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François Gay-Balmaz* (gaybalma@lmd.ens.fr), LMD Ecole Normale Supérieure, 24, Rue Lhomond, 75005 Paris, France, and **Hiroaki Yoshimura**. *A variational Lagrangian formulation for nonequilibrium thermodynamics.*

We present a Lagrangian variational formulation for nonequilibrium thermodynamics. This formulation extends the Hamilton principle of classical mechanics to include irreversible processes in both discrete and continuum systems. The irreversibility is encoded into a nonlinear nonholonomic constraint given by the expression of entropy production associated to the irreversible processes involved. The introduction of the concept of thermodynamic displacement allows the definition of a corresponding variational constraint. We also present the geometric structures underlying nonequilibrium thermodynamics. We illustrate our theory with both finite and infinite dimensional examples, including mechanical systems with friction, chemical reactions, electric circuits, and reacting fluids. (Received September 13, 2016)