A Clean Measurement of the Neutron Skin of ^{208}Pb Through Parity Violating Electron Scattering

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The difference between the neutron radius R_n of a heavy nucleus and the proton radius R_p is believed to be on the order of several percent. This qualitative feature of nuclei, which is essentially a neutron skin, has proven to be elusive to pin down experimentally in a rigorous fashion. I will present a new Jefferson Lab experiment [1] that aims to measure the parity-violating electroweak asymmetry in the elastic scattering of polarized electrons from ^{208}Pb at an energy of 850 MeV and a scattering angle of 6^{o}. Since the Z_0 boson couples mainly to neutrons, this asymmetry provides a measure of the size of R_n with respect to R_p, that can be interpreted with as much confidence as the traditional electron scattering data. The projected experimental precision corresponds to a ±1% determination of R_n, which will access the range of values predicted by nuclear theory, thus establishing the existence of the neutron skin if it is of the expected size.

[1] Jlab Proposal E-00-003, R. Michaels, P.Souder, and G. Urciuoli, spokespersons (2000).