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Introduction: By successively orbiting both 4 Vesta and 1 Ceres the Dawn mission directly addresses the long-standing goals of NASA and the planetary community to understand the origin and evolution of the solar system by obtaining geophysical and geochemical data on diverse main belt asteroids. Ceres and Vesta are two complementary terrestrial protoplanets (one apparently "wet" and one "dry"), whose accretion was terminated by the formation of Jupiter. Ceres is little changed since it formed in the early solar system, while Vesta has experienced significant heating and differentiation. Both have remained intact over the age of the solar system, thereby retaining a record of events and processes from the time of planet formation. Detailed study of the geophysics and geochemistry of these two bodies provides critical benchmarks for the early solar system conditions and processes that shaped its subsequent evolution. Dawn provides the missing context for both primitive and evolved meteoritic data, thus playing a central role in understanding terrestrial planet formation and the evolution of the asteroid belt. Dawn is to be launched in May 2006 arriving at Vesta in 2010 and Ceres in 2014, stopping at each to make 11 months of orbital measurements. The spacecraft uses solar electric propulsion both in cruise and in orbit to make most efficient use of its xenon propellant. The spacecraft carries a framing camera, visible and infrared mapping spectrometer, gamma ray/neutron spectrometer, a laser altimeter, magnetometer, and radio science.

Why Ceres and Vesta: Dawn focuses on Ceres and Vesta, not simply because they are the two largest remaining rocky planets but because they should provide important clues as to the processes taking place in the earliest phase of solar system formation and they form a bridge in our understanding, from the rocky bodies of the inner solar system to the icy bodies of the outer solar system. Radioisotope chronology from the howardite, eucrite, and diogenite (HED) meteorites, believed to be from Vesta, suggests it differentiated in only 5-15 million years [1]. Similar evidence indicates that Mars continued to differentiate for close to 30 million and Earth for 50 million years. The early cessation of accretion in the asteroid belt was presumably due to the formation of Jupiter whose gravitational forcing countered the accretionary process, and today is causing the disruption of the bodies that did accrete. Although we do not have similar meteorite evidence directly linked to Ceres, it too is expected to have formed in the first approximately 10 million years. In addition the asteroid belt may have been scoured by comets, scattered by the formation of the remaining gas giants [2]. Today only some of the largest asteroids remain relatively undisrupted. The most massive of these [3] are Ceres and Vesta, two most complementary minor planets. The former has a very primitive surface, water-bearing minerals, and possibly a very weak atmosphere and frost. The latter is a dry, differentiated body whose exterior has been resurfaced by basaltic lava flows possibly possessing an early magma ocean like the Moon.

The Meteoritic Evidence: Vesta has experienced significant excavating events, most notably indicated by the huge crater near its southern pole [4]. Cosmic ray exposure dating of HEDs indicates that impacts have released meteoritic material at least five times in the last 50 million years [5]. Meteorites from these impacts have been used to piece together a most probable scenario for Vesta's thermal evolution e.g. [6]. No meteorites have unmistakably come from Ceres. Possibly the excavating events or dynamics that provided the HED meteorites did not occur at Ceres, but also possibly, the reflectance spectrum of the surface of Ceres is not indicative of its crustal rocks. Microwave studies suggest that Ceres is covered with a dry clay, in contrast to Vesta's basaltic dust layer that reflects its crustal composition [7]. To determine if we have Ceres-derived meteorites and to understand Ceres' origin, we must go there and obtain spectra inside fresh craters.

Meteorites provide an incomplete glimpse of their parent bodies. For Vesta and Ceres we need to know their interior structure, their thermal history as manifested in the geological and geophysical record, and the processes that are acting on and affecting their surfaces. We need to determine the geologic context for the HED meteorites from Vesta, and search for similar data for Ceres. We are especially interested in contrasting dry, differentiated Vesta with its wet counterpart, Ceres, just a little further from the Sun. It appears that a rather short additional radial separation allowed Ceres to accrete wet and stay cool while early heat sources (^{26}Al?) in the accreting material melted Vesta. Most importantly because they both lie near the ecliptic plane in near circular orbits we can rendezvous with and study both using a single Discovery mission, one with ample reserves.

Concluding Remarks: Dawn is clearly an ambitious mission both scientifically and technically. At the same time we believe that through maintaining simplicity and redundancy, by using proven designs and by keeping ample margins, we have produced a very robust mission. Dawn builds upon the New Millennium's Program's technological developments, transferring NASA's solar electric ion propulsion technology to the commercial sectors and putting it to work in solar system exploration. The mission has much potential to garner the public's attention, beginning just over 200 years from the discovery of Ceres and Vesta, and it can be used as a vehicle to enrich both the pure and applied science curricula. Finally, the mission builds on decades of asteroid and meteoritic studies, providing the first detailed assessment of the two largest asteroids in the main belt, and setting the stage for future exploration of the main belt.

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