

DISCOVERY AND EARTH-BASED RECONNAISSANCE OF VESTA. R. P. Binzel, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139 USA

Summary: In many ways Vesta epitomizes the advancement of planetary science, where objects begin as astronomical targets (known for decades or centuries) and are transformed into geological worlds by *in situ* exploration. This talk will review the circumstances of Vesta's discovery in 1807 and earliest reported physical measurements. Vesta was then at the center of the advent of asteroid physical studies in the 1970's with the recognition of its basaltic-like surface spectrum and resemblance to HED meteorites [1] and the arguments for its likelihood as "the" HED meteorite parent body [2]. Astronomical and dynamical discovery of the pathway for that link [3,4] predicted and subsequently revealed [5] major impact excavation at the south pole of Vesta. Rotational mapping, via time-resolved spectroscopy [6] and direct imaging [7] revealed a hemispheric dichotomy for Vesta. All of these Earth-based deductions, implying Vesta was akin to being "the fifth terrestrial planet" [8] with a thermal history pre-dating the Moon, made Vesta a tempting prime target for a Discovery-class mission. NASA agreed and Dawn emerged from the competition. The extent to which Earth-based observations correctly predicted in advance Vesta's detailed nature, and the areas that missed the mark, offer lessons for the ongoing endeavor of planetary exploration.

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