

Cellular Origin, Life in Extreme Habitats and Astrobiology 24

Arnold Hanslmeier
Stephan Kempe
Joseph Seckbach *Editors*

Life on Earth and other Planetary Bodies

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Book Chapter:

Life in Earth's Lava Caves: Implications for Life Detection on Other Planets

- Diana E. Northup,
- Jennifer J. M. Hathaway,
- Jessica R. Snider,
- Monica Moya Balasch,
- Matthew G. Garcia,
- Maria L. N. Enes Dapkevicius,
- Cristina Riquelme Gabriel,
- Fred D. Stone,
- Michael N. Spilde,
- Penelope J. Boston

Abstract

Lava caves represent a scientifically untapped habitat in which to study Earth's microbial life and provide an outstanding environment in which to identify biosignatures for detecting life on other planets. Our studies of microbial mats and mineral deposits in lava caves in the Azores (Portugal), New Mexico, and Hawai'i (USA) have revealed a wealth of bacterial diversity through molecular genetic analyses and scanning electron microscopy. Much of this bacterial diversity represents novel species, as well as novel higher taxonomic units, such as genera and families. Geochemical analyses of infiltrating water, soils, and rock walls suggest the presence of organic carbon that may fuel heterotrophy and reduce inorganic energy sources, such as iron, manganese, and sulfur to fuel chemolithotrophy. Scanning electron microscopy studies of mineral deposits, accompanied by molecular studies, reveals the presence of extensive biological morphologies in a variety of mineral deposits decorating lava cave walls. These studies provide a rationale for examining mineral deposits in lava caves on extraterrestrial bodies in the search for life or its remnants.

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