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Geometric Measure Theory and Soap Bubbles

Soap bubble clusters and froths model biological cells, fire-extinguishing foams, metallurgical structures, bread, cushions, and many other materials and structures. Classical mathematics sometimes provided beautiful nonphysical solutions without the diversity and singularities of nature. Geometric measure theory provides generalized surfaces and the freedom to minimize various energies in general dimensions and settings. Seminal workers included Caccioppoli and De Giorgi in Italy; Riefenberg in England; Young, Federer, Fleming, Almgren, Allard, Taylor, and others in the United States. We'll describe some of the main ideas and results, including recent work and open questions on soap bubble clusters.