FAKULTÄT für PHYSIK
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PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
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Garchinger Maier-Leibnitz-Kolloquium

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Online via ZOOM:

https://lmu-munich.zoom.us/j/98457332925?pwd=TWc3V1JkSHpyOTBPQVlMelhuNnZ1dz09

Meeting ID: 984 5733 2925
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Prof. Harald Grießhammer

(George Washington University, Washington DC, US)

Are nucleon-nucleon forces as important as we think?

Theorists love the unitarity limit: the two-nucleon S-wave binding energies are zero, the scattering lengths infinite, and there are a lot more symmetries. While the NN-system has then no scale, that does not mean that all binding energies of nuclei are zero or infinite: the 3N-system has one dimensionful scale, set by the triton binding energy and related to the so-called Efimov effect. This 3N-scale sets the only low-energy scale of all observables in Nuclear Physics. But how useful is that to understand the structure of nuclei at the physical point? We speculate that Nuclear Physics resides indeed in a sweet spot: bound weakly enough to be insensitive to the details of the nuclear interaction; but dense enough that the NN-scattering lengths are perturbatively close to the unitarity limit. In this paradigm change, details of two-nucleon interactions are less important than three-nucleon interactions to explain the complexity and patterns of the nuclear chart. For mass number $A \leq 4$ nuclei, this describes the spectrum by a converging, perturbative expansion around the unitarity limit, with controlled corrections. I also comment on tests in heavier nuclei and nuclear matter, and on how the picture changes when the dimensionful scales of the pion-exchange force are added.

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