ANCIENT LACUSTRINE MUDSTONES AND ASSOCIATED FLUVIO-DELTAIC STRATA AT GALE CRATER: MARTIAN SEDIMENTARY CONTEXTS IN THE SEARCH FOR ANCIENT BIOSIGNATURES. S. Gupta[1], J.P. Grotzinger[2], D.Y. Sumner[3], D.M. Rubin[4], S.G. Banham[1], K. M. Stack[5], J.A. Watkins[2], N. Stein[2], K.S. Edgett[6], J. Hurowitz[7], K.X. Lewis[8], R.A. Yingst[9], M. E. Minitti[9], J. Schieber[10], A.R. Vasavada[5]

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Introduction: Ancient lacustrine deposits are considered to be one of the prime targets in the search for biosignatures on Mars because lake environments provide a likely favorable setting for formation and preservation of such signatures. One of the major discoveries of the Mars Science Laboratory mission has been that of a thick succession of mudstone deposits in strata exposed at the base of Aeolis Mons (Mt. Sharp) [1]. These mudstones have been interpreted as ancient lake deposits. Here, we characterize their sedimentology and consider the implications of their physical and chemical characteristics in the search for ancient biosignatures on Mars.

Lacustrine deposits in Gale crater: The mudstones of the Murray formation, which were originally identified at the Pahrump Hills field site in Gale crater, are characterized by abundant fine-scale parallel laminations. The ~13 m thick section at Pahrump Hills is dominated by such laminated deposits which are interpreted to be suspension fall-out sediments in an ancient lake system in Gale crater. Towards the top of the Pahrump Hills section interbedded cross-stratified sandstones are considered to record fluvio-deltaic incursions into the lake. Since leaving Pahrump Hills, the *Curiosity* rover has climbed up stratigraphic section through the Murray formation, with an ~40 m thickness of Murray formation (predominantly mudstones) recorded between Pahrump Hills and the Bagnold dunes field site. This succession of mudstones is characterized by pervasive development of fine-scale lamination throughout the succession, although significant diagenetic features such as nodules are also present.

The Gale example provides a significant sedimentary context for future exploration for biosignatures on Mars in deltaic-lacustrine systems. In this presentation, we will present detailed results of sedimentological observations that permit reconstruction of ancient lake systems and the later effects of diagenesis, and discuss the implications of these in the search for biosignatures.

References:

[1] Grotzinger J.P. et al. (2015) Science, 350.