II Joint Conference of the Belgian, Royal Spanish and Luxembourg Mathematical Societies
Logroño, June 6–8, 2016

The role of chaos in the formation of binary objects in the Kuiper-belt

David Farrelly[1]

Kuiper-belt binaries (KBBs) provide an invaluable window into conditions in the primordial solar system. Several mechanisms for the formation of KBBs have been proposed including; two-body collisions inside the Hill sphere of a larger body (Weidenschilling, *Icarus*, **160**, 212, 2002); strong dynamical friction (Goldreich, *et al.*, *Nature*, **420**, 643, 2002) and exchange reactions (Funato, *et al.*, *Nature*, **427**, 518, 2004). We propose a model of Kuiper-belt binary formation in the Hill approximation; the mechanism involves the following sequence of events: (i) long-lived quasi-bound binaries are formed when two large objects ($\sim$ 100 km sized) penetrate their mutual Hill sphere and get caught up in a sea of chaos; (ii) the binary is stabilized through gravitational scattering with a small intruder; and, finally, (iii) subsequent intruder scattering events gradually reduce the size of the binary until the mutual orbit is essentially Keplerian. In agreement with observations, the model predicts a propensity for the production of large mass ratio binaries having large semimajor axes and moderately eccentric mutual orbits.

[1]Utah State University
Logan, UT, USA
david.farrelly@usu.edu