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Continuum dynamics and reactions in light nuclei[1]

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Atomic nuclei are the heart of matter and the fuel of stars. An overarching goal of nuclear physics is to arrive at the comprehensive understanding in terms of the laws of quantum mechanics and the underlying theory of the strong force (quantum chromodynamics) of atomic nuclei and their interactions, and to use this understanding to accurately predict properties that are difficult to measure or simply inaccessible to experiment but play a fundamental role in explaining the inner workings of the Universe or are critical to the national security. This requires explaining a wide variety of phenomena: from how neutrons and protons organize themselves to form stable bound states, rare unstable isotopes, and transient resonances, to how nuclei dynamically interact with one another during a reaction. I will give examples of how powerful techniques for the description of the nuclear force and the solution of the nuclear quantum many-body problem combined with cutting-edge high-performance computing are enabling the realization of this goal in light nuclei.

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