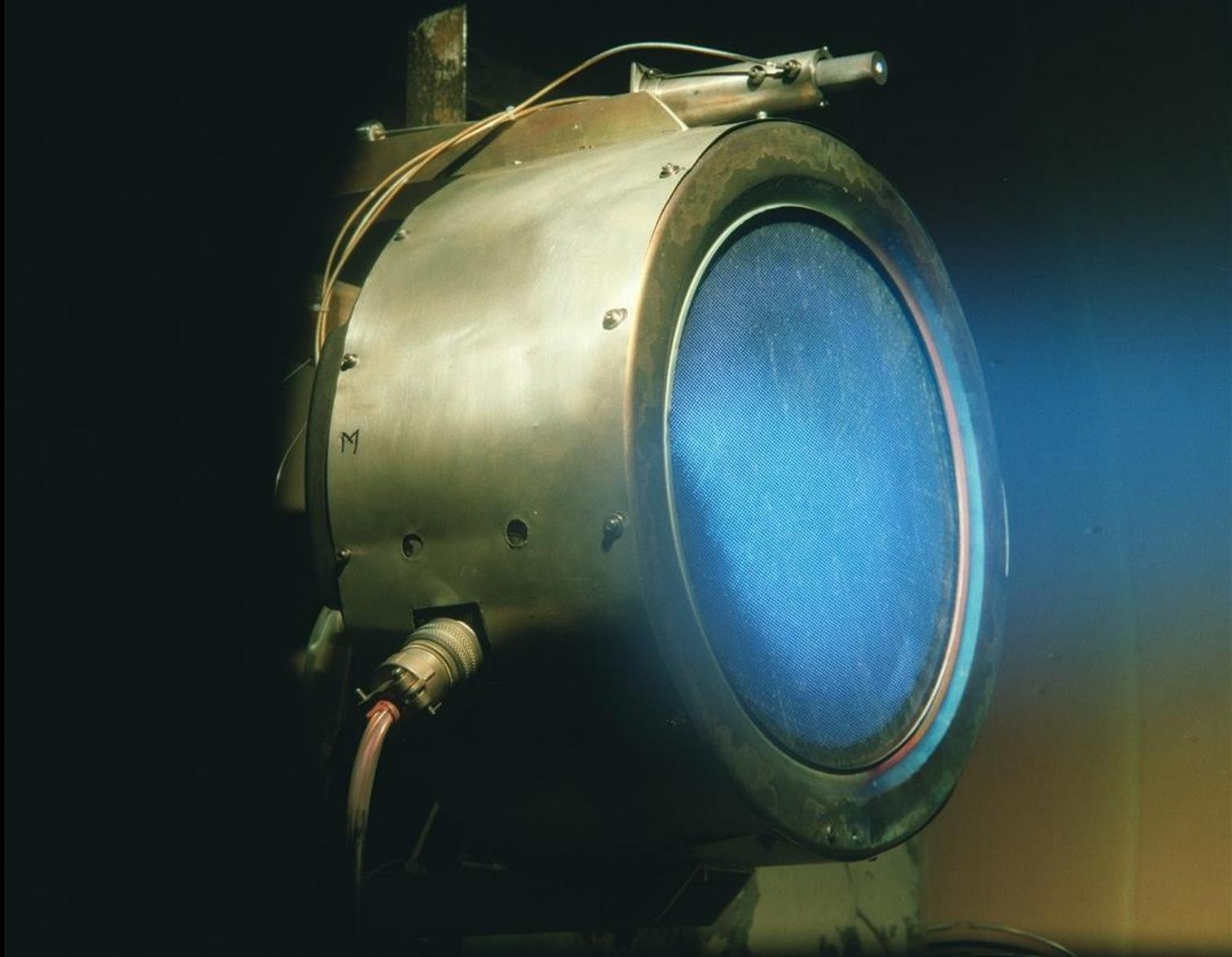


# Dawn Spacecraft



Dawn is the 9<sup>th</sup> mission in NASA's competed, low-cost Discovery Program

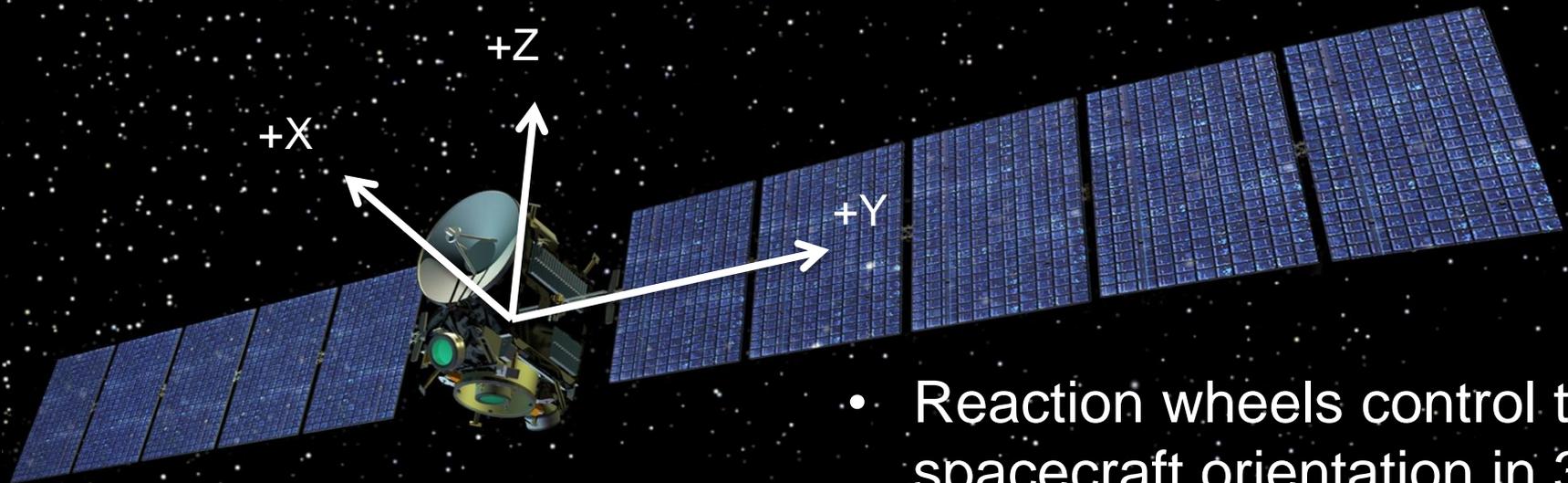
# Dawn is Enabled by Ion Propulsion



# Dawn was the largest interplanetary spacecraft that NASA has launched

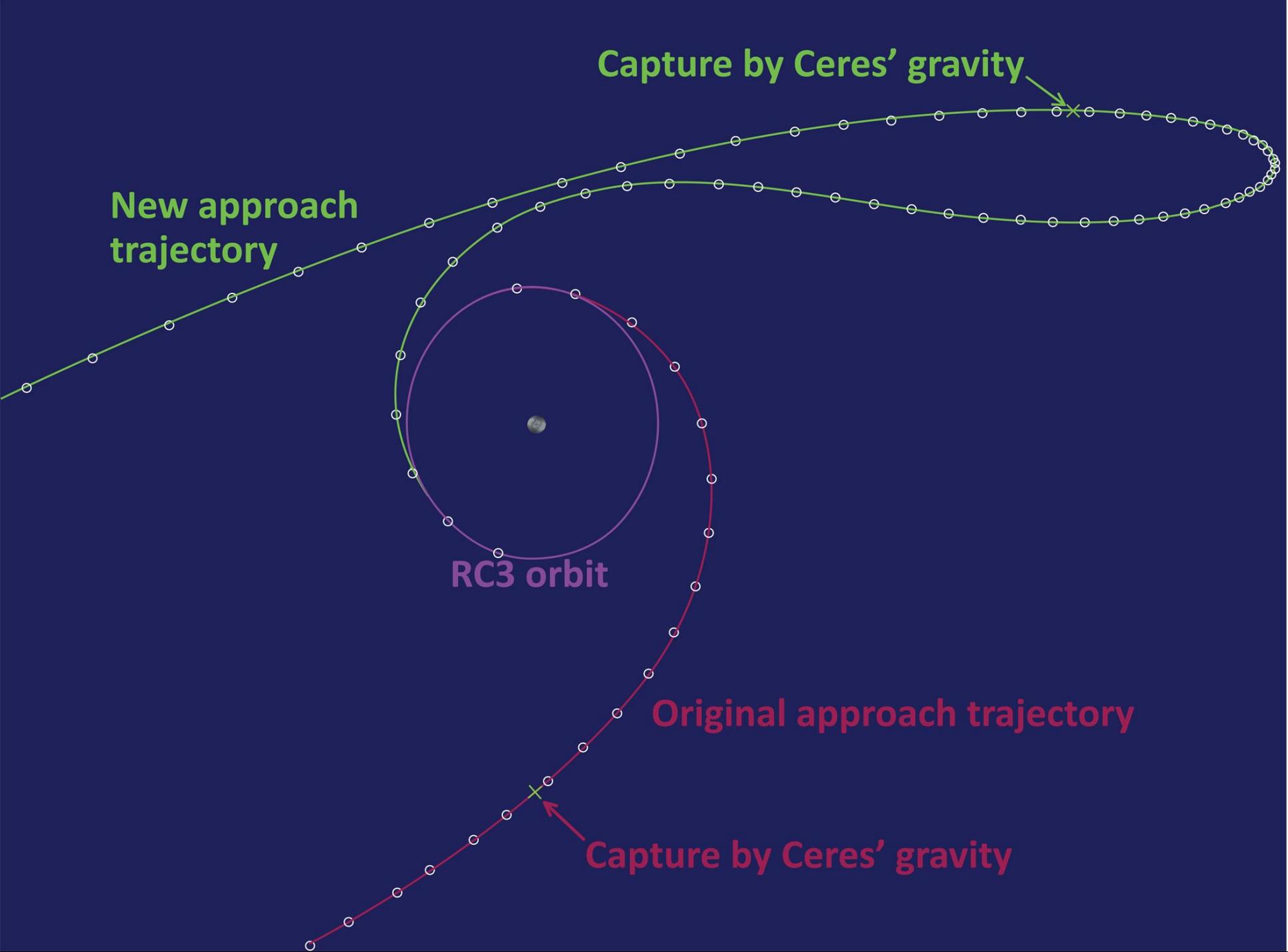


# Dawn Reaction Wheels

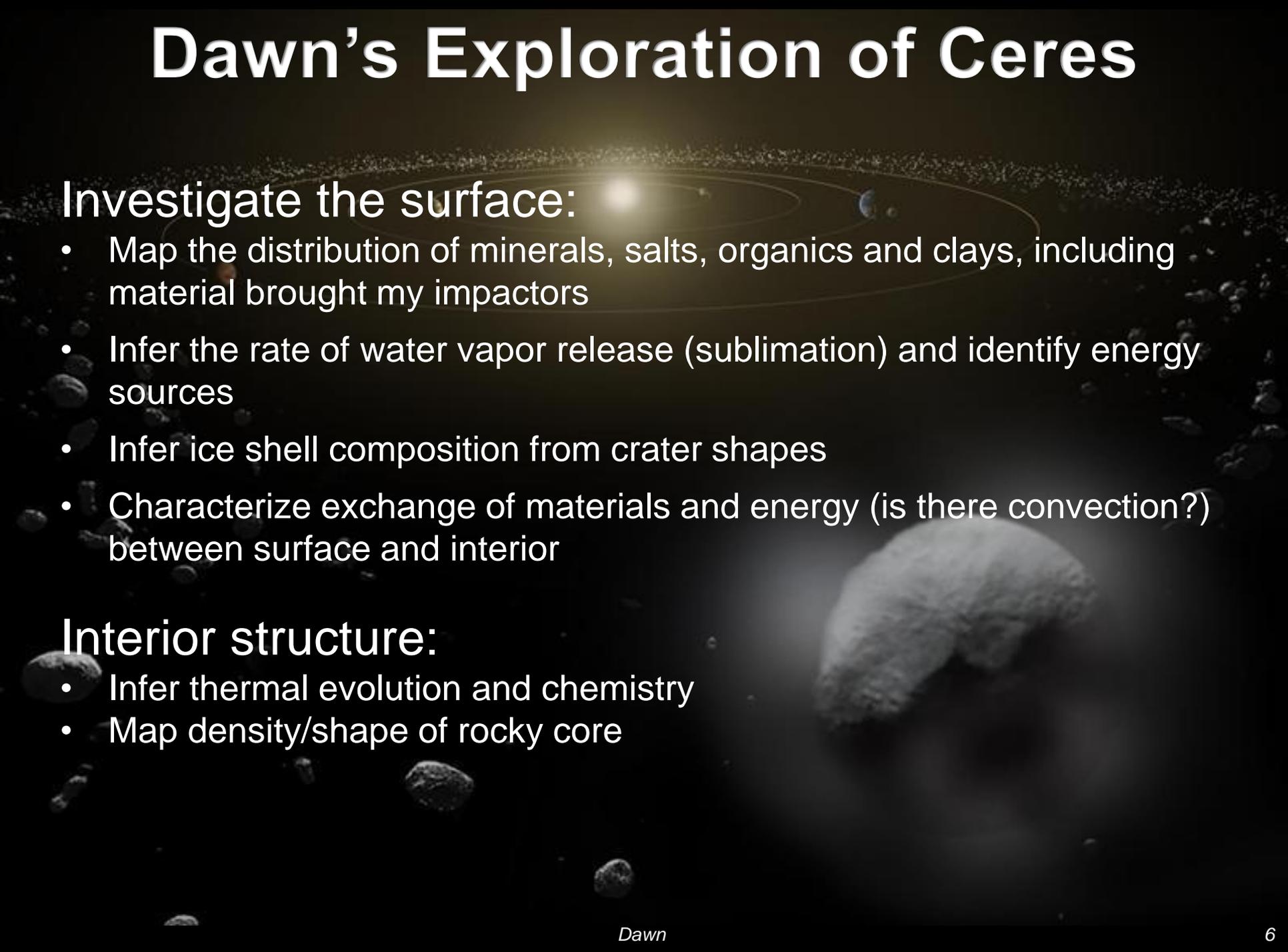


- Reaction wheels control the spacecraft orientation in 3 axes

- An electric motor spins a flywheel, which causes the spacecraft to rotate around its center of mass. Hydrazine thrusters are fired to remove momentum from the wheels.
- Dawn has lost 2 of its 4 reaction wheels
  - Spacecraft currently uses only the hydrazine thrusters to control attitude
  - Team developed a two-wheel “hybrid” attitude control mode to use with jets



# Dawn's Exploration of Ceres



## Investigate the surface:

- Map the distribution of minerals, salts, organics and clays, including material brought by impactors
- Infer the rate of water vapor release (sublimation) and identify energy sources
- Infer ice shell composition from crater shapes
- Characterize exchange of materials and energy (is there convection?) between surface and interior

## Interior structure:

- Infer thermal evolution and chemistry
- Map density/shape of rocky core