Quantum Monte Carlo methods, including the Green's function Monte Carlo (GFMC) method and the auxiliary-field diffusion Monte Carlo (AFDMC) method, are arguably the most accurate many-body methods in nuclear physics. Chiral effective field theory (EFT) presents a systematic way to derive nuclear interactions from an EFT whose organizing principle is the same symmetry as low-energy quantum chromodynamics. The combination of these two is a novel and exciting development. In this talk, I present our recent work on GFMC calculations of light nuclei and AFDMC calculations of neutron matter using local two- and three-nucleon interactions derived from chiral EFT up to next-to-next-to-leading order (N^2LO). I discuss the choice of observables we make to fit the two undetermined low-energy constants which enter in the three-nucleon sector at N^2LO: the ^{4}He binding energy and n-α elastic scattering P-wave phase shifts. I show that chiral two- and three-nucleon interactions have sufficient freedom to simultaneously fit properties of light nuclei, n-α scattering P-wave phase shifts, and provide a reasonable description of neutron matter. Finally I discuss some exciting future projects which are now underway.