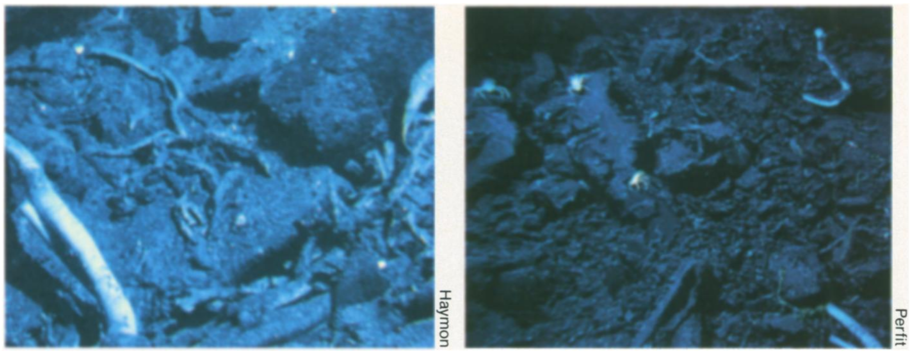
# Animals Seared by Deep-Sea Eruptions

In a stunning case of serendipity, oceanographers conducting a submarine survey have discovered a scene of underwater carnage—a site in the Pacific Ocean where recent lava eruptions sizzled a community of tubeworms and other animals living on the ocean floor. The investigators reached the site so soon after the volcanic outpourings — possibly even *during* the eruptions—that they spotted a few partially covered animals still clinging to life.

The identification of this site, located about 1,000 kilometers southwest of Acapulco, Mexico, marks the first detection of such recent deep-sea lava flows. Although underwater ridges generate about 75 percent of all eruptions on Earth, scientists have never before witnessed the immediate effects of such an event, says Rachel M. Haymon, a geologist at the University of California, Santa Barbara. Haymon co-directed the survey with Daniel J. Fornari of Columbia University's Lamont-Doherty Geological Observatory in Palisades, N.Y. The scientists reported the discovery in the Nov. 12 Eos and will describe their observations in detail at next week's meeting of the American Geophysical Union in San Francisco.



Haymon Perfit

*Photo of "Tubeworm BBQ" on April 23 (left) shows tubeworm colony destroyed by new flows of dark lava. Crabs and other scavengers had not arrived on the scene by that time, but appeared by May 27 (right).*

The new lava flows lie 2.5 kilometers underwater on the midocean ridge — a submerged volcanic mountain chain wrapped around the globe like the seam on a baseball. Scientists know that volcanic activity along this ridge creates the ocean crust through a process of seafloor spreading, but until now they lacked a detailed picture of such eruptions.

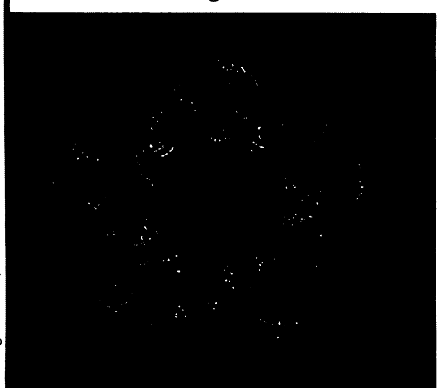
"Now, at least in one place, we know the scale of an eruption, we know what it could do and what it looks like," says Michael R. Perfit of the University of Florida in Gainesville, who participated in the survey.

Oceanographers ordinarily have no way to determine the precise age of the lavas covering midocean ridges. Some flows may be centuries old, while others date back only a decade. But when Haymon and her colleagues began their dives in the submersible *Alvin* early last April, they realized the seafloor had recently erupted because the scenery did not match pictures taken there 15 months earlier. Over the next few days, they found evidence indicating that they might be witnessing an actual eruption or its immediate aftermath.

Suspended particles had turned the water near the seafloor extremely murky, and prodigious streams of superhot water —up to 403°C—poured from the rocks. At a spot dubbed "Tubeworm BBQ" by Haymon and others, the divers found lava flows covering animal colonies, with freshly scorched tubeworms that had not yet decayed. In late April, the region was devoid of scavengers. But four weeks later, Perfit and his colleagues discovered hordes of crabs feeding on the dead

## Crystal structure solves virus puzzle

**A new computer model of the crystal structure of a monkey virus reveals how nature builds a viral coat using only five-sided building blocks.**



Liddington *et al.*/NATURE

*Computer model of simian virus 40.*

Some viruses, such as those that cause polio and the common cold, consist of genetic material encased in shells made from five-sided and six-sided bundles of protein. The coexistence of pentagonal and hexagonal bundles results in a tightly knit shell in which all bundle edges are bound together. But some larger viruses, including those associated with warts and cervical cancer, lack six-sided bundles. Without at least some hexagons, not all of the pentagons can touch on all sides, because pentagons fit together in a way that produces six-sided holes.

To learn how viruses solve this structural problem, Harvard crystallographer Robert C. Liddington and his colleagues used synchrotron radiation to probe the crystal structure of simian virus 40, a cousin of the papillomavirus that causes warts in humans. In the Nov. 28 NATURE, they describe how the five-sided bundles link up.

The coat on simian virus 40 contains a total of 360 proteins. Each protein consists of 361 amino acids strung together and folded so that one 60-amino-acid arm reaches out. The 360 proteins form 72 pentamers—five-sided building blocks containing five proteins. The arms emerging from the various proteins dangle in slightly different directions.

Twelve pentamers (blue) fit tightly with five neighbors. But the other 60 pentamers (multicolored) must each connect with six neighbors. "You've got a mismatch of symmetry," says Liddington. What allows them to fit in are the flexible arms, which allow distinct kinds of interactions.

The pentamers link themselves into a tightly bound surface. A multicolored pentamer extends one arm to an arm of the blue and three other arms to the outstretched arms of three multicolored neighbors. These four pairs of arms twist around each other, linking the pentamers, explains Liddington.

The pentamer's remaining arm then latches onto the multicolored neighbor to the left of the blue one; that neighbor, however, does not extend an arm back. Likewise, the multicolored pentamer fails to extend an arm to the outstretched arm of the multicolored neighbor just to the right of the blue one. Thus, these pentamers connect via linkages with the blue one, creating three-way ties. *—E. Pennisi*