

# **Molecular survey of microbial communities at the Lost City Hydrothermal Field reveals an ecosystem dominated by methane metabolism**

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The Lost City Hydrothermal Field (LCHF) is primarily driven by exothermic serpentinization reactions that result in highly reducing, high-pH fluids containing high concentrations of hydrogen, methane, and organic compounds. Phylogenetic analyses of 16S rDNA and methyl coenzyme-M reductase at the LCHF indicate the presence of organisms related to sulfur-oxidizing, sulfate-reducing, and methane-oxidizing *Bacteria* as well as methanogenic and anaerobic methane-oxidizing *Archaea*, suggesting a microbial role in sulfur and methane cycling at the LCHF. DNA from organisms related to *Methanobacter* and *Thiomicrospira* were recovered from several carbonate rock and fluid samples with a range of chemical and geological characteristics. In contrast, methanogens were found exclusively in high temperature chimneys, while methanotrophic *Archaea* were restricted to lower temperature, less active sites. Furthermore, 16S rDNA sequences belonging to the *Thermococcales* were identified in LCHF fluids, indicating a possible interaction with a sub-seafloor habitat. Because the formation of a system such as the LCHF requires only the formation of oceanic crust and not necessarily modern tectonic or volcanic activity, it may be a useful analog for habitats widespread on the early Earth and possibly other planetary bodies. Moreover, the dominance of methane metabolizing microorganisms at the LCHF could provide insight and strategies for understanding the sources/sinks of the methane detected recently on Mars.