

# Between Laws and Models: Some Philosophical Morals of Lagrangian Mechanics

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## Abstract

I extract some philosophical morals from some aspects of Lagrangian mechanics. (A companion paper will present similar morals from Hamiltonian mechanics and Hamilton-Jacobi theory.) One main moral concerns methodology: Lagrangian mechanics provides a level of description of phenomena which has been largely ignored by philosophers, since it falls between their accustomed levels---`laws of nature" and `models". Another main moral concerns ontology: the ontology of Lagrangian mechanics is both more subtle and more problematic than philosophers often realize.

The treatment of Lagrangian mechanics provides an introduction to the subject for philosophers, and is technically elementary. In particular, it is confined to systems with a finite number of degrees of freedom, and for the most part eschews modern geometry.

**Keywords:** Classical mechanics, Lagrangian mechanics, Laws of nature, models, modality, symmetry, Routhian reduction, Noether's theorem

**Subjects:** [Specific Sciences: Physics: Classical Physics](#)  
[General Issues: Models and Idealization](#)  
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