Dawn Completes its Mission at 4 Vesta and Prepares for 1 Ceres

C.T. Russell[1], C.A. Raymond[2], R. Jaumann[3], H.Y. McSween[4], A. Nathues[5], M.C. DeSanctis[6], T. Prettyman[7], and the Dawn Science Team

1 Institute of Geophysics and Planetary Physics, University of California, Los Angeles, CA 90095-1567, USA

2 Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109

3 DLR, Inst. of Planetary Research Rutherfordstrasse 2, 12489 Berlin, Germany

4 Department of Earth and Planetary Sciences, University of Tennessee, Knoxville, TN 37996, USA

5 Max-Planck-Institut fur Sonnensystemforschung, Max-Planck-Strasse 2, 37191, Katlenburg-Lindau, Germany

6 Istituto di Astrofisica e Planetologia Spaziali, Istituto Nazionale di Astrofisica, 00133 Roma, Italy

7 Planetary Science Institute, Tucson, AZ 85719

The Dawn science team came together beginning with the Discovery workshop in 1992, finally obtaining an opportunity to prepare a Concept Study Report in 2000, and a selection for development in 2001. After a rocky start to its basaltic and water-rich targets, Dawn was launched in 2007, obtained a gravity assist from Mars in 2009, and reached Vesta in July 2011, slipping gracefully into orbit on the gentle thrust of its ion propulsion system. Before orbit insertion, it was clear Vesta was not just another asteroid. It was in many respects a Rosetta Stone for the asteroid belt and perhaps the solar system as well. Very much like the Rosetta Stone, Vesta comes with a translation, the Howardite-Eucrite and Diogenite meteorites, that, if they are from Vesta, tell us much about Vesta already, but this information had no geologic context until we viewed the surface and sounded the interior with our gravity investigation. Vesta is an amazing place. While many “knew” what to expect, few, if any, were able to predict what we found. Yes, there is an impact basin at the south pole. In fact, there are two, or possibly more. The youngest basin has a central peak that rivals Olympus Mons in altitude. Vesta has greater relief than almost any other body in the solar system. It is colorful. It has geochemical and mineral diversity. It has troughs around its equator. It has craters and mountains, perhaps even continents. It has dark material, light material, boulders and pits. The science data taking began in August 2011 with a Survey Orbit at 2700 km altitude moving into a 700-km altitude High-Altitude Mapping Orbit in October and Low-Altitude Mapping Orbit at 210 km in December. This orbit should be complete by the time of the ACM meeting and the spacecraft should be on its way to HAMO-2 and then escape from Vesta and on to Ceres.

Ceres will be quite an adventure too, but for a different reason. We have no Rosetta Stone for Ceres. There are no meteorites identified with Ceres. If material from Ceres has reached the Earth, we do not and cannot recognize it. Ceres appears to have a clay-like surface and contains much water. It appears to be a very wet body with a much different mineralogy and geochemical makeup. It, too, has much to tell us about the early solar system and the origin of the terrestrial planets.