# 13.19: Hamiltonian equations of motion for rigid-body rotation

The Hamiltonian equations of motion are expressed in terms of the Euler angles plus their corresponding canonical angular momenta $(\phi, \theta, \psi, p_\phi, p_\theta, p_\psi)$ in contrast to Lagrangian mechanics which is based on the Euler angles plus their corresponding angular velocities $(\phi, \theta, \psi, \dot{\phi}, \dot{\theta}, \dot{\psi})$. The Hamiltonian approach is conveniently expressed in terms of a set of Andoyer-Deprit action-angle coordinates that include the three Euler angles, specifying the orientation of the body-fixed frame, plus the corresponding three angles specifying the orientation of the spin frame of reference. This phase space approach[Dep67] can be employed for calculations of rotational motion in celestial mechanics that can include spin-orbit coupling. This Hamiltonian approach is beyond the scope of the present textbook.