Colleen Cavanaugh

How do tubeworms acquire their symbiotic bacteria?

The basis for the food chain at submarine hydrothermal vents is the chemical reactions catalyzed by chemosynthetic bacteria. These bacteria, in turn, live in a symbiotic relationship with larger invertebrates, the tubeworms and giant mussles that are among the most spectacular inhabitants of hydrothermal vent fields. There is consensus among marine biologists that tubeworms do not inherit their symbiotic bacteria from the previous generation, but instead each generation somehow acquires the symbiont from the environment. The problem is, how? and where are those bacteria in the environment, before they colonize the tubeworms? These questions are essential to understanding the evolution and ecology of the hydrothermal vent communities.

The West Coast & Polar Regions Undersea Research Center (NURP) is funding a study by Colleen Cavanaugh (Harvard University) to systematically search the hydrothermal vent environment for the free-living version of the symbiotic bacteria that colonize the tubeworm species *Riftia pachyptila*. The study will also investigate the overall diversity of microbes in the vent environment. To do this, Cavanaugh used the manned submersible *ALVIN* to collect samples of bacteria from vent fluids, large volumes of seawater, and the surfaces of rocks, sulfide minerals, and the tubeworms themselves, and to deploy artificial bacterial colonization surfaces. The *ALVIN* dives were part of a larger expedition to the East Pacific Rise at 9Â˚50'N, in December 2002. The bacteria trapped during these dives are currently under study in Cavanaugh's lab at Harvard, using a range of molecular and genetic techniques.