# 10.1: Introduction to Nonconservative Systems

Hamilton’s action principle, Lagrangian mechanics, and Hamiltonian mechanics, all exploit the concept of action which is a single, invariant, quantity. These algebraic formulations of mechanics all are based on energy, which is a scalar quantity, and thus these formulations are easier to handle than the vector concept of force employed in Newtonian mechanics. Algebraic formulations provide a powerful and elegant approach to understand and develop the equations of motion of systems in nature. Chapters $6-9$ applied variational principles to Hamilton’s action principle which led to the Lagrangian, and Hamiltonian formulations that simplify determination of the equations of motion for systems in classical mechanics.

A conservative force has the property that the total work done moving between two points is independent of the taken path. That is, a conservative force is time symmetric and can be expressed in terms of the gradient of a scalar potential $V$. *Hamilton’s action principle implicitly assumes that the system is conservative for those degrees of freedom that are built into the definition of the action, and the related Lagrangian, and Hamiltonian.* The focus of this chapter is to discuss the origins of nonconservative motion and how it can be handled in algebraic mechanics.