Abstract for an Invited Paper
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**Bowls made of Laser Light to Corral Ultracold Atoms**[1]

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Using stable lasers, it is now possible to create nearly perfect bowls made of pure light, which are smaller than a piece of lint and store atoms for several minutes in an ultrahigh vacuum environment. These almost frictionless bowls are ideal for cooling atoms by evaporation, the same way that alcohol cools the skin. In just a few seconds, atoms trapped in the bowl are cooled to temperatures of ten of billionths of a degree above absolute zero, where the de Broglie wavelength is several microns. These ultracold atoms occupy the quantum energy levels of the bowl, producing a giant quantum system that can be directly observed using laser flash photography. I will describe our laser trapping methods and show how they can be use to study a unique quantum gas of spin-up and spin-down $^6$Li atoms, which are fermions that obey the Pauli exclusion principle. I will describe how this ultracold atomic gas now tests predictions in nearly all fields of physics, from high temperature superconductors to neutron stars, the quark-gluon plasma of the Big Bang, and even string theory.

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