A central theme of much of Bill Miller’s research has been to develop semiclassical theories that exploit the realization that nuclear motion is approximately classical, while retaining the most essential consequences of quantum mechanics. A particularly challenging goal in this regard has been to describe nonadiabatic dynamics - processes that involve multiple electronic potential energy surfaces. It is crucial in such cases to properly incorporate feedback between the classical or semiclassical motions and the quantum mechanical electrons. Transitions between electronic states are driven by the time-dependent motion of the nuclei and, in turn, the forces governing the nuclei are altered by electronic transitions (“the quantum back-reaction”). A second important goal is to develop a formulation that satisfies detailed balance; i.e., that approaches the correct equilibrium state. An analysis of quantum back-reaction and detailed balance in semiclassical and mixed quantum-classical theories of nonadiabatic dynamics will be presented, supplemented by numerical simulations of simple model problems.