Contribution ID: **42** Type: **Invited Talk**

Ab initio theory for structure and electroweak properties of medium-mass nuclei

In this talk I will discuss recent advances in the in-medium similarity renormalization group (IMSRG) which expand the scope of ab initio nuclear structure calculations to essentially all properties of light, medium-mass nuclei and beyond. When based on consistently derived two- and three-nucleon forces, these powerful approaches allow first predictions of the limits of nuclear existence, the proton and neutron driplines, and the evolution of magic numbers far from stability. I will also focus on recent extensions to fundamental problems in nuclear-weak physics, including a solution of the long-standing quenching puzzle in beta decays and calculations of nuclear matrix elements of neutrinoless double-beta decay for determining neutrino masses.

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