



## Paradigms and Paradoxes: Dawn at Vesta

Carol Raymond (1), Christopher Russell (2), and David Mittlefehldt (3)

(1) California Institute of Technology, Jet Propulsion Laboratory, Solar System Exploration Directorate, Pasadena, United States (carol.raymond@jpl.nasa.gov, 818-393-4445), (2) UCLA, (3) NASA

While confirming the paradigm of Vesta as the parent body of the HED meteorites, measurements by Dawn have discovered many unexpected aspects of the vestan surface. First, an olivine layer was not found in the bottom of the large basin near the south pole of Vesta where excavation of the mantle was thought to have occurred. In fact, while patches of olivine have been found in the north, it is rare on the surface. Secondly, while Vesta has little gravity and appears to have completely differentiated, it is not completely dry. Morphological evidence from the walls and floors of some craters suggest transient fluid flows and pits formed by devolatilization, implying a substantial amount of accessible water. The question is, did this water derive from internal or external sources? Thirdly, transport of material to the surface of Vesta from elsewhere in the asteroid belt appears as dark material buried near the top of the regolith of Vesta. This may have arrived in a single large impact and been spread around the surface and buried, later to be re-excavated. However, this is not the only scenario possible for the source of this material. Meteoritical evidence from howardites shows that debris from multiple types of impactors are present in the vestan regolith. In short, Dawn's observations of Vesta have been both reassuring but unsettling at the same time.