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Bipotential continuum models for granular mechanics JOE GODDARD, University of California, San Diego — Most currently popular continuum models for granular media are special cases of a generalized Maxwell fluid model, which describes the evolution of stress and internal variables such as granular particle fraction and fabric,in terms of imposed strain rate. It is shown how such models can be obtained from two scalar potentials, a standard elastic free energy and a "dissipation potential" given rigorously by the mathematical theory of Edelen. This allows for a relatively easy derivation of properly invariant continuum models for granular media and fluid-particle suspensions within a thermodynamically consistent framework. The resulting continuum models encompass all the prominent regimes of granular flow, ranging from the quasi-static to rapidly sheared, and are readily extended to include higher-gradient or Cosserat effects. Models involving stress diffusion, such as that proposed recently by Kamrin and Koval (*PRL* **108** 178301), provide an alternative approach that is mentioned in passing. This paper provides a brief overview of a forthcoming review articles by the speaker (*The Princeton Companion to Applied Mathematics*, and *Appl. Mech. Rev.*,in the press, 2013).

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