

On the optimal location of singularities arising in variational problems of nonlinear elasticity

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ABSTRACT. Experiments on elastomers have shown that triaxial tension can induce a material to exhibit holes that were not previously evident. Analytic work in nonlinear elasticity has established that such cavity formation may indeed be an elastic phenomenon: sufficiently-large prescribed boundary deformations yield a hole-creating deformation as the energy minimizer whenever the elastic energy is of slow growth. One of the many unanswered problems is where such holes will form. In this paper we suggest a new method, which is based upon asymptotics and linear elasticity, that can be used to determine the optimal location for hole creation. Using this method we show that, under reasonable hypotheses, the centre is (locally) the best position for a solitary hole to form in an elastic ball.

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