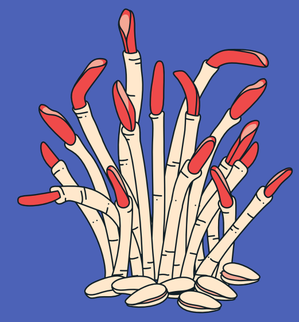


HYDROTHERMAL VENTS: HOW STRANGE LIFE GROWS WITHOUT SUNLIGHT

SEEDS OF SCIENCE

Burke Harris - Middle Primary - Balnarring Primary School - MP-1-269

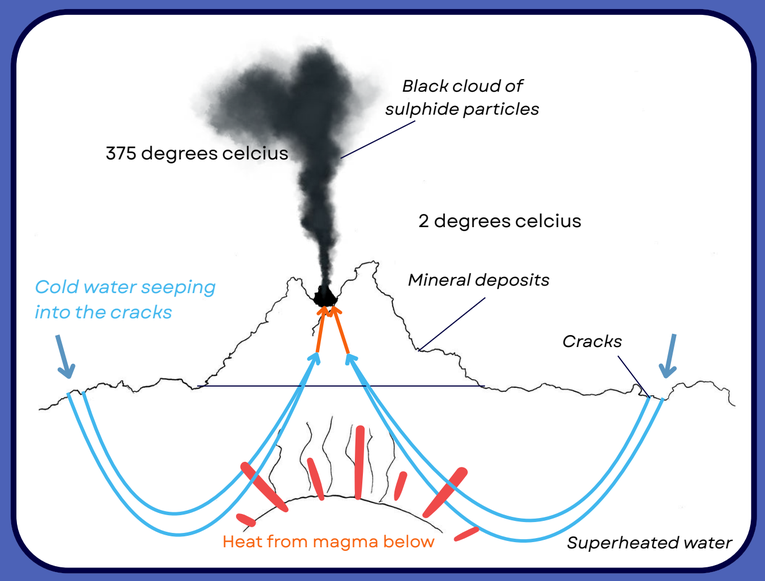
Hydrothermal vents are 'Seeds of Science' because they help scientists understand how life survives in entreme environments and may provide clues about how first life began on Earth.



What are Hydrothermal Vents?

Hydrothermal vents look like smoking chimneys at the bottom of the ocean. As shown in Figure 1, they are formed by seawater seeping into cracks in the ocean floor, where it becomes superheated by magma below, dissolving minerals such as hydrogen sulphide as it passes through rocks before rising back up through the cracks and erupting hot mineral-rich water. As the hot, water is chilled by the cold ocean water, the minerals precipitate and make what looks like smoke. Other minerals are deposited around it to form these amazing chimney-looking structures *(Dk Publishing, Inc)*.

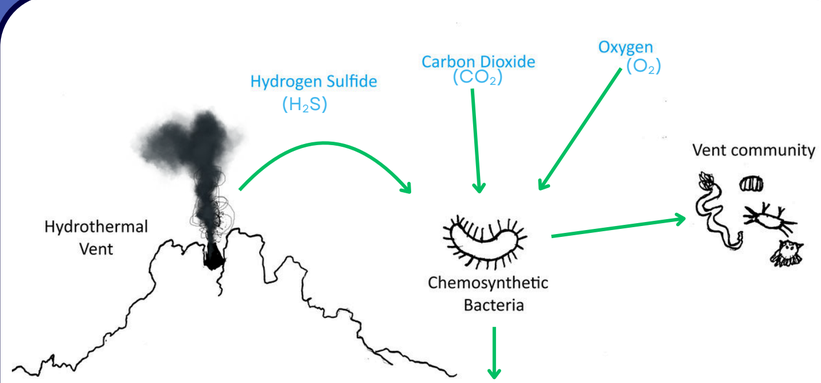
Figure 1 - Formation of a Hydrothermal Vent



How Life Survives There / Chemosynthesis

Scientists discovered hydrothermal vents in 1977 in the Pacific Ocean. Before scientists made this discovery they believed that all life on earth depended on sunlight, but it turned out that some deep ocean life doesn't (*Attenborough and Butfield*).
The minerals from the vent water are used by bacteria to make energy. This process is called Chemosynthesis (*Black*) (see Figure 2). These bacteria form the base of the ecosystem and support animals such as Giant tubeworms, Giant clams and visitors such as Dumbo octopuses (Honeyborne et al.). The bacteria act as 'seeds' of the ecosystem because all the other vent animals depend on them.
Hydrothermal vents are considered extreme environments because they have high pressure, complete darkness and very hot temperatures.

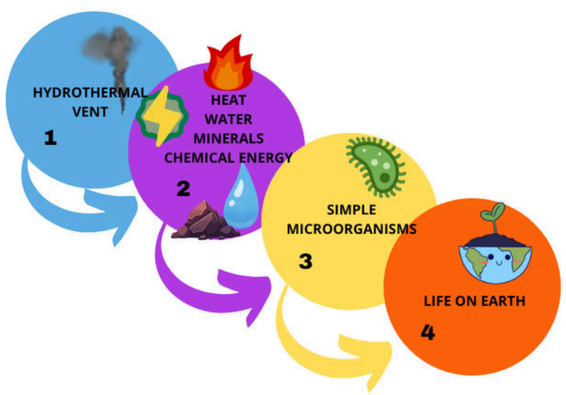
Figure 2 - Chemosynthesis at a Hydrothermal Vent



The Origin of Life

One of the biggest questions in science is how life first began on earth. Some scientists believe that hydrothermal vents could have taken part in that process because they provide heat, minerals, water and chemical energy... all the ingredients needed for simple life to be formed. Unlike most ecosystems on Earth, hydrothermal vent communities don't depend on energy from sunlight, instead, the bacteria use chemicals such as hydrogen sulphide from the "smoke" to produce energy through chemosynthesis. Some scientists think that something similar may have helped the first living organisms on Earth billions of years ago. Although scientists are still uncovering secrets about how exactly life began, hydrothermal vents provide important clues. By studying these deep sea environments scientists can learn more about the extreme conditions that could have allowed life to develop on earth (*MarineBio Conservation Society*).

Figure 3 - The Recipe for Life



Did You Know?

Giant tube worms living near hydrothermal vents can grow over 2 metres long and have no mouths or stomachs. They rely entirely on bacterial living inside them for food (*Weiss*).

Bibliography

Attenborough, Sir David, and Colin Butfield. *Ocean. Earth's Last Wilderness*. Grand Central Publishing, 6 May 2025.
Black, Riley. *Deep Water*. Hachette UK, 1 Oct. 2023.
Dk Publishing, Inc. *Ocean. The World's Last Wilderness Revealed.* New York, Dk Pub, 2006.
Honeyborne, James, et al. *Blue Planet II : A New World of Hidden Depths*. London England, Bbc Books, An Imprint Of Ebury Publishing, 2018.
MarineBio Conservation Society. "*Hydrothermal Vents & Chemosynthetic Ecosystems.*" MarineBio Conservation Society, www.marinebio.org/oceans/deep-sea/hydrothermal-vents/. Accessed 23 May 2026.
Weiss, Sabrina. *Ocean Creatures*. Simon and Schuster, 15 Oct. 2024.

Search for Life

Jupiter's moon Europa and Saturn's moon Enceladus are amongst the most likely locations for extraterrestrial life within our Solar System. Both moons are believed to contain subsurface oceans of liquid water beneath icy crusts where photosynthesis would be impossible but chemosynthesis could potentially supprt life. (*MarineBio Conservation Society*).