120 kHz and previous dredging and submersible observations to guide the program. In my opinion, the ideal use of submersibles for this kind of study is to combine a human presence with other technologies to maximize results

I love the pace and excitement that goes with a submersible study. Although remote sensing is a useful tool in volcanology, for me there is simply no substitute for hands-on fieldwork. I would argue that the excitement and possibility to descend to previously unknown regions of the seafloor have inspired hundreds of young scientists to pursue marine geological research.

When I talk to school kids about what I do, the reactions are very telling—they think robots are cool, but in-person exploration is just simply thrilling. Would I propose new studies like the STOWA project if there were no human-occupied submersible? Oh, I don't know—maybe, probably. Maybe not. But I

guarantee that I will propose additional studies to use Alvin as long as I and it are available.

—John Sinton, University of Hawaii, SOEST

Our most significant results using Alvin are probably related to studying the first two known historical eruption sites on the Juan de Fuca Ridge: Cleft (1986) and CoAxial (1993). In both cases, the Alvin dives were critical for distinguishing new lava flows from older flows, finding new hydrothermal vent sites, and studying the biological colonization and chemical evolution of the new vents sites. In both these cases, when we were studying something relatively new and unexplored, it was critical to have our eyes on the seafloor in order to interpret what was going on.

—Bill Chadwick and Bob Embley,
NOAA PMEL & Oregon State University

...We humans are biologically programmed to ingest information with all of our senses and integrate it in time and space. These are basic tools for survival and evolutionary progress. ... Even the best remote systems just do not cut it in my view ... Just look at a Web cam from anywhere—do you really feel as if you know what is going on?

—Jeff Karson, Duke University

From an education standpoint, a dive in a submersible is a very different experience than watching the video and data feed from an ROV. I've never heard someone get off of an ROV watch and say, "That just changed my whole perspective on deep-sea ecology," or, "That was the most awesome and inspirational thing I've ever done."

—Lauren Mullineaux, Woods Hole Oceanographic Institution

Brilliance of observation matched with immersion in a natural setting is often the crucible of new insight. When coupled to new technology, new paradigms are born. Developments in deep submergence technology over the past decade have spawned a wide array of enabling vehicle and sensor technologies that profoundly enhance our ability to map, sample, and image the deep ocean.

The future of deep submergence science lies in the synergy between observational, mapping, and sampling vehicle systems, their routine availability, and high-resolution, quantitative sensor capabilities. The array must include HOVs, ROVs, and AUVs with complementary, calibrated sensors and capabilities for combined field deployments.

—Dan Fornari, Woods Hole Oceanographic Institution

Although hard to explain, “being there:” After two years of work at small sites on Endeavour with [the Canadian ROV] ROPOS (and hundreds of virtual hours on the bottom), I got a better feeling for my study sites in one Alvin dive than I had in the previous two years. This is partially because of the way my mind works, but after a dive, I knew where everything was, how big it was, what the real shapes were, etc. This takes a special mind to get from an ROV dive.

—Chuck Fisher, Pennsylvania State University

The ability to view in 3-D: I do not think that anything can replace this capability. My first views of the seafloor were through Alvin videos shown in class, and it never conveyed the distinction between fresh or altered basalts, until I could see it with my own eyes. After my first dive, it became instinctive. The capability to explore the seafloor like a field geologist, making real-time decisions based on field experience is invaluable.

—Marie Helene Cormier, Lamont-Doherty Earth Observatory, Columbia University

The ability to quickly examine a wide field of view, something ROVs are terrible at doing: This is the BEST reason to keep the manned sub ops going. Our research would be hindered if we could not personally examine the collection sites, and quickly assess the feasibility of collecting from the various patches of biota found at one dive site.

—Peter Girguis, Monterey Bay Aquarium Research Institute

Both undersea and in space, I have found the experience of being there in person profoundly transformed my prior comprehension of earth system phenomena and catalyzed the assimilation of additional data and insights. I believe strongly that experiential learning—being directly in the environment rather than just assessing data—deepens and accelerates comprehension and assimilation.

—Kathy Sullivan, former Astronaut, Oceanographer, and NOAA Chief Scientist, currently President and CEO, COSI