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Gluon mass gap through the Schwinger mechanism

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In QCD, the Schwinger mechanism endows the gluons with a mass gap through the dynamical formation of longitudinally coupled poles at zero momentum in the interaction vertices. In this talk, we review the key aspects of the Schwinger mechanism in QCD, discuss recent evidence for its occurrence, and some of its implications on the infrared behavior of the QCD Green's functions. First, we show how the massless poles arise through the dynamical formation of massless colored bound states, and discuss the Bethe-Salpeter equation governing this process. Next, we demonstrate that the presence of irregularities in the three-gluon vertex modifies the Ward identity that relates it to the gluon propagator and certain ghost sector Green's functions. Importantly, the new term in the Ward identity turns out to be precisely the Bethe-Salpeter amplitude of the massless bound-sate. This allows an independent determination of the Bethe-Salpeter amplitude from a certain algebraic combination of two- and three-point sector Green's functions computed with gauge fixed lattice simulations. The results are then contrasted to the prediction based on the Bethe-Salpeter equation, finding excellent agreement.

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