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Few nucleons and other stories

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Universality connects few-nucleon systems to seemingly very different areas of physics, ranging from cold atoms to hadronic molecules. An important principle that guides the description of all these systems is the existence of a separation of scales. The key insight is that it is possible to built a theory where all forces are of short range, while the universal physics of interest is governed by the long-range tails of wavefunctions. Not only is such a scale separation the physical principle that enables the construction of effective field theories (EFTs), a framework that has revolutionized nuclear physics and contributed significantly also to the other areas mentioned at the outset, it moreover leads to powerful relations which enable the extraction of physical observables from simulations performed at finite volume. In this talk I will give overview of recent developments along these lines, covering both fundamental questions regarding the construction of nuclear forces, as well as finite-volume calculations for few-body bound states and resonances.

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