Li-ion batteries are ubiquitous in portable electronics, and are being implemented to power electric vehicles. A Li-ion battery is a system that dynamically couples electrochemistry and mechanics. The electrochemical processes of Li insertion and extraction lead to rich phenomena of mechanics, such as large deformation, plasticity, fracture, and fatigue. Likewise, mechanics influences interfacial reactions, ionic transport, stability of chemical reactions, and phase transformations in the electrodes. In this talk, I will highlight the intimate coupling between mechanics and electrochemistry in Li-ion batteries. Theories of diffusion-induced stresses, coupled Li diffusion and large elasto-plastic deformation, concurrent chemical reactions and flow, and fracture of electrodes will be presented. First-principles simulations and in-situ experiments that emphasize the mechanisms of reactions and deformation will also be discussed.