MINERAL DEPENDENT CHEMOLITHOTROPHY IN SUBGLACIAL SYSTEMS. M. L. Skidmore[1*], R. Mitchell[1], A. Steigmeyer[1], W. van Gelder[1], E. Dunham,[2] M. Lindsay[2], T.L. Hamilton[3], E. S. Boyd[2]. [1]Department of Earth Sciences, Montana State University, Bozeman, MT, USA. [2]Department of Microbiology and Immunology, Montana State University, Bozeman, MT, USA. [3]Department of Biological Sciences, University of Cincinnati, OH, USA. (*skidmore@montana.edu)

Earth, like other planets in our solar system, has experienced numerous intervals of glaciation throughout its history. On Earth, abundant, active, and diverse microbiomes exist beneath ice masses which are supported by mineral-based energy made available through the communition of bedrock. Recent research conducted on ice masses in sedimentary and metasedimentary catchments indicate a primary role for Fe and S in minerals such as pyrite in sustaining microbes in a range of subglacial environments despite pyrite only being of low abundance (1-2 wt %) in the bedrock. However, little is known of the role of mineralogy or of the specific water rock interactions that sustain microbial ecosystems in basaltic systems.

Crushed basalt, which comprises 5-14 wt % FeO and 45-55 wt % SiO_2, has been shown to generate hydrogen (H_2) when exposed to water at 30 to 60°C. The H_2 produced was suggested to result from the reduction of water by reduced iron. But, recent research demonstrates significant H_2 production following abiotic crushing of a variety of silicate minerals at 0°C and subsequent wetting in a process that simulates glacial communition of silicate bedrock. however, basalt was not a rock type analyzed in our recent study and thus rates of abiotic H_2 release from crushed, wetted basalt via a Si mineral shearing mechanism at temperatures relevant to subglacial ecosystems (0-1°C) are unknown. Moreover, it is unclear if Si mineral shearing or Fe-based mechanisms are most likely to contribute H_2 in basaltic subglacial systems and whether microbial communities present in these systems are founded on H_2-based chemolithoautotrophy. We report on the geochemical and microbial properties of subglacial systems recently sampled in Iceland and evaluate the role of H_2 and iron cycling as predominant modes of metabolism in these systems.