

## Mineralogical and Geochemical Trends in a Fluviallacustrine Sequence in Gale Crater, Mars

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The Mars Science Laboratory rover, *Curiosity*, landed at Gale crater in August 2012 and has been investigating a sequence of dominantly fluviallacustrine sediments deposited 3.6-3.2 billion years ago [1]. *Curiosity* collects quantitative mineralogical data with the CheMin XRD/XRF instrument and quantitative chemical data with the APXS and ChemCam instruments. These datasets show stratigraphic mineralogical and geochemical variability that suggest a complex aqueous history.

The Murray Formation, primarily composed of fine-laminated mudstone, has been studied in detail since the arrival at the Pahrump Hills in September 2014. CheMin data from four samples show variable amounts of iron oxides, phyllosilicates, sulfates, amorphous and crystalline silica, and mafic silicate minerals. Geochemical data throughout the section show that there is significant variability in Zn, Ni, and Mn concentrations. Mineralogical and geochemical trends with stratigraphy suggest one of possibly several aqueous episodes involved alteration in an open system under acidic pH, though other working hypotheses may explain these and other trends. Data from the Murray Fm contrast with those collected from the Sheepbed mudstone located ~60 m below the base of the Murray Fm, which showed evidence for diagenesis in a closed system at circumneutral pH [2-4]. Ca-sulfates filled late-stage veins in both mudstones.

[1] Grotzinger et al. (2015) *Science*, 350. [2] McLennan et al. (2014) *Science*, 343. [3] Vaniman et al. (2014) *Science*, 343. [4] Bristow et al. (2015) *Am. Mineral.*, 100.