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Manifestations of Efimov states in three-body bound levels and continua[1]

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In 1969, Vitaly Efimov stunned nuclear physicists with a paper that made a bizarre prediction: that a system of 3 uncharged particles can possess an infinite number of weakly bound states, even when none of its 2-particle subsystems are sufficiently attracted to one another to form even one bound state. This counterintuitive effect was initially controversial, but subsequent theoretical studies of 3-body nuclear states as well as analogous states for atoms and molecules confirmed Efimov's universal prediction. Until last year, these states had little or no experimental evidence, but their first confirmation has now been reported.[1] In the meantime theoretical understanding of Efimov states and their implications for seemingly unrelated observables like 3-body recombination has been making exciting advances.[2] This invited talk will summarize our present understanding and recent generalizations, describe an intuitive way of visualizing the Efimov effect, and review its implications for modern day experiments in ultracold quantum gases that manipulate Fano-Feshbach resonances.

[1] T. Kraemer *et al.*, Nature **440**, 315 (2006).
[2] B. D. Esry and C. H. Greene, Nature **440**, 289 (2006).

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