THE ROLE OF MICROBIAL MATS IN THE FOSSILIZATION OF SOFT-BODIED ORGANISMS IN SANDY SEDIMENTS. S. A. Newman[1,*], S. C. Fakra[2], M. A. Marcus[2] and T. Bosak[1], [1]Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139, USA (*correspondence: sharon.newman@mit.edu), [2]Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, California, 94720, USA

Soft-bodied organisms are known to be commonly preserved on the bedding soles of Ediacaran and early Cambrian coarse-grained siliciclastic sediments, but rarely occur in similar coarse-grained environments of the later Phanerozoic. Thus, it is likely that a unique taphonomic window opened and closed during the terminal Proterozoic/early Phanerozoic, which facilitated the preservation of soft, labile tissues in sandy environments. In the absence of grazing and bioturbating metazoans, microbial mats were widespread in Precambrian shallow marine settings, and may have played an important role in the fossilization of early animals. In this study, we experimentally test the ability of microbial mats to preserve soft tissues. Scallop, shrimp and worm tissues were buried within microbial mats growing on beach sand in the presence of 0.1 mM dissolved silica. Control experiments were performed in the absence of microbial mats. Energy Dispersive X-Ray Spectroscopy (SEM-EDS) reveals the formation of clay minerals around soft tissues that were incubated for 25 days in the presence of microbial mats. However, clay minerals do not visibly coat tissues incubated in the absence of microbial mats during this same time interval. Micro-focused Fe K-edge X-Ray Absorption Near Edge Structure (μXANES) spectroscopy and X-ray diffraction (μXRD) reveal abundant Fe-rich clays as well as organic-bound Fe(III) and sulfate-bound Fe(II) coating soft tissues after 25 days of incubation. These findings suggest that interactions among microbes, tissues and the redox cycling of iron may have been critical for the early fossilization of soft tissues in sandstones and siltstones of the terminal Proterozoic and early Cambrian Period. Additional work will assess the specific mechanisms of microbe-mineral interactions that are associated with the fossilization of soft-bodied organisms.