STRATEGIES FOR THE GEOLOGIC MAPPING OF SMALL AIRLESS BODIES: DAWN AT VESTA AND CERES. D. A. Williams and the Dawn Science Team. School of Earth & Space Exploration, Arizona State University, Tempe, Arizona 85287 (David.Williams@asu.edu).

Introduction: NASA’s Dawn spacecraft orbited the main belt asteroid (4)Vesta from July 2011-September 2012, and conducted a lengthy orbital study of this unique protoplanet [1,2]. A geologic mapping campaign was developed as part of the Nominal Mission to provide a systematic, cartography-based initial characterization of the global and regional geology of Vesta. In this abstract we present the final global geologic map of Vesta (Figure 1), and look ahead to plans to conduct a similar geologic mapping campaign at dwarf planet (1)Ceres beginning in Winter 2015.

Purpose & Goals of Mapping: Geologic maps are tools to understand the evolution of the terrestrial planets. The goal of geologic mapping is to place observations of surface features into their stratigraphic context to determine the geologic evolution of planetary surfaces [3,4]. The advantage of geologic mapping over photogeologic analyses alone is that it reduces the complexity of heterogeneous planetary surfaces into comprehensible portions, in which discrete material units are defined and characterized based upon specific physical attributes related to the geologic processes that produced them. The final goal of global geologic mapping is to identify a geologic timescale for a planetary object, so that its geologic evolution can be easily compared with other objects [5]. The goal of the Vesta global mapping was 1) to support the Geophysics group by providing geologic-stratigraphic context of surface features, and 2) to better support the analysis of data from the Visible and Infrared Spectrometer (VIR) and the Gamma Ray and Neutron Detector (GRaND).

Plans for Ceres: NASA’s Dawn spacecraft will arrive at Ceres in mid-March, and begin its orbital mission in April 2015. The Dawn Science Team plans to implement a similar geologic mapping campaign at Ceres as was done at Vesta, but using fewer mappers and combining or subdividing quadrangles as necessary to map Ceres surface efficiently based on its surficial geology.


Figure 1. The high-resolution global geological map of Vesta derived from Dawn spacecraft data. Brown colors represent the oldest, most heavily cratered surface. Purple colors in the north and light blue represent terrains modified by the Veneneia and Rhea silvnia impacts, respectively. Light purples and dark blue colors below the equator represent the interior of the Rhea silvnia and Veneneia basins. Greens and yellows represent relatively young landslides or other downhill movement and crater impact materials, respectively. This map unifies 15 individual quadrangle maps published in the December 2014 Special Issue of Icarus. Map is a Mollweide projection, centered on 180° longitude using the Dawn Claudia coordinate system.