Beyond the Efimov effect: an infinity of trimer states from sub-critical attractive $1/r^2$ interactions$^1$ NICOLAIS L. GUEVARA, BRETT D. ESRY, Department of Physics, Kansas State University, YUJUN WANG, JILA, Department of Physics, University of Colorado — We have investigated the spectrum of three identical bosons interacting through a pair-wise sum of two-body attractive $1/r^2$ potentials. We have found an infinite number of three-body bound states even when the two-body interaction does not support any dimer state. The effect we have found thus resembles the Efimov effect, but it is not the Efimov effect since no scattering length can be defined in the usual sense for an attractive $1/r^2$ potential. Moreover, we show that the effective three-body potential is more attractive asymptotically than the Efimov potential. When the two-body interaction is strong enough to support dimer states, a geometrically-spaced Efimov-like spectrum appears yielding an infinite sequence of three-body bound states. We have also found that three identical fermions interacting via a subcritical attractive $1/r^2$ potential produces an infinite number of three-body bound energies, geometrically spaced like the Efimov effect. We have thus identified a new class of three-body states distinct from those discussed before, yet possessing some of the peculiar properties of Efimov effect.

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