THE DIANA DISCOVERY MISSION: A SOLAR ELECTRIC PROPULSION MISSION TO THE MOON AND A COMET; C. T. Russell, IGPP/UCLA; J. Abshire, GSFC; M. A'Hearn, U. Maryland; C. Alexander, A. Konopliv, A. Metzger, JPL; J. Arnold, UCSD; J. J. Berthelier, CETP; R. Elphic, LANL; M. Hickman, D. Palac, LeRC; R. Jaumann, G. Neukum, DLR; T. McCord, U. Hawaii, R. Phillips, U. Washington; C. Pieters, Brown University; W. Purdy and R. Rosenthal, TRW.

In response to the Discovery announcement of opportunity a team consisting of TRW, Lewis Research Center, JPL and UCLA with scientific co-investigators from government and University laboratories have proposed to fly the first planetary solar electric propulsion (SEP) mission. Diana is designed to carry an X-ray and gamma ray spectrometer, an imaging spectrometer, a framing camera, a laser altimeter an ion spectrometer and a magnetometer. In order to obtain lunar gravity data from the far side of the moon a relay satellite is placed into high polar orbit about the moon to relay the Doppler-shifted telemetry to Earth. Diana will spend two months in a 700 km polar orbit obtaining mineralogical data from a full spectral map of the lunar surface, and then spend a year in a 100 km (or below) polar orbit mapping the lunar elemental composition, its topography, gravity field, ions from its atmosphere and its permanent and induced magnetic fields. After the low altitude mapping phase the ion thrusters propel the spacecraft out of the lunar sphere of influence and onto a heliocentric trajectory to rendezvous with dormant comet Wilson-Harrington. The ground truth provided by the returned lunar samples to validate the remote sensing instruments for lunar studies will also serve to validate the Wilson-Harrington observations since the same instruments will be used at both bodies.

The value of solar electric propulsion to the planetary program is made evident by comparing the same mission attempted with solely chemical propulsion. Diana is launched with a Delta II launch vehicle. A similar chemical mission would require a Titan IV and would be in the Cassini class of missions. Solar electric propulsion will open up exploration of the inner solar system including the main belt asteroids by making many bodies accessible at an affordable cost.