CHARACTERISTICS AND THE ORIGIN OF THE VERA RUBIN RIDGE, GALE CRATER, MARS, E. Heydari1, T. J. Parker1, F. J. Calef2, J. F. Schroeder3, J. Van Beek4, S. K. Rowland5, and A. G. Fairen6, 1Dept. of Physics, Atmospheric Science, and Geoscience, Jackson State University, P.O. Box 17660, Jackson, MS 39217, (ezat.heydari@jsums.edu), 2Jet Propulsion Laboratory, Pasadena, CA 91109, 3Malin Space Science Systems, P.O. Box 90148, San Diego, CA 92191-0148, 4Dept. of Geology and Geophysics, University of Hawaii, Honolulu, HI 96822, 5Centro de Astrobiología (CSIC-INTA), Madrid, Spain, and Dept. of Astronomy, Cornell University, Ithaca, NY 14853.

Introduction. The Vera Rubin Ridge (VRR), also known as the Hematite Ridge, is a linear topographic feature that parallels the northern foothill perimeter of Mt. Sharp in Gale crater, Mars (Fig. 1). It is about 250 m wide and its best exposure extends for nearly 7 km (1).

Observations. Crucial data for the understanding of the VRR are provided by the Mars Hand Lens Imager (MAHLI) instrument: a 2-megapixel camera mounted on the Curiosity Rover's robotic arm capable of resolving grains as small as coarse silt at its closest working distance (4). MAHLI images show two important features of the VRR. The first is that the VRR does not consist of new rock unit. Rather, it is composed of the Murray formation (5): a 260 meters of dominantly mudstone that occurs at the foothill of Mt. Sharp and has been examined since Sol 750. Lithologic and geochemical characteristics of the Murray formation on the VRR and away from it are identical (5). Figures 2 and 3 show this lithologic similarity.

The VRR was originally identified based on high concentration of hematite revealed by the analysis of data from the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) on board the Mars Reconnaissance Orbiter (2-3). Lithologic, sedimentologic, and diagenetic characteristics of the VRR as well as its origin have remained unknown. The Curiosity Rover landed in Gale crater in August of 2012. Soon after, it followed a southerly path reaching the VRR on Sol 1720 and began a systematic study of its rocks.
formation at the VRR. Targets away from the VRR are relatively soft (Fig. 4); those on the VRR are very hard (Fig. 5).

The difference in hardness is revealed by the effect of the dust removal tool (DRT): a pair of steel brushes used to remove dust to examine fresh surfaces of samples. This process indicates that the Murray formation is much more lithified at the VRR than elsewhere in Gale crater. The variation in lithification is attributed to increased cementation of the Murray formation at the VRR.

**Preliminary Interpretations.** Our observations indicate that the VRR is not a distinct rock unit with specific depositional setting. Instead, it consists of the Murray formation that experienced enhanced cementation resulting in its preservation as a ridge. However, the timing of cementation is not clear at this time. One possibility is that the Murray formation experienced preferential early, synsedimentary cementation at this location. This retarded the subsequent erosion causing the formation of the VRR. Alternatively, a high topographic feature formed by erosion of the Murray formation first and subsequent preferential cementation maintained that morphology as the VRR. Interestingly, the VRR lines-up along an escarpment (possibly produced by river erosion) that begins at the southern margin of Gale crater and follows the northern perimeter of Mt. Sharp (Fig. 1). The process that created this escarpment could have produced a topographic high in the study area. Subsequent cementation of that topographic high created to the VRR. As such, the VRR may have initially been an escarpment produced by erosive action of rivers that originated from the Farah Vallis (Fig. 1). In fact, an unsorted, black sandstone overlies the Murray formation with an erosional contact near the VRR (Fig. 6). The unsorted sandstone could have been deposited by rivers that passed through this area.