

Abstract Submitted
for the APR15 Meeting of
The American Physical Society

Spin Dynamics of Kelvin's Pebbles, Jellett's Eggs, and Shiva's Lingam Stones KENNETH BRECHER, Boston University — Study of the problem of the rise of the center of mass (COM) of spinning objects is said to have begun in the late nineteenth century. These early mathematical treatments aimed to explain the motion of the newly invented and patented “tippe top.” This semi-spheroidal top will invert when spun on a smooth surface while raising its COM. Because of the importance of friction in their dynamics, such non-holonomic systems are not readily amenable to analytic treatment, or of intuitive understanding. In notes written in 1844 - before the invention of the tippe top - Lord Kelvin (William Thomson) discussed the problem of the rising COM of spinning objects. He experimented with both oblate and prolate ellipsoidal pebbles, but did not publish a complete theoretical treatment of the problem. J. H. Jellett, in his 1872 book “Theory of Friction,” provided a partial account of the related problem of the rise of the COM for an egg-shaped (ovoid) object, making use of a new (adiabatic) invariant of the motion that he devised. Naturally occurring prolate ellipsoidal “Lingam stones” from the Narmada River in India exhibit similar counter-intuitive dynamical behavior. When spun around its minor axis in a horizontal plane, a Lingam stone will stand erect and spin around its major axis in a vertical position. This presentation will explore the history and some of the experimental facts and theoretical ideas about the rotational dynamics of such physical objects.

Kenneth Brecher
Boston University

Date submitted: 02 Jan 2015

Electronic form version 1.4