

1 Viscoelastic fluids

Read the paper *A Method for Animating Viscoelastic Fluids* by Goktekin, Bargteil, and O'Brien, from SIGGRAPH 2004. Then answer the following questions concerning it:

- (1) What sorts of problems could this approach have if used to simulate a fully elastic object? (i.e. with no plastic deformation or "flow")
- (2) Is equation 5 reasonable (given how the elastic strain is used in equation 1)? In particular, think of the following situation. The material is stretched elastically by a factor of two in the horizontal direction (but not along other axes). It is then rotated by 90 degrees rigidly, so it is now stretched along the vertical direction. In what direction will the elastic force be pulling on the material?
- (3) Play with stuff at home! Find three examples of viscoelastic fluids (around your house), and explain how you know they are not simply viscous fluids like honey or molasses. In other words, explain an experiment that would differentiate them from regular fluids.
- (4) Briefly explain (in layman's terms) what the Deborah number is, and why it's called that.