

Krishna Kumar – Colloquium seminar March 24, 2021
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Title: How Thick is the Neutron Skin of a Heavy Nucleus?

Abstract: For over a hundred years, subatomic forces in Nature have been investigated by studying the scattered flux of relativistic elementary particles that were bombarded on quasi-stationary nuclear matter. Precise and detailed information on fundamental forces and the size and shapes of atomic nuclei and their constituents have come from scattering measurements using electron beams. Over the past forty years, significant new discoveries have been made in such experiments by exploiting an intrinsic quantum property of elementary particles known as "spin", which manifests itself as a left- or right-handedness when particles move at relativistic speeds. There is a tiny difference (of order parts per million) between the probabilities for scattering left- and right-handed electrons off subatomic matter, which can be used to gain unique new insights into the nature of constituent quarks as well as those that bubble in and out of existence inside protons and neutrons, the radial extent of neutrons in a heavy nucleus, and to search for new forces that might have shaped the evolution of the early universe. I will describe the experimental technique to measure the tiny left-right probability difference in electron scattering, report on exciting new precise measurements of the neutron RMS radii of Pb-208 and Ca-48 nuclei, and then conclude with a discussion of future directions of this experimental campaign.