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Probing Quark-Gluon Correlations in the Neutron: Precision Measurements of d_2^n and g_2^n BRAD SAWATZKY, Temple University, E06-014 COLLABORATION, E12-06-121 COLLABORATION, JLAB HALL A COLLABORATION — The spin structure function g_2 and the higher twist reduced matrix element d_2 are fundamentally coupled to the quark-gluon interactions and transverse momentum of the quarks in the nucleon. Unlike most higher-twist processes which can not be separated from associated leading twist terms, g_2 contributes to leading order in the longitudinal-polarized lepton scattering on a transversely polarized nucleon. This makes g_2 one of the *cleanest* higher twist observables. Within the OPE, the second moment of a linear combination of g_1 and g_2 may be connected to the higher twist reduced matrix element d_2. This quantity has been well studied in Lattice QCD and other theoretical models. While calculations on the proton are in good agreement with data, calculations on the neutron not only have the opposite sign, but are 3–4 sigma away from the world average. This talk presents two Jefferson Lab measurements focused on g_2 and d_2 for the neutron. The first, E06-014, completed its run in March 2009 and will reduce the uncertainty on the neutron d_2 by a projected factor of four. The second experiment to be described, E12-06-121, is targeted to run shortly after the JLab 12 GeV upgrade is completed (est. 2014–5) and will focus on precision measurements of g_2^n over the region $0.2 < x < 0.95$ and $2.5 < Q^2 < 6\,\mathrm{GeV}^2/c^2$.

Brad Sawatzky
Temple University

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