



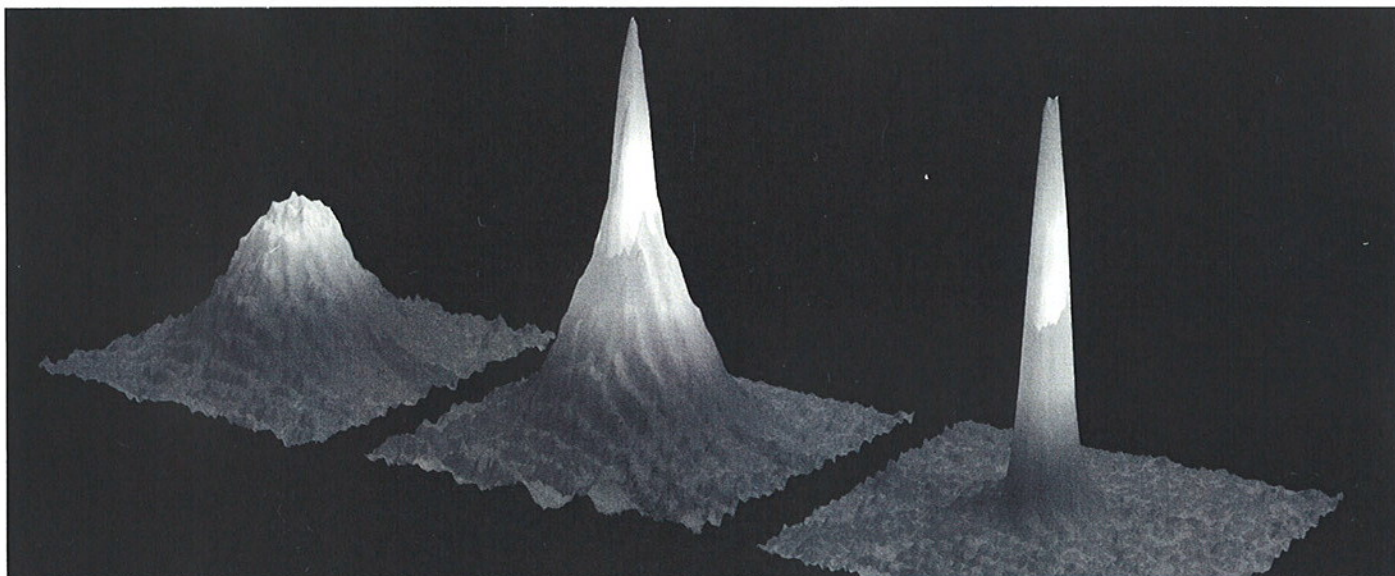
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FRONTIERS OF ATOMIC PHYSICS AT RLE



Absorption shadows of sodium atoms in ultracold clouds show evidence for Bose-Einstein condensation as the clouds are cooled to lower temperatures (from left): above the condensation point, just after condensation begins, and the remaining, essentially pure condensate. BEC of atomic gases presents new possibilities for applied and fundamental research. For the first time, it provides scientists

with macroscopic samples of atoms in a single quantum state, implying ultimate control over the motion of atoms. Several applications are foreseen in nanotechnology (high-resolution atom deposition), precision measurements (new atomic clocks and the determination of fundamental constants), and atom optics (atom interferometers that hold promise as ultraprecise gyroscopes).

The quantum world is remote from the familiar, everyday experience of most people. In the quantum world, waves can act like particles and particles can act like waves. However, to atomic physicists, the quantum world is a friendly and familiar place. Today, with the assistance of powerful experimental tools—some old and honored (such as spectroscopy), and others hardly dreamt of a decade ago (such as atom trapping)—and the beautiful mathematical apparatus of quantum theory, atomic

physicists are exploring a world of breathtaking discoveries.

The focus for this issue of *RLE currents* is research on fundamental atomic physics in RLE's Atomic, Molecular, and Optical (AMO) Physics group. Traditionally, atomic physics is concerned with the structure of atoms and how they interact with each other, with other particles, and with light. Much of the field continues to be occupied with these studies, and the fruits of this research are

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