Contribution ID: **310** Type: **Oral presentation**

KEYNOTE: Geomicrobiology in and beneath polar ice sheets

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Once thought devoid of life, glacial ice has only recently been recognized as a habitat for life and a potentially significant global reservoir of organic carbon. Because biological particles in ice provide quantitative (cell density) and qualitative (genetic evolution and metabolic potential), their study can address many facets of the Earth system. When collected in concert with other impurities in the ice, the density, genetic potential, metabolic function and community composition of ice-bound microbes can provide new and corroborative information regarding past climate patterns, sea-ice extent, atmospheric circulation, and the origin of particles within the ice itself. Biological data can further be used to more accurately interpret paradoxes that exist in the concentrations and isotopic ratios of biologically important gases in ice cores. Biological matter deposited on the surface of glaciers and ice sheets also provides seed material for subglacial environments. Subglacial environments represent a crucial and relatively unstudied transition zone between an ice sheet and underlying geologic substrata. Processes taking place in this zone determine: i) the rate and patterns of ice sheet movement, (ii) erosional and sedimentary dynamics of an ice sheet, (iii) phylogenetic and metabolic diversity, (iv) the biogeochemical transformation of materials between an ice sheet and its geologic substrate, and (v) transport of nutrients to the surrounding marine environment. The first indirect evidence for life in subglacial lakes came from studies published in 1999 of accretion ice overlying Vostok Subglacial Lake, one of the largest lakes on our planet. Direct clean sampling of Whillans Subglacial Lake in January 2013 and Mercer Subglacial Lake in January 2019 provided the first unequivocal evidence for thriving microbial ecosystems beneath the West Antarctic Ice Sheet. Results from these subglacial studies showed that their biology is fueled by relict marine organic matter and in situ chemolithoautotrophic carbon production. I will present data on the bacterial distribution in the West Antarctic Ice Sheet from the Late Glacial Maximum to the early Holocene, microbial changes in Himalayan Glaciers (the Third Pole) over the past 60 years, and discuss recent biogeophysical discoveries in the subglacial aquatic environment beneath the West Antarctic ice sheet.

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Track Classification: Progress in proxy development and interpretation