SEDIMENTARY STRUCTURE AND MORPHOLOGY OF THE IRESON HILL DEPOSIT, GALE CRATER, MARS. J. M. Comellas[1], H. E. Newsom[1], L. A. Scuderi[1], Z. E. Gallegos[1], R. C. Wiens[2], J. C. Bridges[3], S. Banham[3] T. Seeger[4]. [1]Earth and Planetary Science Dept., Institute of Meteoritics, Univ. of New Mexico, Albuquerque, NM, U.S.A. (jcomellas@unm.edu). [2]Los Alamos National Lab., NM. [3]Space Research Centre, University of Leicester, UK. [3]Imperial College London, UK. [4]Western Washington University, Bellingham, WA, U.S.A.

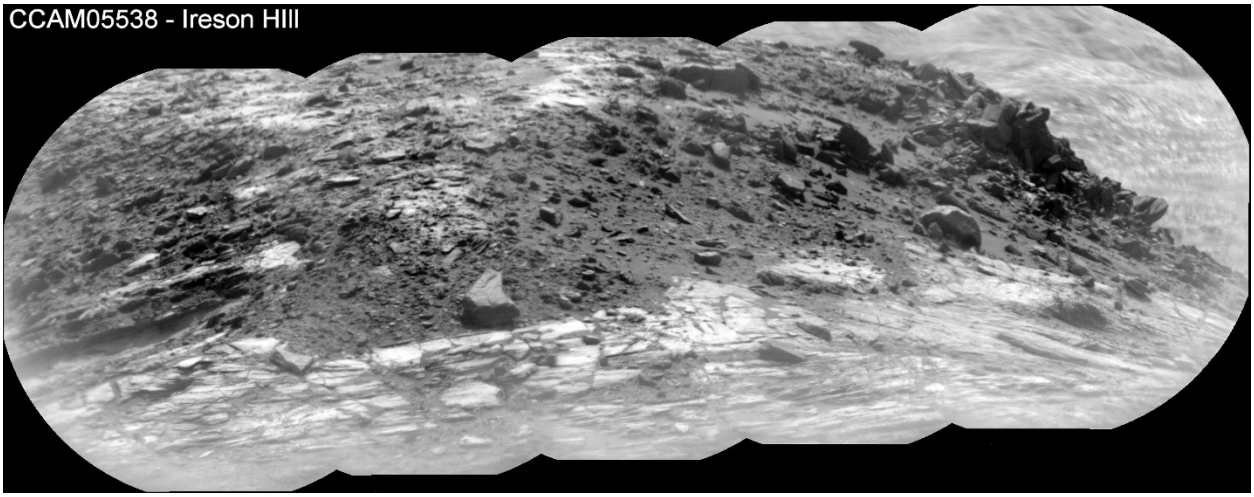

Figure 1. Long Distance ChemCam RMI of Ireson Hill from the North.

Introduction: Ireson Hill, located on the Murray formation in Gale Crater, shows stratification that indicates a different depositional and erosional history than the surrounding area. The Curiosity Rover gathered data and images of this feature between Sols 1538 and 1610, capturing a series of images beginning with the long distance RMI (Figure 1) with subsequent views covering around 270 degrees. Orbital data was collected using HiRISE imagery to determine the overall nature and physical structure of Ireson Hill providing insights into the local geologic history.

The Murray Formation makes up the base of Mt. Sharp, and is overlapped in some areas by the Stimson Formation in the form of buttes or mesas, which consist of sandstones dark in coloration and includes cross laminations. This formation has been concluded to be aeolian in nature. [1].

As shown in Figures 2 and 3, the superimposed layers of Ireson Hill have different coloration suggesting they are a different unit than the surrounding area. It is unclear whether the depositional history of the formation was influenced by aeolian or fluvial processes. Since this feature is in an area with relatively small elevation variability, it likely exhibits a resistance to erosion unique to its specific sedimentary composition [2].

At the time of the MSL observations, preliminary interpretations done by Steve Banham suggested that the cap of Ireson Hill may include Stimson formation materials and potential alteration halos. The discolorations were hypothesized to be signs of bleaching from fluid flow indicating a difference in permeability. However, there is no indication of the typical aeolian cross bedding found in Stimson material, although some analytical data on float rocks seemed to be of Stimson composition.

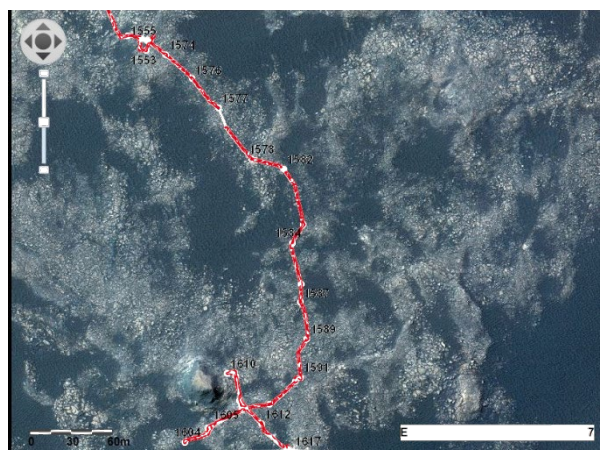

Figure 2. HiRISE Image of Ireson Hill and the traverse map of the Curiosity Rover

Tina Seeger's preliminary analysis of the layering and compositional components of Ireson Hill showed irregular contact between the units and varying chemical signatures of the material. The majority of the ChemCam and APXS measurements on the capping unit of Ireson did not show chemical similarities to the Stimson Layer, except the sample Perry, which also was very similar texturally to Stimson.

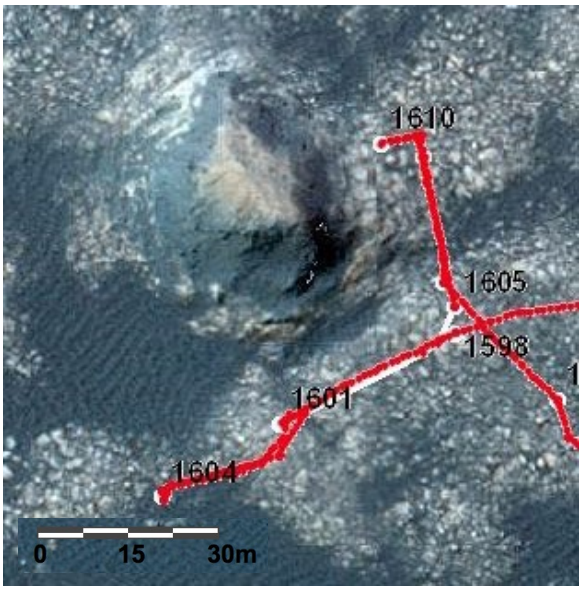

Figure 3. Close up HiRISE Image of Ireson Hill and the traverse map of the Curiosity Rover.


Figure 4. MastCam Image of Ireson Hill from the East, Sol 1598.

Methods: The nature of the contact between the Murray Formation and the capping unit will be determined using spatial analysis. Elevation models and profiles created using data from the Curiosity rover provide in-formation on the morphology of Ireson Hill. High resolution images are used to study the disparate dip angles on different places around the hill. Using the HiRISE high-resolution digital elevation models and ARCGIS, we will investigate the sedimentary structure and map where the contact layer re-sides and the angles of the dips.

Preliminary indications from the images taken from the North (Figure 1) and from the East (Figure 4) suggest the contact with the Murray Formation is dipping to the South West.

References: [1] Banham et al. (2017) Sedimentology. [2] Roger C. Wiens et al. (2019), in preparation. [3] Bridges et al. (2019) MetSoc abstract.