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Ain A. Sonin, Gareth McKinley; MIT

1 The Continuum Viewpoint and the Equation of Motion

- 1.1 On the molecular origin of fluid behavior and its analytical difficulties.
- 1.2 Rheological properties of materials; elastic solids, Newtonian fluids and viscosity, non-Newtonian fluids, viscoelastic fluids. The defining attribute of a "fluid."
- 1.3 The continuum viewpoint and the concept of properties as fields; Eulerian vs Lagrangian methods of description. The importance of reference frame in the Eulerian description; steady and unsteady flows.
- 1.4 Acceleration of a fluid particle expressed in terms of the (Eulerian) velocity field: the material (or substantial, or total) time derivative. The rate of change of with time of a fluid property seen by an observer moving through a continuum at an arbitrary velocity.
- 1.5 Material particles, material volumes, and control volumes. The physical laws that govern the behavior of continua, expressed in terms of material volumes. (Much more to follow in §3 and §4).
- 1.6 Forces acting on a continuum: body forces and surface forces.
- 1.7 Pascal's principles and the concept of pressure in a static (or otherwise shear-free) fluid.
- 1.8 Net surface force on a fluid particle in a pressure field.
- 1.9 Thermal equation of state for fluids of constant composition (the equilibrium density-pressure-temperature relation).
- 1.10 The equation of motion of a fluid in differential form.

<u>Read:</u>	Fay	Chapt. 1 Chapt. 3, pp 89-97	Chapt. 2, pp 39-44 Chapt. 4, pp 128-132
	Or Kundu & Cohen	Chap. 1.1–1.6, Chap . 4.1, 4.5-4.7	Chap. 2 (review)

Problems: Handout: special Problem 1.01 on sounding rocket.