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Thomas J Pence* (pence@egr.msu.edu), Department of Mechanical Engineering, 2452 Engineering Building, Michigan State University, East Lansing, MI 48824. *Swelling in highly elastic materials.*

Swelling, sometimes by a large amount, can occur in a variety of soft materials including rubbery polymers, elastomeric gels and biological tissue. The amount of swelling can depend on a variety of factors such as temperature and chemical environment. This talk will focus on the use of large deformation theories for modeling the mechanical effect of material swelling. One type of modeling applies to situations in which the amount of swelling is relatively insensitive to mechanical stress. In this case there is a simple generalization of both the compressible theory of hyperelasticity and the incompressible theory of hyperelasticity. Interesting deformations can then be created by exploiting either spatially inhomogeneous swelling or directionally anisotropic swelling. Boundary value problems for both of these possibilities can be analyzed in some detail. A second type of modeling applies when the amount of swelling is directly coupled to the state of mechanical stress. In this case there is the possibility of stress induced absorption of all of the swelling agent (typically water). The resulting transition saturated response and unsaturated response also gives rise to some interesting mathematical issues. (Received January 26, 2010)