

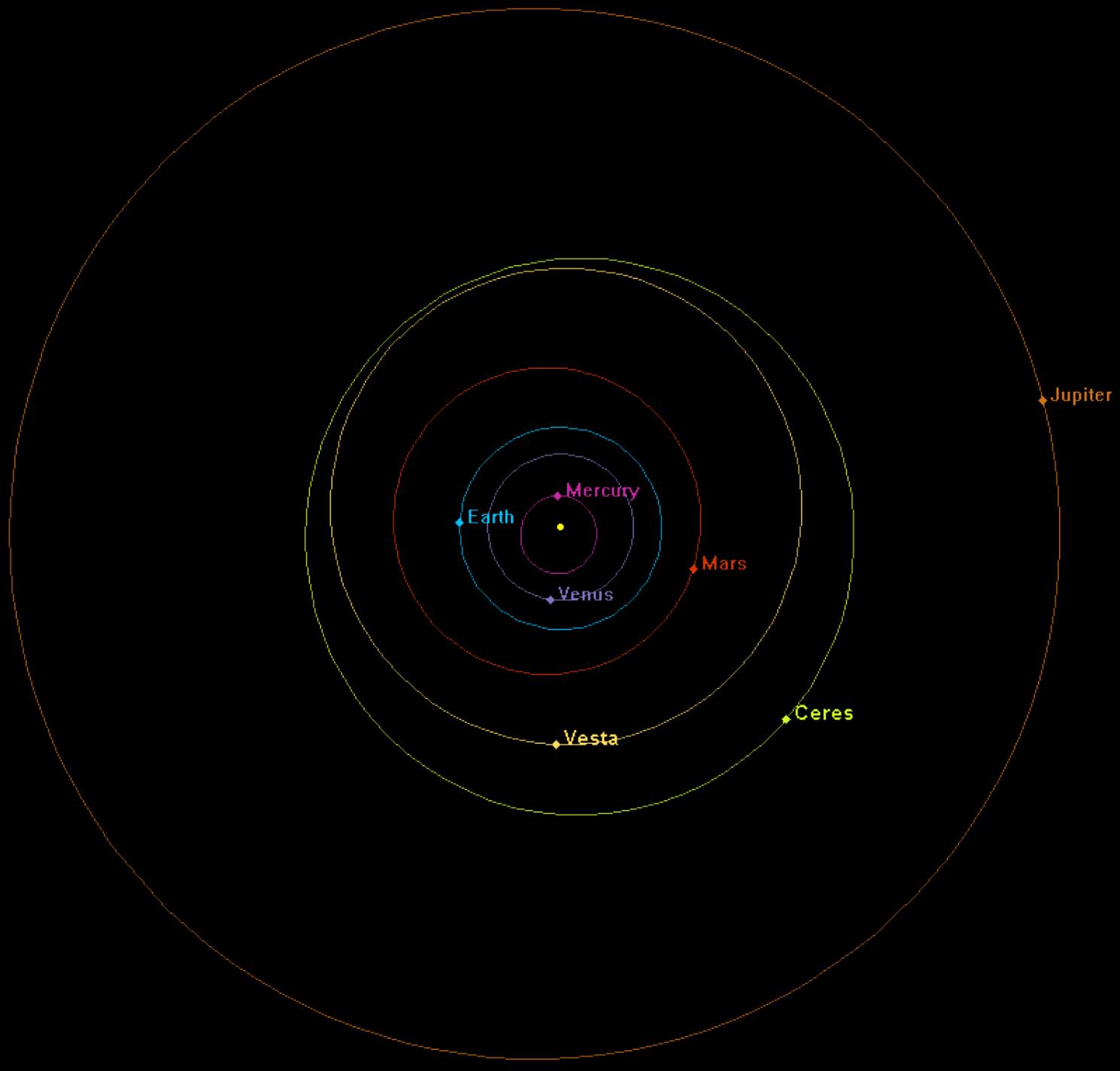
# TO BOLDLY GO ...

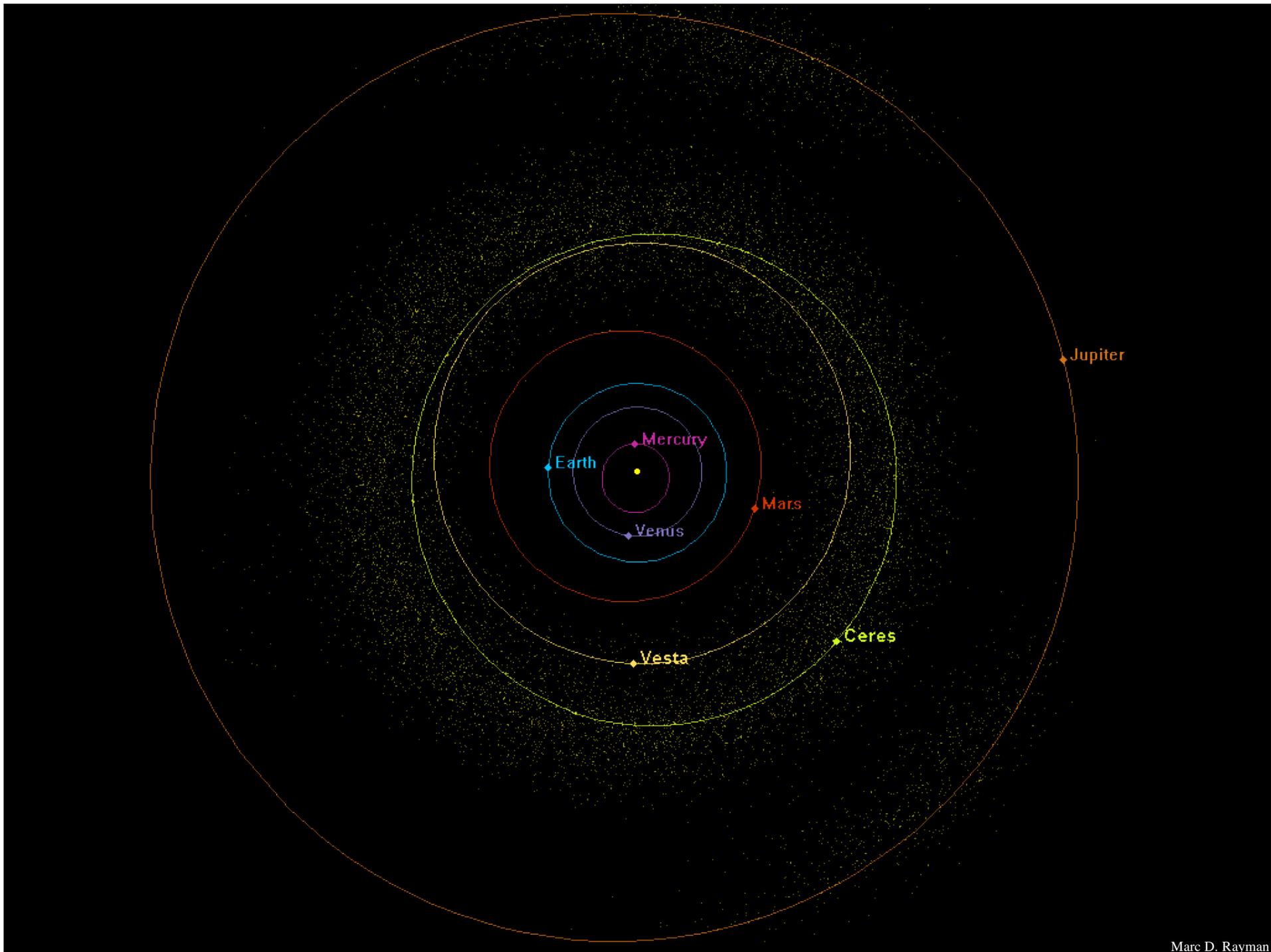
Well, You Know:  
NASA's Dawn Mission  
to the Asteroid Belt

Marc D. Rayman  
March 18, 2011

**JPL**







# Scientific Motivation

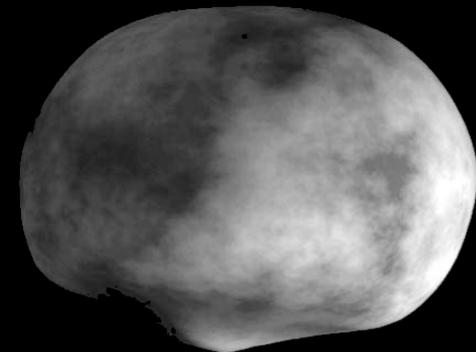
By comparing Ceres and Vesta, Dawn will yield insights into conditions and processes acting at the dawn of the solar system.

Although they are at similar distances from the Sun, Ceres remained cool and retained water, while Vesta became very hot and is dry.

Ceres and Vesta are the two most massive asteroids.



Ceres



Vesta

# Vesta and Ceres Size

Mathilde



Lutetia



Vesta



Ceres



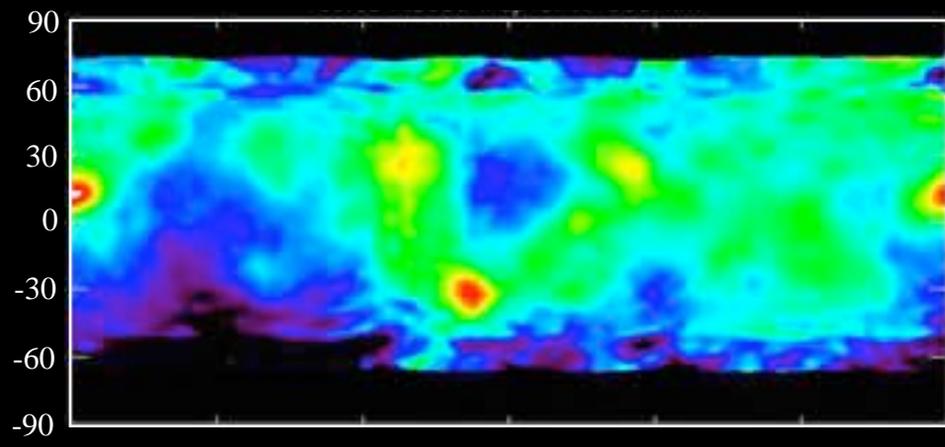
Pluto



California



Earth's moon

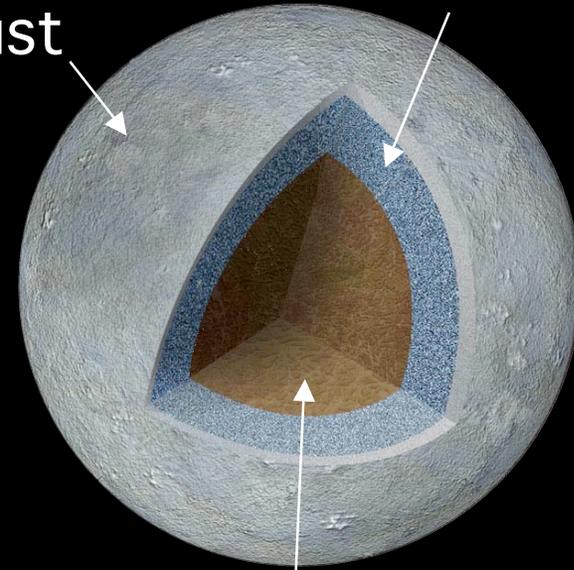


# Ceres



Thin, dusty  
crust

Water ice

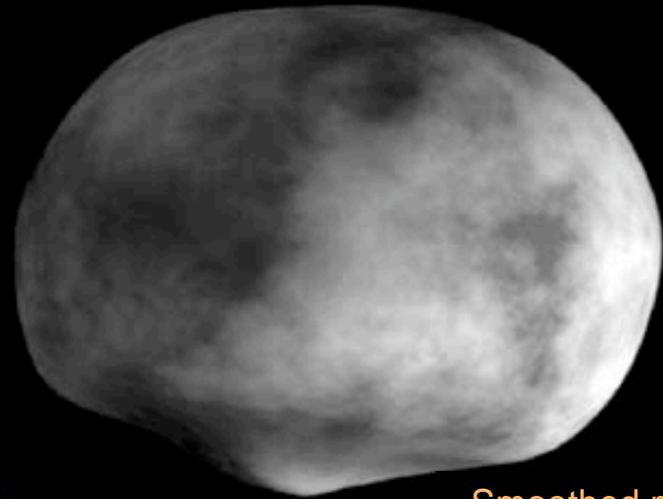


Rocky core

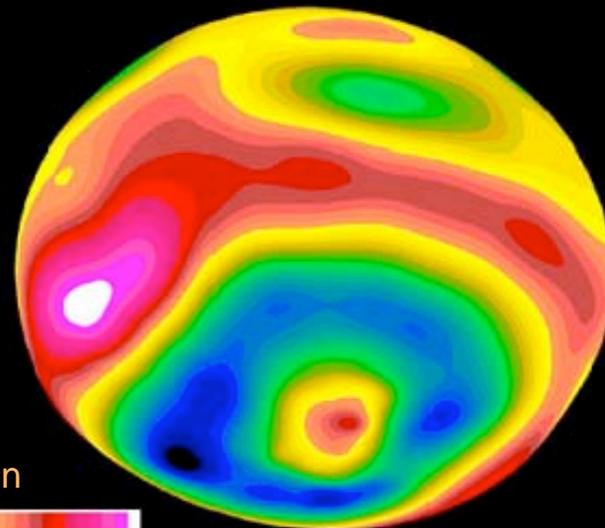
# Vesta



View from Hubble  
Space Telescope



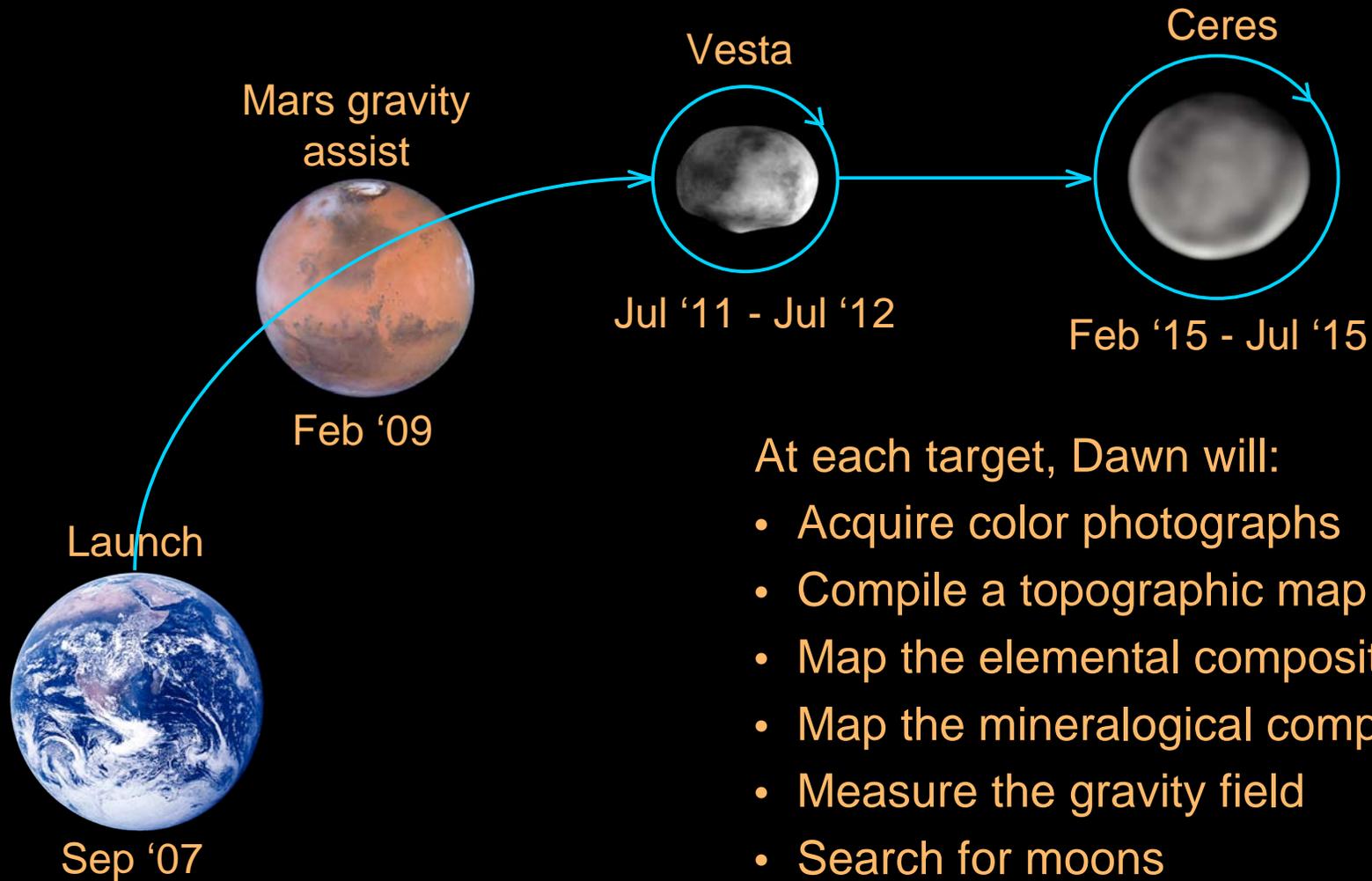
Smoothed model



Elevation

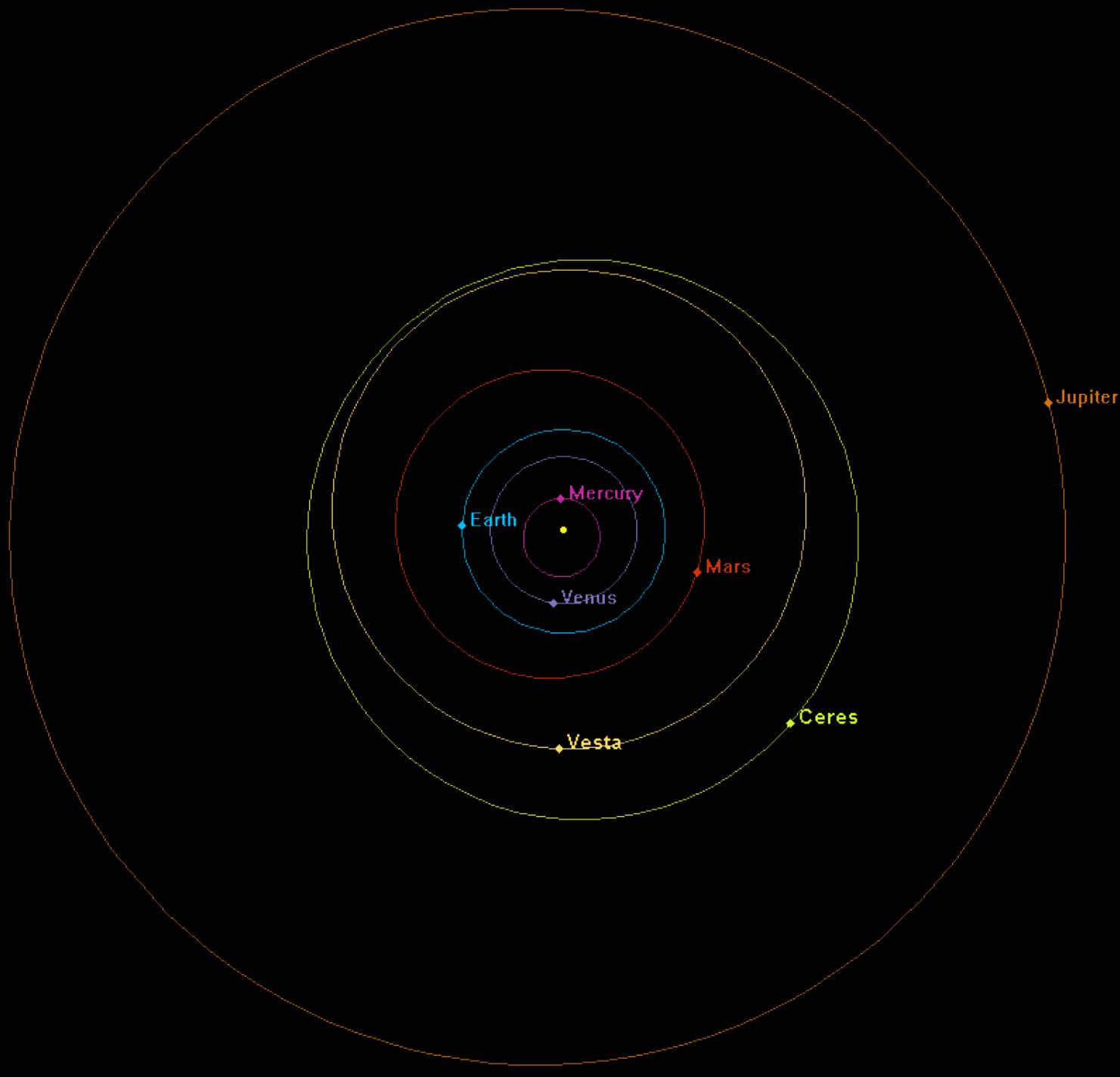


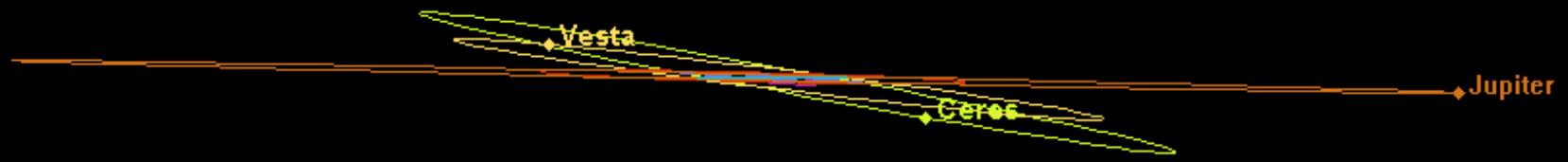
# Mission Itinerary



At each target, Dawn will:

- Acquire color photographs
- Compile a topographic map
- Map the elemental composition
- Map the mineralogical composition
- Measure the gravity field
- Search for moons



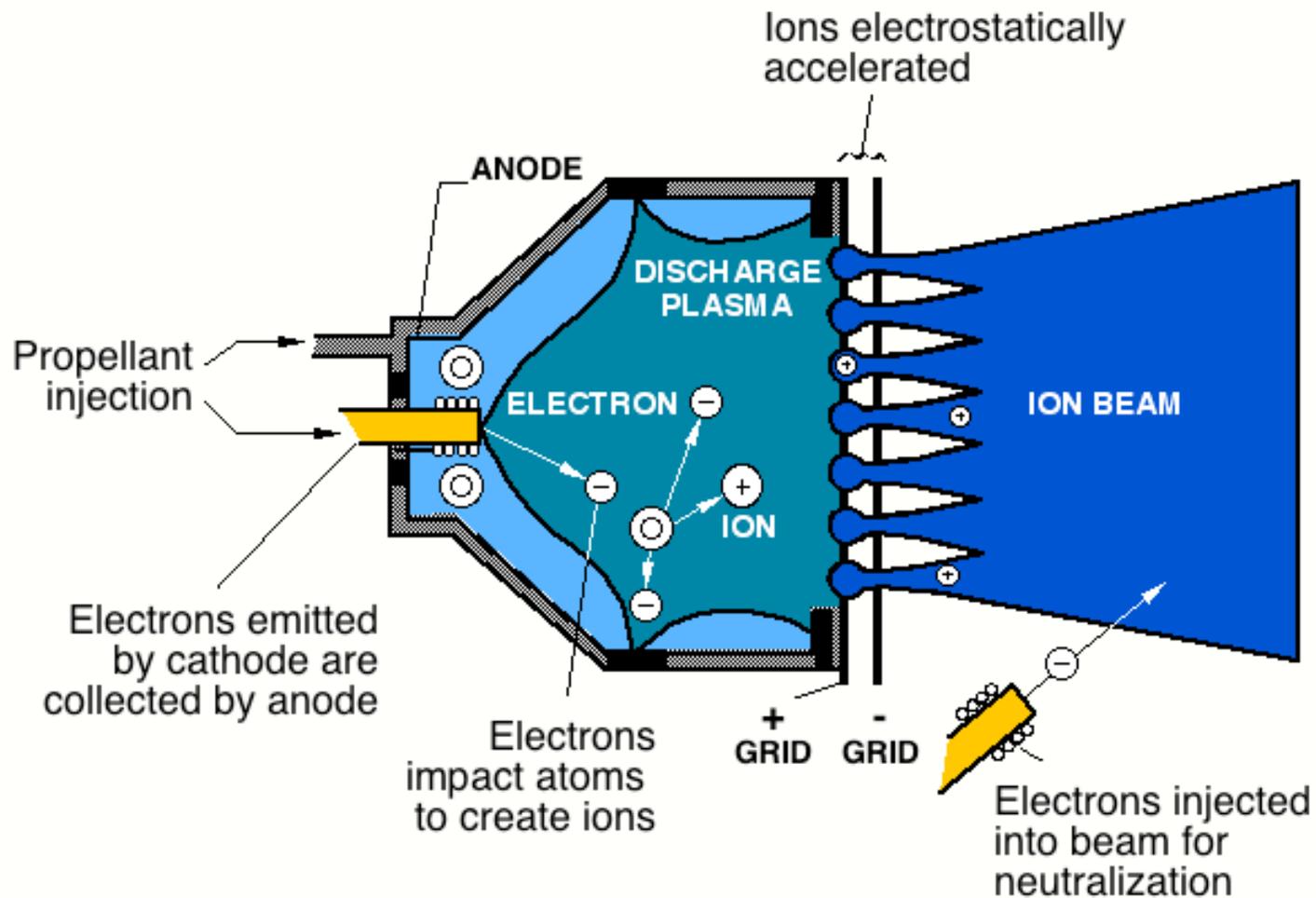


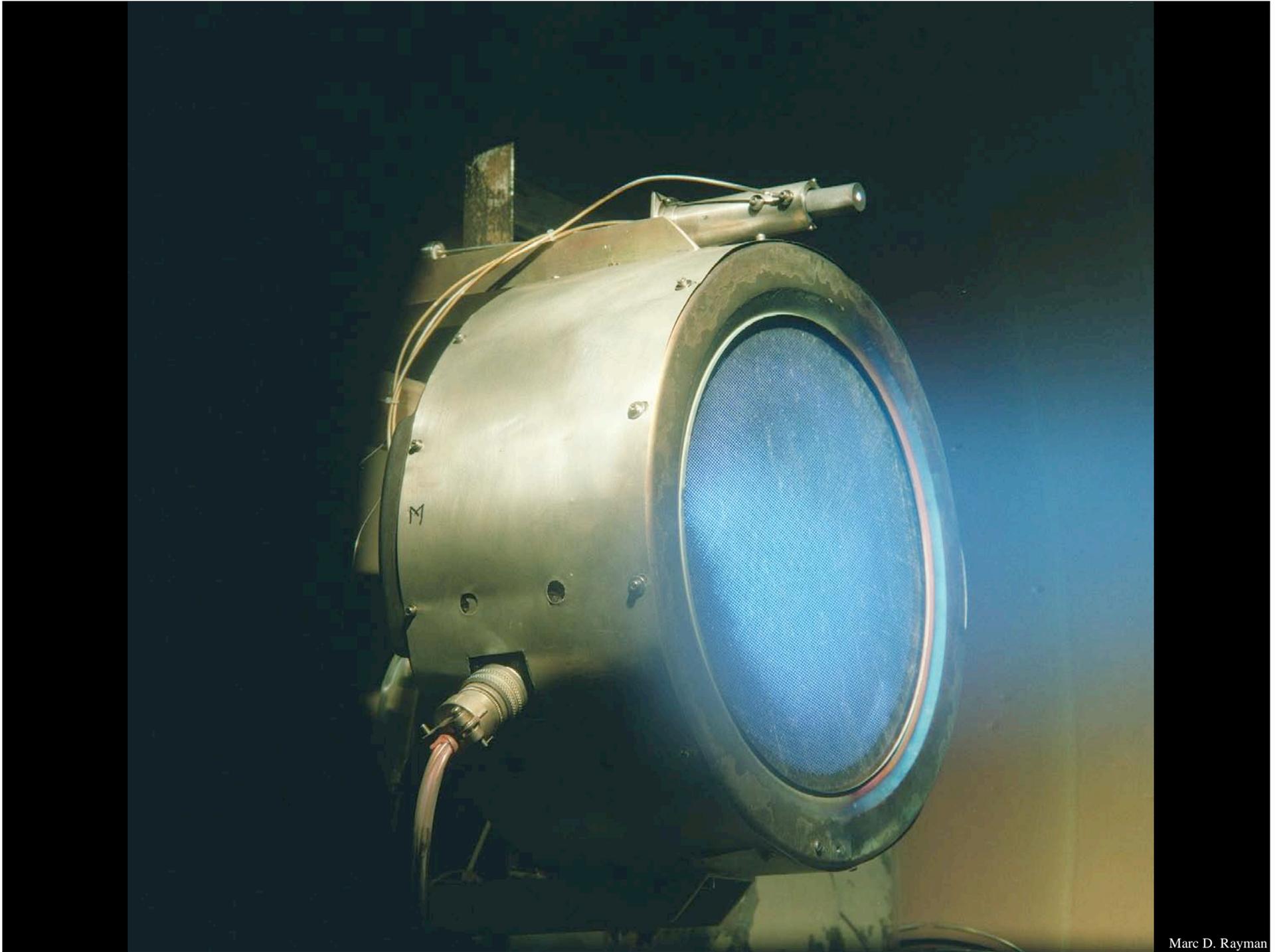


**How can we travel  
around the solar system  
more easily and less  
expensively?**

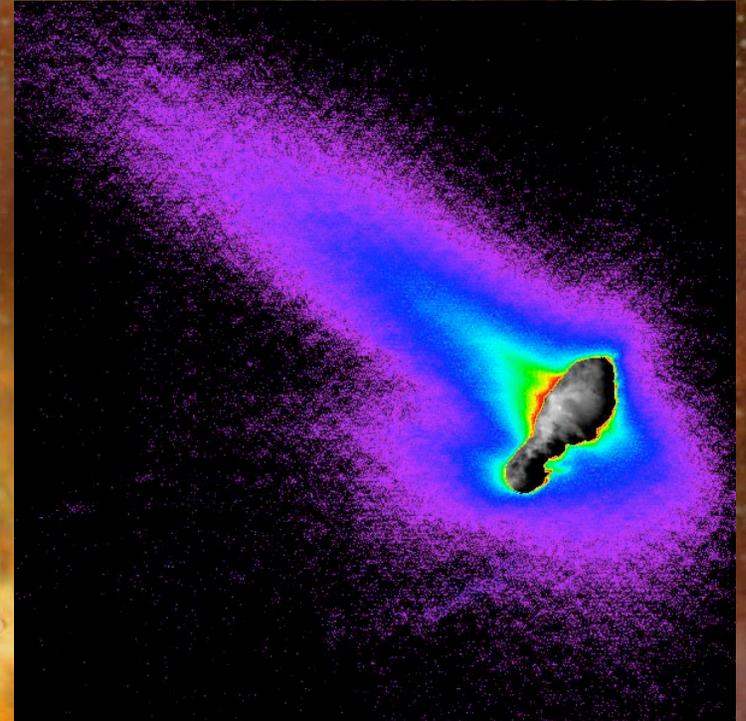
**Answer:  
Ion propulsion**

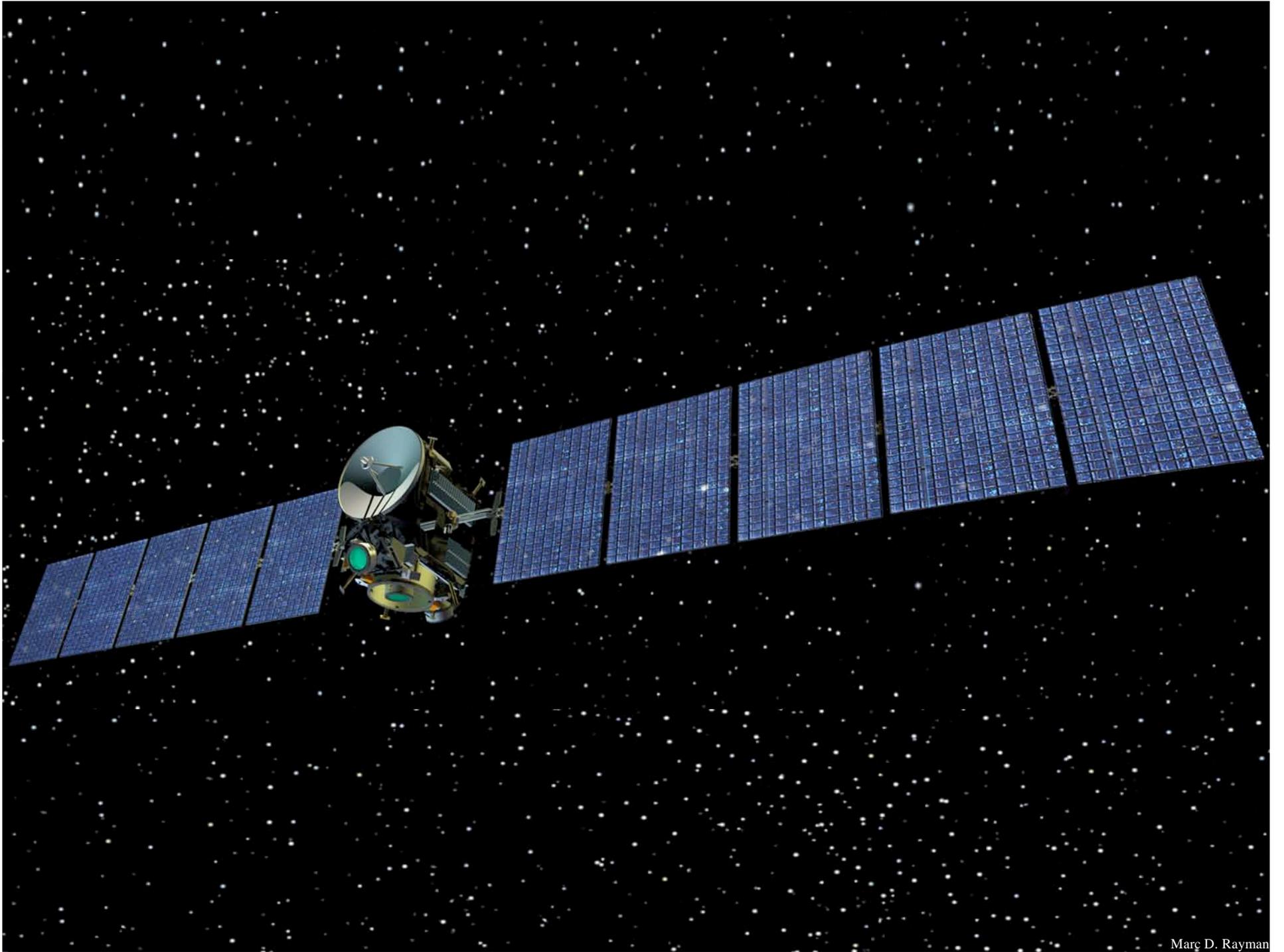
# Ion Thruster

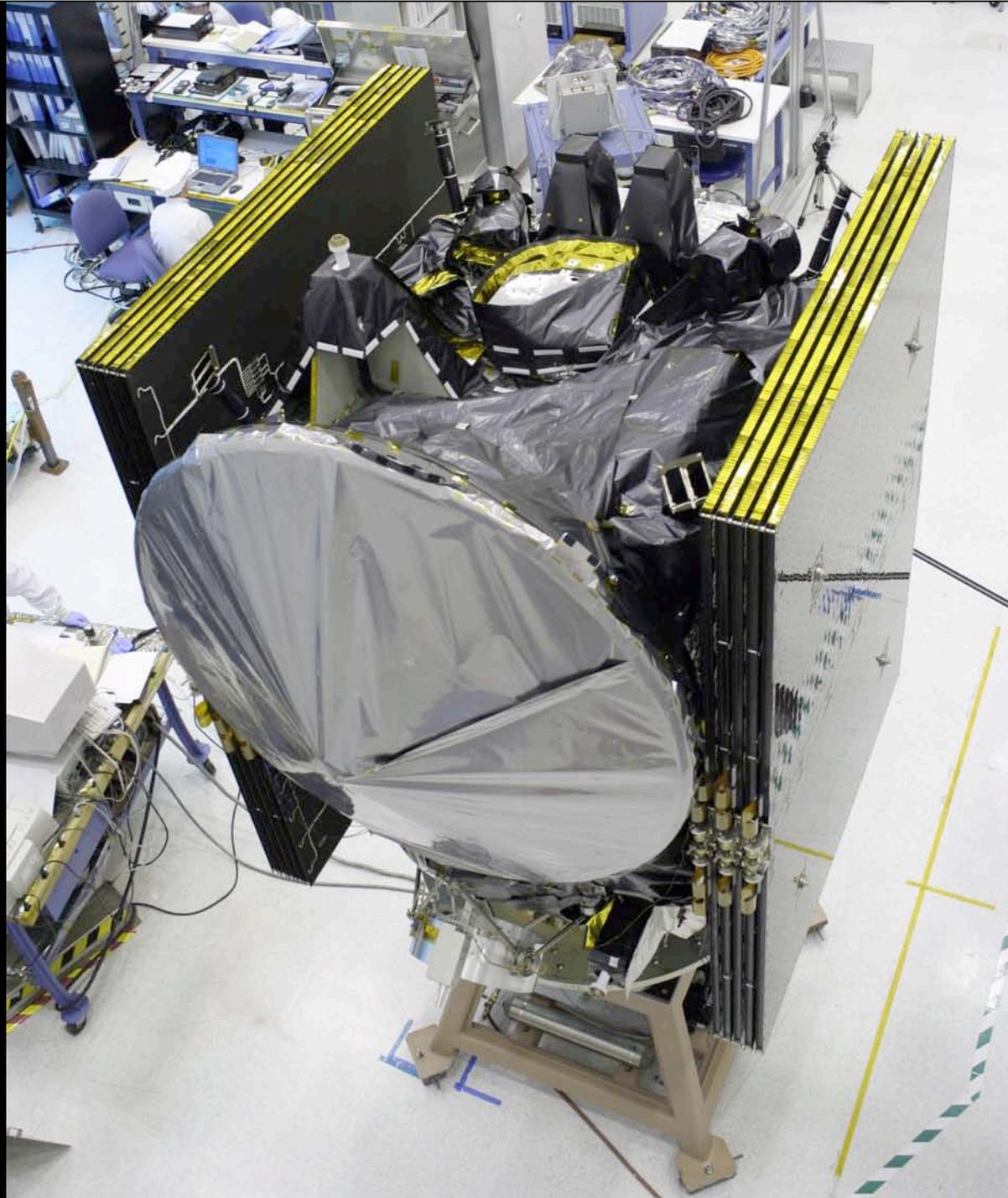


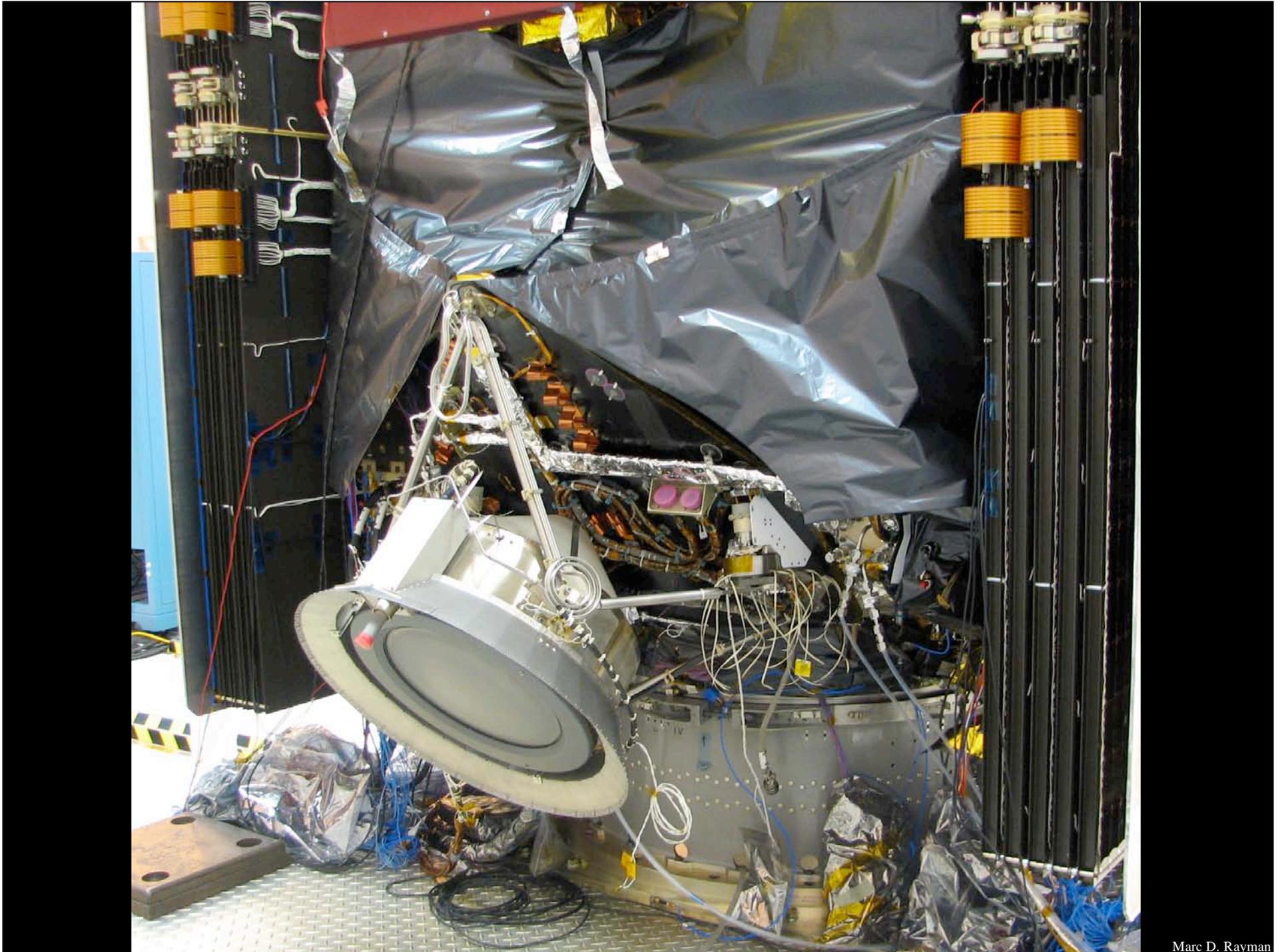


# Deep Space 1

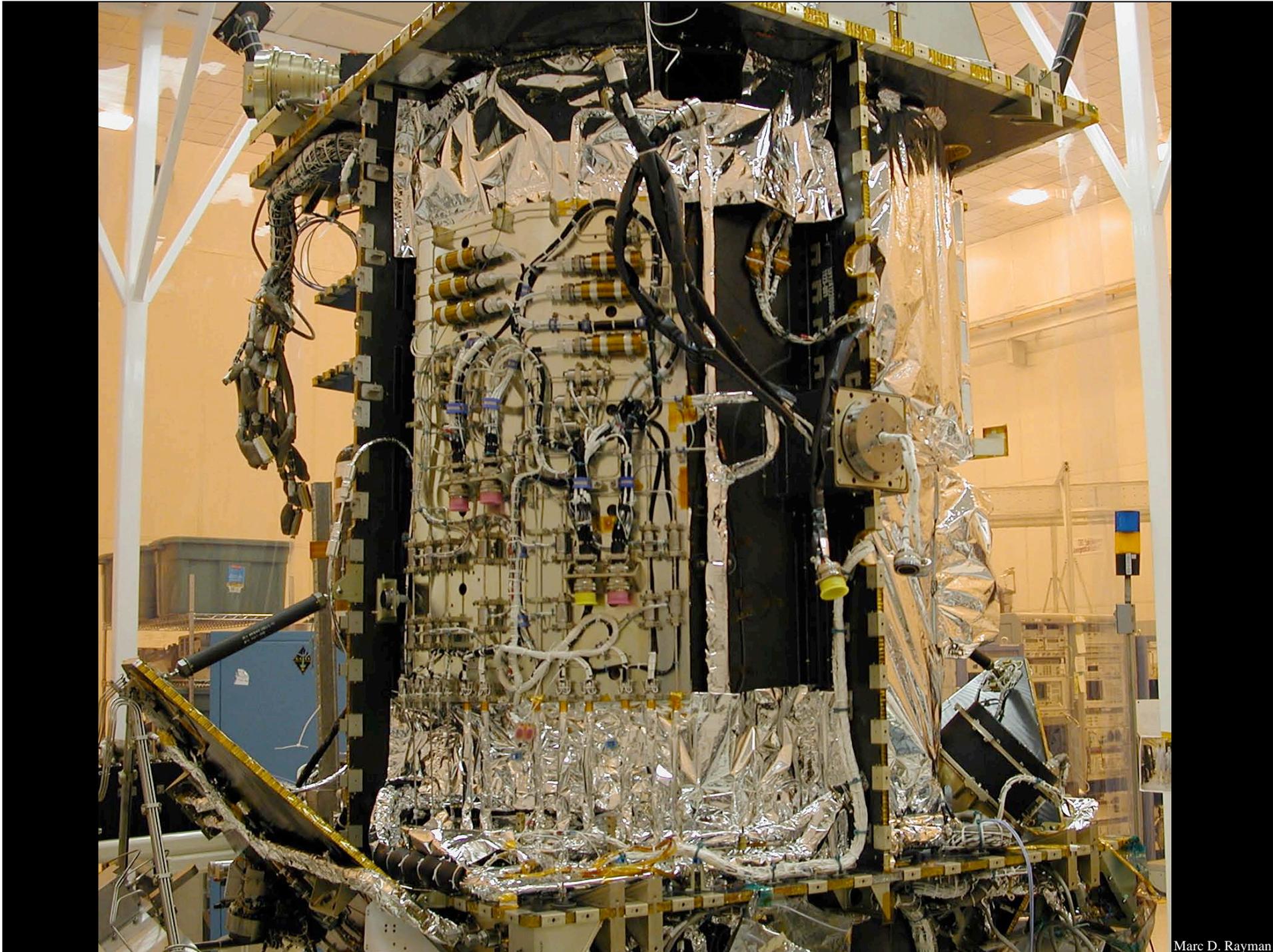




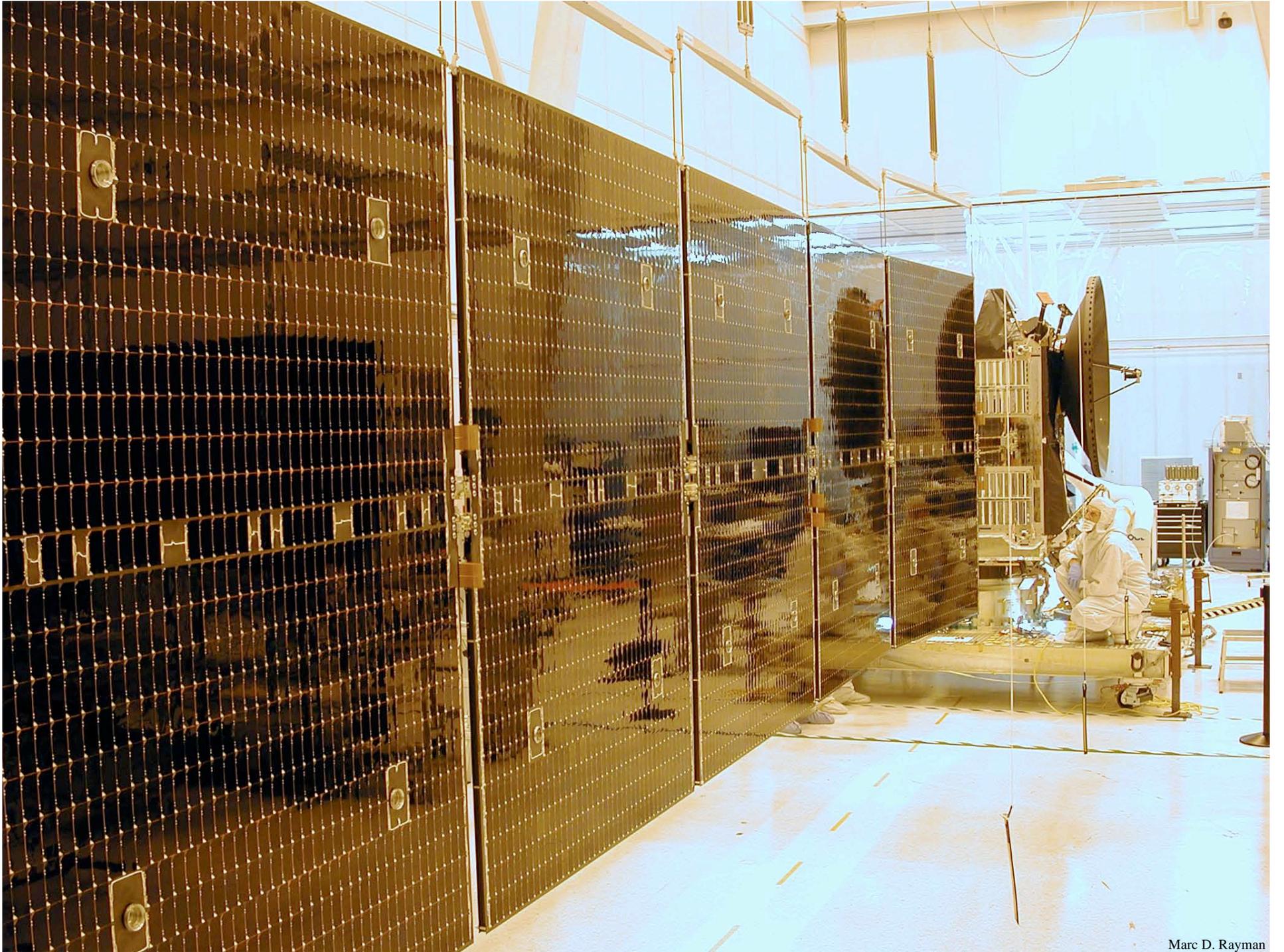




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# Dawn Launch

September 27, 2007, 7:34 am EDT



Space Launch Complex 17B  
Cape Canaveral Air Force Station

# Ion Propulsion Is Essential for Dawn

- It would not be possible to rendezvous with either one of Dawn's targets using a conventional propulsion system within NASA's constraints.
- Without ion propulsion, a mission only to Vesta (the easier target to reach) would require:
  - 5400 lbs. of chemical propellants, instead of 540 lb. of xenon.
  - An entirely new spacecraft structural design.
  - A high-energy version of the Atlas V, instead of the Delta II.



Delta II



Atlas V

