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*Saari's Conjecture on simple mechanical systems with symmetry*

In 1970 Donald Saari famously conjectured that if a Newtonian  $N$ -body system has a constant moment of inertia then it is in relative equilibrium (i.e., it is in rigid rotation with a constant angular velocity). In 2002 Jerrold Marsden hypothesized that the conjecture may be generalized to a simple mechanical system that admits a Lie symmetry. The aim of this talk is to explore a geometric approach to Saari's Conjecture. In particular we may pose the problem on a Manakov rigid body and prove a refined statement of the conjecture. (The refinement is essentially necessary to handle higher dimensional symmetry.) By employing a Palais slice decomposition, the question may be further enlarged to simple mechanical systems in which the group action has no points of isotropy. We will conclude with a brief discussion on handling points of isotropy by using a blowup technique.