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Western Inter-University Geosciences Conference Abstract

Geobiology of the Paleoproterozoic Belcher Group, Nunavut, Canada

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The ~2.0-1.8 Ga Belcher Group on the Belcher Islands in Nunavut provide a unique opportunity for studying Paleoproterozoic geobiology. The Belcher Group includes a sequence of low metamorphic grade peritidal carbonate rocks that preserve putative microbiota, as first described by Hofmann and Jackson (1969). Microbial mats, including stromatolites, are abundant in the pertidal carbonate succession. Additionally, morphologies possibly related to blue-green algae were first described in granular iron formation rocks of the Belcher Group by Moore (1918). The Belcher Group microbiota are a group of simple organisms, believed to be prokaryotic in nature. Microbiota morphologies include ellipsoids, spheroids, and filamentous chains of cells interpreted by previous workers to represent blue-green algae and acritarchs. Some microstructures are questionably biogenic and might be abiotic. The most significant field studies on the Belcher Group occurred from the late 1950's to the early 1980's, which provides the geological context for this study. This project aims to build on the previous work of H. Hofmann and others in the '60s and bring these microbiota into a modern context, drawing on the analytical advancements of the last 50 years. The main goal of the project is to determine if there is evidence that the microbiota are perhaps eukaryotic organisms. The emergence of eukaryotes is arguably the most significant geobiological event in Earth history, with eukaryotic cells believed to have evolved around 1.6 Ga (Knoll et al. 2006; Javaux and Lepot 2018), but some contentious fossils interpreted to represent eukaryotes have been dated to as early as 2.2 Ga (Retallack et al. 2013). In North America, the oldest discovered eukaryotic remains are around 1.5 Ga (Adam et al. 2017). If eukaryotic fossils were to be discovered in the Belcher Group, this would make them the oldest occurrence in North America. To test the hypothesis, samples from the microbiota-containing units were collected on the Belcher Islands. Both light microscopy and a collection of modern analytical techniques will be used to obtain high resolution images and chemical signatures of the microbiota and their biosignatures. Preliminary data from petrography, Raman Spectroscopy, and X-ray Photoelectron Spectroscopy (XPS) will be presented.

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