

The Elasticity of Elasticity

K.R. Rajagopal

Texas A&M University

College Station, TX 77843-3123

Abstract

In this talk I assert that the usual interpretation of what one means by “elasticity” is much too insular and illustrate my thesis by introducing implicit constitutive theories that can describe the non-dissipative response of solids. I show that response which was hitherto untenable within the context of Cauchy or Green Elasticity are not only possible, they can explain phenomena that have thus far defied explanation. There is another important aspect to the introduction of such an implicit approach to the non-dissipative response of solids, namely the development of a hierarchy of approximations wherein, while the strains are infinitesimal or have a limiting value, the relationship between the stress and the linearized strain could be non-linear! Such approximations have been used but without a proper understanding of the basis for such theories (they would not be logically consistent within the context of explicit theories of Cauchy elasticity or Green elasticity).