

**Mono Lake, California: A Natural Lab for Geomicrobiology**

J. D. Farmer<sup>1</sup>, <sup>1</sup>Arizona State University, School of Earth and Space Exploration, P.O. Box 871404, Tempe AZ 85287-1404; jfarmer@asu.edu

Mono Lake is a terminal (hydrologically closed) lake basin in eastern CA that has been in existence since the late Pleistocene [1]. Mono Lake is famous for its stunning tufa towers, clusters of carbonate pinnacles that form around cold springs on the lake floor sediments [2]. Spring-related tufas are not unique to Mono Lake, but rather common features of alkaline, hypersaline terminal lake environments, worldwide [3]. Because evaporative lake depositional systems also appear to have been widespread on Mars early in the planet's history [4]. Could low temperature mineralizing springs have also been present on Mars? If so, what is their potential as a target for astrobiological exploration?

The tufa deposits of Mono Lake provide a particularly interesting environmental setting for investigating the processes of biosignature capture and preservation in rapidly mineralizing depositional systems. For the past 35 years, there has been an ongoing debate over the role that microbes play in forming the tufa towers of Mono Lake [5]. Our recent studies have provided important insights into: A) the role that microbial biofilms play in tufa formation; B) the initial stages of biofilm fossilization and the nature of taphonomic biases that affect microbial biosignature capture and preservation; C) the effects of early diagenetic mineral transformations (polymorphic phase transitions, recrystallization and replacement) on biosignature retention; and D) how information from modern systems can help us better interpret the paleoenvironmental and microbial fossil records of ancient analog deposits.

In this talk, I will review recent progress in our study of primary depositional and secondary diagenetic processes operating in the carbonate depositional system of Mono Lake, the nature biosignature preservation and implications for Mars exploration.

**References:**

[1] Russell, I. C. (1889). Quaternary history of Mono Valley, California: U. S. Geol. Survey 8th Annual Report For 1886-1887, pp. 261-394. [2] Council, T. C., and P.C. Bennet (1993). Geochemistry of ikaite formation at Mono Lake, California: implications for the origin of tufa mounds. *Geology*, 21: 971-974. [3] Ford, T.D.; H.M. Pedley (1996). A review of tufa and travertine deposits of the world. *Earth-Science Reviews* 41 (3-4): 117-175. [4] Dunn, J. R. 1953. The origin of the deposits of tufa in Mono Lake. *J. of Sed. Petrology*, 23(1): 18-23; [5] Scholl, D. W., and Taft, W. H. 1964. Algae, contributors to the formation of calcareous tufa, Mono Lake, California. *J. of Sed. Petrology*, 34(2): 309-319.