GEOLOGIC MAPPING OF THE AV-8 MARCIA QUADRANGLE OF ASTEROID 4 VESTA. D.A. Williams[1], P.M. Schenk[2], R. Jaumann[3], D.L. Buczkowski[4], T.B. McCord[5], R.A. Yingst[6], H. Hiesinger[7], W.B. Garry[6], J.-Ph. Combe[5], C.M. Pieters[8], A. Nathues[10], L. Le Corre[10], M. Hoffmann[10], V. Reddy[10], T. Roatsch[3], F. Preusker[3], S. Marchi[11], C.T. Russell[12], C.A. Raymond[13], G. Neukum[14], N. Schmedemann[14], E. Ammannito[15], M.C. De Sanctis[15], and the *Dawn* Science Team, [1]School of Earth & Space Exploration, Arizona State University, Tempe, Arizona 85287-1404 (David.Williams@asu.edu), [2]LPI, Houston, Texas, USA; [3]DLR, Berlin, Germany; [4]JHU-APL, Laurel, Maryland, USA; [5]Bear Fight Center, Winthrope, Washington, USA; [6]PSI, Tucson, Arizona, USA; [7]Westfälische Wilhelms-Universität, Münster, Germany; [8]Brown University, Providence, Rhode Island, USA; [10]MPI for Solar System Research, Katlenburg-Lindau, Germany; [11]Observatoire de la Cote d'Azur, CNRS, Nice Cedex, France; [12]UCLA, Los Angeles, California, USA; [13]NASA JPL, California Institute of Technology, Pasadena, California, USA; [14]Freie Universität, Berlin, Germany; [15]National Institute of Astrophysics, Rome, Italy.

Introduction: NASA's *Dawn* spacecraft entered orbit of the inner main belt asteroid 4 Vesta on July 16, 2011, and is spending one year in orbit to characterize the geology, chemical and mineralogical composition, topography, shape, and internal structure of Vesta before departing to asteroid 1 Ceres in late 2012. As part of the *Dawn* data analysis the Science Team is conducting geological mapping of the surface, in the form of 15 quadrangle maps. This abstract reports results from the mapping of quadrangle Av-8, named Marcia.

Data: The base for mapping this quadrangle is a monochrome Framing Camera (FC) mosaic produced from the High Altitude Mapping Orbit (HAMO) data with a spatial resolution of ~70 m/pixel. This base is supplemented by a Digital Terrain Model (DTM) derived from Survey orbit stereo image data with a lateral spacing of 450 m/pixel (10 pixels per degree) and a vertical accuracy of ~30 meters. Also used to support the mapping are FC color ratio images from the Survey orbit with a spatial resolution of ~250 m/pixel, slope and contour maps derived from the DTM, and Visible and InfraRed (VIR) hyperspectral images from the Survey and HAMO orbits with spatial resolutions of 700 and 200 m/pixel, respectively.

Geologic Setting: Av-8 Marcia Quadrangle straddles the 180˚ longitude in the equatorial region of Vesta, covering 144˚-216˚E longitude and ±21˚ latitude. This quadrangle is dominated by the 'Snowman' crater region, which is a low-albedo ejecta field first observed during *Dawn*'s Approach to Vesta. This region was detected in *Hubble* Space Telescope observations (the 'Olbers' low-reflectance feature: [1]). Av-8 is dominated by the impact crater Marcia (base of 'Snowman'), which is 68 km long (N-S) by 58 km wide (E-W). Crater Calpurnia (middle of 'Snowman') just to the NE is is 54 km long (N-S) by 52 km wide (E-W), and Crater Minucia (head of 'Snowman') to the NE is is 26 km long (N-S) by 23 km wide (E-W). An unusual hill with a dark-rayed crater, named Aricia Tholus, is 42.5 km long (N-S) and 28 km wide (E-W). One of the equatorial troughs, observed in Approach images, extends for ~76 km into the quadrangle from the western border.

Geologic Units & Features: At the global scale [2,3] Vesta has three dominant terrains: A heavily-cratered northern terrain with ancient troughs and grooves, an intermediately-cratered equatorial terrain bearing prominant flat-floored, E-W-trending troughs, and the relatively lightly-cratered south polar region, containing the Rheasilvia impact basin and related terrains. All three terrains are present in this quadrangle.

'Snowman' ejecta. Superposed on the equatorial and northern terrains is the low albedo impact ejecta field derived from the 'Snowman' craters. This unit, which we call Dark Crater Ejecta Material, mantles underlying older terrains. There is an obvious low abundance of impact craters for this unit, indicative of a relatively younger age than surrounding units; crater counts of these units are in progress. A dark-rayed crater, occurring at ~14˚N, 180˚ excavates a darker unit from underneath the brighter ejecta. Initial images from the Low Altitude Mapping Orbit (LAMO) show dark materials exposed in the rim of crater Marcia, suggesting basaltic flows or intrusions underlie the crater ejecta. In addition, both Bright and Dark Lobate Materials occur in this quad, and appear to be associated with impact or gradational processes (rotational slumps and landslides).

Aricia Tholus. This hill with a dark-rayed crater is prominent in both monochrome and color Approach images, and was initially suggested as a potential volcano. This hill clearly has been sculpted by impact craters, and the dark material on the hill consists of a dark-rayed crater and additional material on the NW flank of the hill that is partially obscured by shadow. There is no unequivocal evidence of extrusive volcanic materials on this hill, which suggests that this hill may represent an dike or intrusion that is being exposed by impact cratering. A more definitive interpretation requires higher spatial resolution FC and VIR data from

LAMO, which is being acquired during the first quarter of 2012.

Compositional Information: Both FC color ration images and VIR images show compositional variations within the Marcia quadrangle. VIR data analysis thus far [4] has concentrated on determining the band depth of the 1 μm and 2 μm absorptions associated with pyroxene minerals. VIR data shows strong 1 μm and 2 μm absorptions exposed within the walls and floor of impact crater Marcia, suggesting excavation of pyroxene-rich material and/or variations in particle sizes. FC color ratio images using nearly *Clementine* ratios [Red (750/430 nm); Green (750/920 nm); Blue (430/750 nm)] show color differences in the floors of Marcia and Calpurnia, the distinctiveness of the eastern side of the 'Snowman' ejecta field from its western side, the dark-rayed crater at ~14˚N, 180˚ and on Aricia Tholus, and an unusual orange diffuse deposit surrounding an unnamed crater on the western side of the quadrangle. Further study is underway to investigate the significance of these color variations.

References: [1] Binzel, R.P., et al., (1997) *Icarus, 128*, 95-103. [2] Yingst, R.A., et al., this meeting. [3] Jaumann, R. et al., this meeting. [4] De Sanctis et al., this meeting.

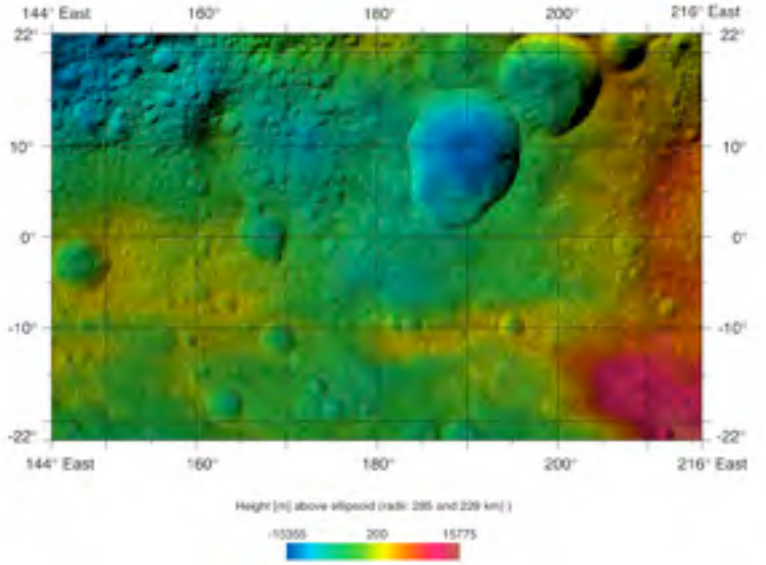

Figure 1. Color-coded Digital Terrain Model of quad Av-8, derived from NASA Dawn FC monochrome imaging.

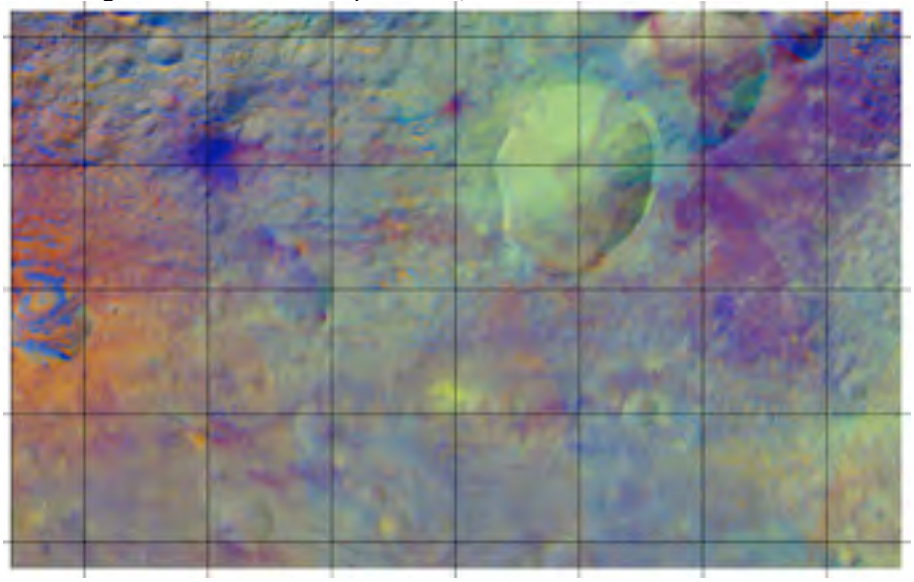

Figure 2. NASA *Dawn* FC color ratio mosaic of quad Av-8, show false color variations in the terrain. This figure uses quasi *Clementine* color ratios: Red (750/430 nm); Green (750/920 nm); Blue (430/750 nm).