Life can find ways to flourish even near hydrothermal vents

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The first humans to see the strange life forms that flourish around deep ocean hydrothermal vents were the crew of the submersible Alvin in 1977.

Vents are formed by the movement of tectonic plates that cause cracks in the sea floor. This allows the near-freezing sea water to seep several kilometers down into the magma beneath the earth's crust. The magna rapidly raises the temperature of the water causing the water to rise back to the sea floor. Where the water and magma meet, the magma releases into the water many compounds of sulfur and carbon.

Although the contact with magma can heat the water as high as 750 degrees, the water does not boil due to the intense water pressure at the ocean floor. The water from the vents quickly cools as it enters the open ocean.

Vents may have black or white smokers. Smokers are named after the colored plume they release, as 500-degree to 750-degree water from the vent makes contact with the 36-degree sea water. When the hot chemical-rich water in the smokers meets the cool sea water, some of its dissolved compounds precipitate out of the water. The released minerals form towers, which resemble chimneys, around the vent. The highest recorded smoker tower stood 160 feet tall.

Vents often form in clusters, some covering an area roughly the size of a football field. Vents are normally found in and around the Mid-Oceanic Ridge, although they have been discovered in nearly all oceans. The life span of a vent is relatively short. Most last no more than a few decades.

Ecosystems form rapidly around vents. The various types of bacteria in and around the vents form the foundation of the ecosystem. The bacteria are the first to arrive, making the sites habitable for the rest of the vent ecosystem. Some species of bacteria arrive in large clusters that some scientists have compared to snowstorms.

The lack of sunlight prevents the bacteria from using photosynthesis to make food. Instead the bacteria use chemical reactions with the hydrogen sulfide in the water to obtain energy.

Other creatures that live around the vent include mollusks, tubeworms and crustaceans. Several of the vent's creatures play host to the bacteria, most notably the tubeworms. The symbiotic relationship is beneficial to both the animal and the bacteria. The animal is provided with easy access to an abundant food source: carbohydrates made by the bacteria using energy from the hydrogen sulfide.

Living within the tissues of the tubeworm provides the bacteria with a perfect environment for rapid reproduction. An adult tubeworm can have as many as 285 billion bacteria per ounce of its flesh. Up to half of a worm's weight is actually the bacteria housed within it. The reproduction level of the vent bacteria is estimated to be 200-300 percent greater than the reproduction level of bacteria on the surface.

The tubeworms live in clusters that are on or very near the vents. They do so to make life as comfortable as possible for the bacteria living inside them. The worms are without a mouth or gut. This makes them solely dependent on the bacteria for life. The hemoglobin in their blood absorbs the hydrogen sulfide from the water and transports it to the bacteria.

Using carbohydrates made by their bacteria, the tubeworms are able to grow 33 inches or more a year, making them the fastest-growing marine invertebrates. They complete the maturing process rapidly, enabling them to quickly reproduce in an ecosystem with a short life span.

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Tubeworms are shown growing near the boundary where hot vent fluid mixes with cold seawater. Tubeworms lack a mouth or stomach, and instead have billions of symbiotic bacteria living in their red plumes producing sugars from sea chemicals.