

SCIENCE & TECHNOLOGY

In 1760, Sicilian artist Fillipo Morghen depicted the moon as a tropical paradise.



Library of Congress.

thought that the moon's darker surfaces were bodies of water. He reasoned that God would not have made a spotted moon if He intended it only to reflect sunlight toward the Earth. But Huygens' stargazing revealed that the moon's dark spots were pitted, and therefore could not be liquid. His observations of Venus, Mars, Mercury, and Jupiter were just as discouraging.

The notion of extraterrestrial life challenged Church doctrines. Could Adam's original sin, for example, be extended to moonmen, who also required salvation? There was speculation over the role of Jesus Christ as a kind of "planet-hopping Savior."

Worried religious leaders could not suppress the 17th-century search for alien life forms. According to Dick, discussion of extraterrestrial life by the likes of Kepler, Huygens, Wilkins, and, in the 18th century, by German philosopher Immanuel Kant completed the intellectual revolution begun by Copernicus. These thinkers helped to free scientists of their preoccupation with the "closed world" of Earth and roused their curiosity about the larger universe.

Nature's Undersea Laboratories

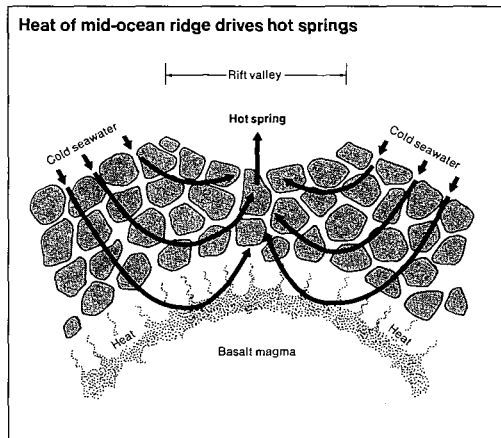
"Ocean's Hot Springs Stir Scientific Excitement" by Mitch Waldrop, in *Chemical and Engineering News* (Mar. 10, 1980), Membership and Subscription Services, ACS, P.O. Box 3337, Columbus, Ohio 43210.

The recent discovery of two underwater hot springs on the crest of the Pacific's mid-ocean ridge is forcing geochemists to rethink traditional theories about the oceans' chemical history, writes Waldrop, a *Chemical and Engineering News* correspondent.

A Woods Hole Oceanographic Institute expedition discovered the

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Heated by molten rock, millions of gallons of water per second shoot through vents in the ocean floor.



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first spring in February 1977 on the Galápagos Rift Zone midway between the Galápagos Islands and Ecuador. In April 1979, a second vent was located off the tip of Baja California. These finds "represent a totally new geochemical force," a system of hot springs riddling virtually the entire 30,000-mile length of the world's mid-ocean ridge system, according to Waldrop.

Scientists believe that the vents are formed by a percolating process. The ocean's cold bottom water seeps through porous rock along the ridge until it hits molten basalt rock, and the scalding water surges upward and chemically reacts with surrounding rock until it spews forth as a mineral- and gas-laden hot spring. Molten basalt that wells up with the water forms a new crust on the ocean bottom.

The temperatures of the spring water vary widely. The maximum temperature at Galápagos is around 62°F—hot only when compared to the frigid surrounding waters. But at Baja California, the water blasts out of rock chimneys at nearly 700°F. Ocean chemists believe that the Baja water goes directly from the hot basalt to the surrounding ocean, while the Galápagos water is cooled along the way by ordinary sea water that leaks into the spring through crevices in the surrounding ocean floor.

Scientists estimate that a million and a half gallons of water pour through the entire (mostly undiscovered) vent system per second, "enough to [recycle] the whole ocean in about 8 million years—500 times since the Earth began."

These figures flatly contradict the old model of the ocean as an immense, passive evaporation pan—formerly invoked to explain why sea water is salty. According to Waldrop, the discovery supports an alternative view that depicts the hot springs as natural "laboratories." They manufacture the chemicals needed to make salt water out of fresh water that continually flows into oceans from the world's rivers.