Probing physics beyond the Standard Model at low energies

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In this talk I will provide a theoretical perspective on low-energy searches for physics beyond the Standard Model involving hadrons and nuclei. After presenting an overview of this exciting field, I will focus on two probes that illustrate the breadth of the field. First, I will discuss how ongoing beta decay measurements have the potential to unveil new interactions that are up to ten thousand times weaker than the known weak force and manifest themselves through apparent violation of the quark- and lepton- universality of weak interactions. In the second part of the talk I will discuss neutrino-less double beta decay as a probe of lepton number non-conservation and its implications for the origin of neutrino mass and the Majorana nature of neutrinos. Throughout, I will highlight the theoretical challenges and progress associated with the interpretation of these sensitive experiments.