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Universal Three-Body Bound States of Ultracold Fermionic Atoms

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In the early 1970's, Vitaly Efimov predicted that three-body systems with resonant two-body interactions admit an infinite sequence of arbitrarily shallow three-body bound states. The binding energy of these so-called Efimov trimers have a geometric spectrum with an accumulation point at the three- particle scattering threshold. The existence of these universal Efimov trimers is independent of the detailed structure of the two-body interactions and subsequent trimer states in the spectrum exhibit a discrete scaling symmetry with a universal scale factor ≈ 22.7. I will present experimental evidence for the existence of the ground- and first-excited states of this infinite sequence in a system of ultracold fermionic atoms. Near resonant two-body interactions in our system of ultracold ^{6}Li atoms are realized by making use of three overlapping, magnetically-tunable Feshbach scattering resonances. I will describe how our observations of three-body recombination in the ultracold gas allows us to determine the spectrum of the Efimov trimers as well as their lifetime.