

# Impact and breakup of drops of polymer solutions

Prabhakar Ranganathan

*Ph.D. position available*

We are looking for somebody with a [H1 or equivalent](#) graduate degree in either engineering, physics or mathematics to take on the challenge of setting up computer simulations to study an important problem that has several potential industrial applications. A PhD in this project will provide in-depth training in numerical methods, modern simulation techniques, fluid mechanics, polymer physics and statistical mechanics, and can be the stepping stone to an exciting career in academic or industrial research in a number of fields: computer simulations, nanotechnology, mechanical/ chemical/ materials engineering, microfluidics, etc. Scholarships are available from Monash University for applicants with a [strong \(i.e. H1 or equivalent\) academic background](#).

Liquid drops splattering after striking a surface is a common, everyday experience that is nevertheless of considerable importance in applications such as ink-jet printing, agricultural spraying, etc. In many situations, it is necessary to reduce or eliminate splattering, and this is often achieved by adding small amounts of polymeric additives. However, we do not understand this ability of polymers to reduce splatter well enough to be able to "design" fluids with just the right amount of stickiness. Computer simulations of the process of drop impact and splattering have been hampered by the lack of an efficient numerical method that can simultaneously handle all the complexities of gravity, surface tension, fluid flow, surface wettability, and polymer elasticity. Our central goals are to firstly devise and test a new numerical technique that will be suitable for complex free-surface problems involving breakup of the polymeric viscoelastic liquids into droplets, and then apply this technique to develop a detailed predictive understanding of drop impact.

Interested candidates can mail [Dr. Ranganathan](#), or [Dr. Jagadeeshan](#) for additional information. Candidates from India interested in applying through the IITB-Monash Research Academy can contact [Dr. Sunthar](#).

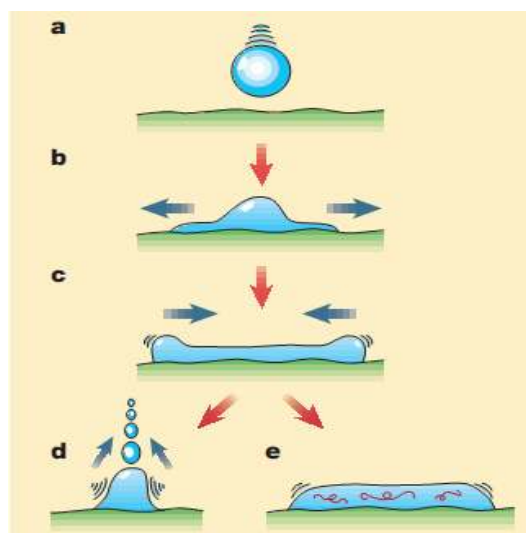


Figure 1: *The process of drop impact: (a-c) The drop flattens after striking a surface, and after reaching a maximum radius, begins to retract. (d) In drops of pure water, the retraction is fast enough to result in ejection of satellite drops, leading to wastage. (e) Adding very small amounts of polymer can completely eliminate retraction and breakup (image from Klein, Nature, 405, 6788:745, 2000).*