

# MECHANICS COLLOQUIUM



Tuesday, March 22, 2005  
10:45-11:45 h.  
Delft University of Technology  
Faculty of Mechanical Engineering  
Mekelweg 2, Delft  
Conference Room 4 (38-8B-2<sup>nd</sup> floor)



## “Equilibrium Configurations of Ellipsoidal, Soil-Like, Spinning Asteroids”

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**Abstract** - Recent research has suggested that asteroids might be particle aggregates held together by self-gravity alone. This has important implications on the possible equilibrium shapes of spinning asteroids. As in the case of spinning fluid masses, not all shapes and spins may be compatible with a granular rheology. The asteroid is taken to be an ellipsoid with an interior modelled as a rigid-plastic, cohesion-less soil.

Using an approximate volume-averaged procedure, it is possible to derive regions in spin-shape parameter space that allow equilibrium solutions to exist. Results obtained are the same as those reported by Holsapple (2000), but are obtained with much less effort. It is also possible to investigate the dynamics of such spinning asteroids and attempt to recover the results of Richardson et al. (2004), who obtained equilibrium shapes of smooth spherical aggregates by numerically studying their passage into equilibrium. As a final application of this approximate procedure, the Roche limit for a satellite tidally interacting with a central planet is derived.

**About the speaker** - Dr. Sharma is currently a post doctoral fellow at the Institute of Theoretical Geophysics, DAMTP, University of Cambridge, UK, working on deep penetrating anchors, collapsing granular columns and, perhaps, other granular phenomena. He has his degrees from the Indian Institute of Technology, Kanpur, India, B.Tech (1999) and Theoretical and Applied Mechanics, Cornell University, PhD (2004) where he worked on rotational dynamics of deformable bodies, with application to asteroids under Joe Burns and Jim Jenkins. He is interested in mechanics and kinematics.