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**Many-body physics of spin-orbit-coupled quantum gases**

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Spin-orbit-coupled systems provides a unique area in which a fascinating variety of novel and fundamental phenomena occur. Recent theoretical and experimental works have demonstrated that dressed states of ultra-cold atoms coupled to light acquire effective spin-orbit (SO) interactions. In this talk, I will review recent progress in theoretical understanding of these synthetic spin-orbit coupled quantum systems. First, I will discuss possible single-particle Hamiltonians for dressed states that arise in various laser schemes, including Rashba and Dresselhaus-type Hamiltonians, three-dimensional isotropic SO (Weyl) interaction, and su(3) SO coupling. Then, I will discuss many-body quantum physics that arise in bosonic systems. Possible ground states of SO-coupled Bose-Einstein condensates will be discussed. It will be shown that when put on a lattice, SO-coupled, interacting bosons give rise to Mott insulators with exotic spin orders, such as a skyrmion lattice phase and various stripe orders. Finally, I will discuss non-equilibrium phenomena in SO-coupled systems and show how the interplay between spin-orbit coupling and interactions results in interesting quantum dynamical systems, which feature a rich variety of time-dependent behaviors and dynamical transitions.