

# Efimov Physics: from three- to N-particle universality

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Efimov physics refers to the universal behaviour of three-body particles in systems where the interaction is tuned, by nature or by scientists, close to the verge of binding a two-body subsystem. The most striking aspect of this physics is the Efimov effect, that is the appearance of an infinite number of three-body bound states that accumulate at the zero-energy threshold in the limit where the two-body-scattering length diverges (unitary limit). Moreover, the ratio between two consecutive bound-state energies tends to a constant that, for identical bosons, is universal. The limit is exact for all of the three-body states in the case of zero-range potentials, an ideal and pathological limit where the infinite tower of three-body bound states is unbounded from below (Thomas collapse). For real potential, the range of the force is finite, the system has a well-defined three-body-ground state, and the limit receives non-universal corrections -finite-range corrections.

After an introduction to Efimov physics, I will show how finite-range corrections can be taken into account in the theory, allowing to map both real-potential calculations and experimental results onto the universal zero-range theory.

In addition, I'll show that the same finite-range analysis allows to analyse the N-body spectrum (at least up to six particles) and to map it onto the same universal prediction of the zero-range three-body theory. In a sense still to be clarified, I'll show evidences that the three-, four-, five-, and six-body shallow systems belong to the same class of universality.