Abstract: This talk will review recent research on the celestial mechanics of the N-body problem when the bodies have finite densities and are rigid. This rigidity allows the bodies to rest on each other, forming new types of relative equilibria that don’t exist in the classical point-mass N-body problem. Some of these new relative equilibria can be shown to be energetically stable, and thus can be a natural end-state of an evolving system of gravitating bodies, such as occurs in a rubble pile asteroid.

To study this problem the amended potential for the N body system is derived and used to find all relative equilibria that can exist for a collection of bodies at a fixed level of angular momentum. As angular momentum is changed as a parameter specific transitions in the stability of these relative equilibria occur, and indicate possible evolutionary pathways for small asteroids subjected to slowly changing spin rates over time.

Bio: Daniel J. Scheeres is a University of Colorado Distinguished Professor and holds the A. Richard Seebass Endowed Chair in the Smead Department of Aerospace Engineering Sciences. Prior to this he held faculty positions at the University of Michigan and Iowa State University, and was a Senior Member of the Technical Staff at NASA’s Jet Propulsion Laboratory. He holds degrees from the University of Michigan and Calvin College. Scheeres is a member of the National Academy of Engineering, a Fellow of the American Institute of Aeronautics and Astronautics and of the American Astronautical Society. Asteroid 8887 is named “Scheeres” to recognize his contributions to the scientific understanding of the dynamical environment about asteroids.