

Abstract for an Invited Paper
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Otto Laporte Lecture: Explaining the flow of elastic liquids

JOHN HINCH, DAMTP, Cambridge University, UK

The behaviour of elastic liquids does not follow simply from our understanding of both elastic solids and viscous liquids. Four anomalous behaviours will be discussed :- (i) long wakes at low Reynolds numbers, (ii) large vortices upstream of a constriction, (iii) long times for capillary forces to squeeze a filament, and (iv) different devices measuring wildly different values of ‘the’ extensional viscosity for the international standard liquid M1. Many features can be explained and understood using the simplest constitutive equation, that of an Oldroyd-B fluid, which generates the important ideas of tension in streamlines and delays for the stress to response. This model fluid has however an undesirable negative viscosity under certain conditions, which can be regularized by requiring a finite extensibility of the underlying microstructure, in the FENE modification. This modification enables the remain anomalous behaviours to be understood, with a high extensional viscosity to increase drag and an anisotropy to create the long upstream vortices.