# Morphological and mineralogical biosignatures of anoxygenic photosynthetic benthic microbial communities

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To improve our understanding of life and processes recorded by shallow marine Archean sediments, we explore the ecology, morphology, metabolisms and fossilization potential of benthic photosynthetic microbial communities that lack cyanobacteria. We culture photosynthetic microbial biofilms in the presence of methane, hydrogen, Fe(II) and Mn(II) in anaerobic solutions that mimic the Archean seawater and analyze the microbial, mineral diversity and the preservation of textures. 16S rRNA gene amplicon paired-end sequencing on the MiSeq Illumina platform shows that cyanobacteria are absent from the cultures and Chlorobi are the dominant photosynthetic organisms. Methane, CO and other gases in some cultures lift biofilms and produce cuspate structures with morphologies similar to some Archean stromatolites. Calcite, dolomite, kaolinite and other minerals precipitate early and are able to preserve fine microbial textures. Future work will compare the textures of model microbial mats and various Archean stromatolites and analyze the carbon isotope composition of organic matter and carbonate minerals.