# Methanogenesis in Subglacial Environments - Biosignatures of Extraterrestrial Life

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Evidence of liquid water in the basal zones of Polar ice sheets and the discovery of over 140 subglacial lakes in Antarctica suggests that these environments may not be the lifeless deserts they were once thought. Indeed, subglacial sediments, ice, and water have been shown to harbor a diversity of microorganisms. While the majority of organisms found in subglacial and polar environments have been those which live by respiring oxygen, it is quite likely that there is no oxygen in many subglacial environments, resulting from a lack of connectivity to the outside atmosphere, which suggests that many microorganisms which can live in oxygen free environments may be present. There is also the exciting possibility that in oxygen-free icy extra-terrestrial environments, including the icy Martian Poles, and the icy moons of Jupiter, similar forms of microbial life may also exist.

Methanogens are a major group of microorganisms which live and survive in oxygen-free environments, because instead of oxygen, they use carbon and hydrogen to respire, and produce methane, the well known greenhouse gas, as a by-product of their activity. However, because of scientific limitations in detecting methanogens, we have until now known very little about the occurrence, diversity, abundance, and activity of methanogens in subglacial environments, despite the implications such data would have for our ability to identify biosignatures of life-sustaining processes on other planets.

We will use a combination of novel techniques to investigate the occurrence, diversity, abundance, and activity of methanogens in subglacial sediment, ice, and liquid water samples collected from Robertson Glacier, Alberta, Canada. We will extract DNA from microbes present in subglacial samples and probe for specific genes which control methanogenesis, and will look for specific bio-molecules produced by methanogens which will indicate whether the methanogens are living and active. These data have large-scale implications for understanding and detecting life in extreme terrestrial systems and extraterrestrial environments.

## Contact Info


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