

Meeting: 1003, Atlanta, Georgia, SS 1A, AMS Special Session on Current Events

1003-37-1230 **Jerrold E. Marsden*** (marsden@cds.caltech.edu), Control & Dynamical Systems, California Institute of Technology, 107-81, Pasadena, CA 91125-8100, and **Shane D Ross** (shane@cds.caltech.edu), Control and Dynamical Systems, California Institute of Technology, 107-81, Pasadena, CA 91125-8100. *New Methods in Celestial Mechanics and Mission Design.*

The title of this lecture comes from Poincaré, who introduced many key dynamical systems methods through his study of celestial mechanics and especially the three-body problem. Since then, many researchers have contributed to Poincaré's legacy by developing and applying these methods to problems in celestial mechanics and, more recently, with the design of real space missions. This talk will give a survey of some of these exciting ideas.

One of the key ideas is that the competing gravitational pull between celestial bodies creates a vast array of passageways that wind around the sun, planets and moons. One can identify these passageways geometrically as the invariant manifolds of equilibrium points and bounded orbits in the three-body problem. In particular, tube-like structures form an interplanetary transport network which will facilitate the exploration of Mercury, the Moon, the asteroids, and the outer solar system, including a mission to assess the possibility of life on Jupiter's icy moons. (Received October 04, 2004)