# First Talk

## Electrodynamics and Thermomechanics of Material Bodies

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**Abstract**

This talk begins with a brief review of classical electrodynamics for a given aether frame, including certain invariance properties of Maxwell's equations under Euclidean changes of frame. I then introduce, in the given aether frame, the balance of energy and the Clausius-Duhem inequality (a form of the second law of thermodynamics) for the arbitrary parts of a material body. The form-invariance of these fundamental laws under Galilean changes of frame is taken as axiomatic and the consequences are discussed.

I then consider electromagnetic-thermomechanical processes, defined for a material body and its environment, and investigate the notion of isolated processes when the environment consists of the vacuum and several fixed, charged, rigid conductors. In this case, a Lyapunov function is identified and I use this function to motivate the form of a "potential energy functional" that serves to define a meaningful minimization theory within the variational approach to thermomechanical-electrostatics. This minimization theory may be studied with the view toward characterizing possible equilibrium states, coexistent phases and domain structures for elastic dielectrics. The dynamical approach outlined here integrates well with the classical variational theory, which is not based on dynamical considerations.