Some toy problems and their fluid dynamical analogues

HMI and TCD Physics Department Public Lecture
by Keith Moffatt

7.30pm Tuesday 25 January 2005
Schroedinger Lecture Theatre, Fitzgerald Building TCD.

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The Schroedinger Lecture Theatre is at the top of the Fitzgerald Building just east of College park.

Three 'toy' problems, which allow for simple table-top demonstrations, will be considered:
1) The problem of a spheroid spinning rapidly on a table (the 'spinning egg' problem). Here, the spheroid rises to a position of maximum potential energy, a process driven by weak dissipation associated with slip and friction at the point of contact with the table.
2) The problem of the 'celt', which, due to a weak chiral asymmetry, exhibits a preference for rotation in one sense rather than the other.
3) The problem of a disc rolling on its edge at a small angle to the table on which it rolls ('Euler’s Disc'); this system exhibits a singularity at finite time driven by weak dissipative effects.

Each of these problems exhibits counter-intuitive behaviour which, however, is suggestive of a counterpart of fundamental significance in more complex fluid systems. These counterparts will be briefly discussed.

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See also: http://www.hamilton.tcd.ie/events/25Jan2005/