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Nuclear Structure Near Doubly Magic Nuclei

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In this contribution, we investigate the strong force in atomic nuclei, i.e. the way nucleons arrange themselves in a many-body system governed by the repulsive Coulomb interaction and the attractive strong interaction. We will focus on nuclear structure near nuclei with a "magic number"of Z protons and N neutrons, so-called doubly-magic nuclei, exhibiting a particularly stable configuration with respect to neighboring nuclei. Within the nuclear shell model, similar to the atomic shells, the magic numbers indicate shell closures accompanied by energy gaps. Nuclei at double-shell closures and their direct vicinity provide an important playground to benchmark nuclear theories and models that aim to predict the intricate interplay of the nucleons that lead to enhanced nuclear binding energies, significant changes in charge radii and transition strengths, etc. Of particular interest are nuclear isomers, long-lived excited states, in which the nucleon configuration is altered, resulting in a modification of their nuclear properties despite having the same number of protons and neutrons. In 99In, one proton away from the important doubly-magic nucleus 100Sn, we found the isomeric state exhibiting contrasting trends in binding energies and compared these with nuclear electromagnetic moments. In 79Zn, near the doubly-magic nucleus 78Ni, we discovered that the isomer shows signs of shape coexistence, which has strong implications on the magicity of 78Ni. In this presentation, we will revisit these two isomers and put them into a greater context in modern nuclear theory.

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