

DEVELOPMENT AND APPLICATION OF A CLASSIFICATION SCHEME FOR MICROBIALITE MORPHOLOGY IN MODERN ENVIRONMENTS: MAPPING PAVILION LAKE WITH DEEPWORKER SUBMERSIBLES. R. Shepard¹, M. M. Marinova², A. L. Brady³, A. Forrest⁴, G. F. Slater³, B. Laval⁴, M. Gernhardt⁵, M. Wilhelm⁶, Z. Cardman⁷, D. S. S. Lim^{8,9}, ¹Department of Geology, University of California, Davis, ²Planetary Science, California Institute of Technology, ³School of Geology and Geography, McMaster University, ⁴Department of Civil Engineering, University of British Columbia, ⁵NASA Johnson Space Center, ⁶Cornell University, ⁷University of North Carolina, Chapel Hill, ⁸NASA Ames Research Center, ⁹SETI Institute.

Introduction: The morphology of microbialites is the most commonly preserved and most easily recognizable characteristic of these structures within the fossil record. The microbialite form is the result of complex interactions between microbial communities and environmental processes. Unraveling the complex biological and environmental influences on microbialite morphogenesis is challenging, yet is potentially invaluable in our attempt to understand the early establishment and evolution of Earth's biosphere.

Microbialites forming in modern environments provide a natural laboratory in which to examine details of morphogenetic processes that can then be applied to the rock record. It is useful to make such comparisons between modern and ancient processes within the context of specific morphological traits. This requires a systematic characterization of modern microbialite morphology. In many modern microbialite systems, the diversity of morphological forms is relatively limited or difficult to survey, and a systematic classification scheme has not been adopted across modern environments. In contrast, the microbialites present in Pavilion Lake, British Columbia, exhibit an impressive diversity of morphological form as well as a complex distribution throughout the lake. Such diversity has made the development of a modern microbialite classification scheme essential. The use of DeepWorker submersibles in Pavilion Lake has allowed the extensive mapping of the lake that makes the application of such a classification scheme possible.

Here we present the classification scheme developed and applied to the microbialite morphologies of Pavilion Lake. The scheme was modified from the fossil stromatolite classification scheme developed by Hans Hofmann, 1969 [1]. Mapping of the lake was conducted by observation from DeepWorker submersible as well as HD video recording. The classification scheme was applied to still images extracted from the HD video at 3 second intervals. The morphological classification analysis is being conducted in conjunction with mapping of the other environmental parameters such as lake geochemistry, light conditions, and substratum characteristics. The emerging dataset of classified microbialite morphological diversity within

an environmental context is unique among modern environments.

References: [1] Hofmann, H. J. (1969) *Geological Survey of Canada*, 69-39.