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How to make a giant bubble JUSTIN BURTON, STEPHEN FRAZIER, Department of Physics, Emory University — Soap and water solutions can form massive, free floating films encompassing volumes in excess of 50 m^3 with thicknesses of only 1-10 microns when mixed with polymeric additives. These films are interesting from a physical standpoint due to their long lifetime and stability in ambient environments. We have investigated a variety of mixtures which are deemed "optimal" for making large bubbles, such as solutions made from guar seeds and polyethylene oxide (PEO). Making a giant bubble requires a balance between viscous and elastic forces. Drawing out a large soap film requires a low-viscosity solution, while elasticity enhances stability. Using a combination of shear rheology, drop-based extensional rheology, and time-dependent thickness measurements, we found that "optimal" solutions showed similar extensional properties even though their shear viscosity differed by more than an order of magnitude. Soap and water solutions with polymers lived 2-3 times longer and drained more slowly than typical soap and water solutions, even though their initial thicknesses were similar. In addition, polymeric bubbles showed increased stability to aging in dry environments. By varying the molecular weight and concentration of PEO in the solutions, we are able to optimize the lifetime of the film and determine the best way to make a giant bubble.

Justin Burton
Department of Physics, Emory University

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