

## Life Without the Sun?

In 1979 scientists aboard the deep-sea diving vessel Alvin were exploring a deep rift in the East Pacific Rise. What they found changed one of the basic rules of biology forever.

Biologists had taught us that all life forms were dependent on the energy of the sun for their survival. Plants need the sun's energy to produce the food that is necessary for their survival. Animals eat these plants or they eat other animals that have already eaten the plants. Even animals that lived beyond the reach of the sun's light in the depths of the oceans relied on dead plants and animals that had floated down from the sunlit shallows for their food. Even though the deep-sea creatures never saw the sun, they were dependent on it for survival.

The voyage of the Alvin changed this basic theory. Life forms were found that were not dependent on the sun's energy in any way!

The research ship was traveling along the ocean floor. Its lights picked up a column of white smoke rising into the water from the rocks of the sea floor. Not far away was a similar column of black smoke. The scientists noticed that the rocks in that part of the ocean floor were what is called pillow lava. This type of rock forms when molten rock from inside the earth meets cold sea water.

The scientists piloted the Alvin closer to one of the vents. They used their mechanical arm to pick up some of the pillow lava. Suddenly they noticed that the temperature of the sea water around them was rising. They looked out the window at their thermometer and noticed that its plastic holder was melting. Just in time, they backed away from the vent.

Then they noticed a feather worm that was more than 10 feet long and some huge clams and a giant crab. How were these creatures able to survive at a temperature of 250 degrees Celsius and at a pressure 265 times greater than the pressure at the earth's surface? What was their food source?

The answers were found in the sample of rock that the scientists had collected. The block of rock consisted of several heavy metals and sulfur. The smoky vents they found were caused by volcanic activity near the crust. Sea water can leak into the cracks in the crust. This water is heated until it is super hot. It dissolves minerals from the rocks around it. The water eventually turns to steam and escapes out cracks or vents in the rocks, carrying with it the dissolved minerals.

The escaped steam cools quickly, and as it turns back into liquid water, the dissolved minerals precipitate out and coat the nearby rocks. Small, microscopic life forms are able to live on the minerals, especially the sulfur, that coat the rocks. Larger animals, such as the feather worms and clams, filter these organisms out of the water and feed on them. The giant crabs feed on the clams and feather worms.

The scientists had made a startling discovery. They had found a community of organisms that was not dependent on the sun for energy and for survival. These organisms were dependent on the energy of the molten rock found within the earth. Thermal energy was the original source of their food, not solar energy.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

For the student:

1. Does all life depend on the sun for survival? Explain.

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2. What caused sea water to turn to steam along the ocean floor?

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3. Why didn't scientists discover the deep-sea life forms 50 years earlier?

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4. What types of animals did scientists see in the Alvin?

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5. How big were the creatures that the scientists saw?

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6. What did these creatures eat? What was the original source of their food?

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7. Other than total darkness, what problems did animals of the rift zone have to deal with for survival?

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8. Where were the vents located?

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