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Microgravity and Microscale Fluid Mechanics

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This Introductory Lecture will cover aspects of Microgravity Fluid Mechanics by first describing the characteristics of the microgravity environment and establishing the manner in which the body force of gravity appears in the basic scalings and diimensionless parameters. The following themes are then developed: (i) the Space environment is characterized by transient accelerations, which implies that both the magnitude and direction of g are time-dependent, and; (ii) the magnitude of g is important only in combination with other intrinsic scales, with the consequence that microgravity and microscale fluid mechanics have much in common. The lecture will then focus on two classes of problems. The first is a class of so-called g-jitter phenomena driven by the time dependence of g, and the second is a class of interfacial fluid mechanics problems in which the essential driving force is applied tangential stresses due to Marangoni effects. If time allows, the inclusion of non-hydrodynamic forces will be mentioned, particularly in reference to the invited talk SL16, Electrokinetics and electrohydrodynamics in microfluids, by D.A. Saville.

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