Abstract: Proton form factors are some of the cornerstone observables that characterize the spatial distribution of charge and magnetization in the proton. Electron scattering measurements of proton form factors using two different experimental techniques are in significant disagreement. The origin of this discrepancy is believed to be a "two-photon exchange" reaction mechanism, which was first proposed by our research collaboration some 15 years ago.

In this talk I will discuss recent theoretical and experimental progress in the determination of the presence and significance of two-photon exchange in electron-proton scattering. Three experiments to directly measure two-photon exchange effects by comparing positron and electron scattering have recently been published, and I will discuss the findings from a theoretical perspective.

Time permitting, I will discuss related calculations of strong interaction effects in parity-violating electron-proton scattering and atomic parity violation, which are relevant for precision tests of the Standard Model.