

Examples of Earthly Extremophiles

Cold – The McMurdo Dry Valleys in Antarctica are some of the coldest, driest deserts on Earth, with average annual temperatures of -20°C (-4°F) and less than 10 centimeters (4 inches) of precipitation a year. Scientists have found bacteria in liquid water pockets embedded about twelve feet deep in “solid” lake ice. Some of these bacteria use chemical nutrients from particles of dirt in the ice and use energy from sunlight for photosynthesis.

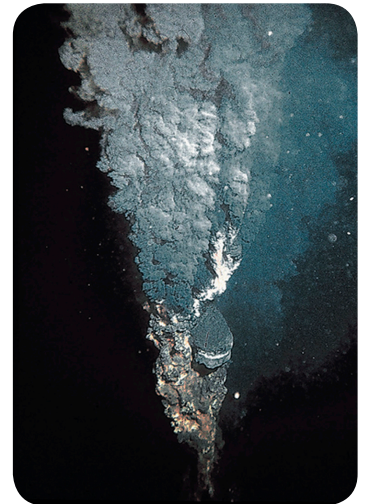


Hot – Large concentrations of microbes thrive in Yellowstone National Park’s Grand Prismatic Springs, a hot spring with water temperatures up to 90°C (188°F). Other hot springs in Yellowstone are extremely acidic, yet are home to many different kinds of bacteria and microbes. Many of these microbes use chemical nutrients in the waters and energy from sunlight for photosynthesis.



Deep underground – Scientists have discovered bacteria living in groundwater 5 kilometers below the surface in deep gold mines of the Witwatersrand Basin in South Africa. These microbes thrive in cavities and cracks in rocks. Scientists are also investigating life within and below permafrost in northern Canada.

Bottom of the sea – Scientists have found abundant life clustered around hydrothermal vents on the ocean floor, including bacteria, mussels, clams, shrimp, and giant tubeworms that can reach ten feet in length. Water pouring out of the vents in the complete darkness thousands of feet under the surface of the sea can reach temperatures of $113\text{-}120^{\circ}\text{C}$ ($235\text{-}248^{\circ}\text{F}$). The high pressures keep the water from boiling. Bacteria use chemicals in the vent’s water, primarily hydrogen sulfide, as their energy source instead of sunlight. Other creatures survive by eating the bacteria or each other.



High Acidity – The water in the Rio Tinto in southwestern Spain is very acidic, a result of chemical reactions between the water, and iron and sulfur minerals in the ground. The river has a deep red color, like wine, because of iron dissolved in the water. Microbes living in the water use chemical reactions with iron and sulfur minerals to generate the energy they need. Products from these metabolic reactions contribute to the low pH in the environment. Many algae and fungi also live in the acidic waters.