# Raman Researchers Set a Trap to Cool Ions

Captured ions can be cooled, rather than heated, through contact with cold atoms, and these ion traps can store them in a stable condition for longer periods than previously demonstrated. The results could pave the way to experiments that generate molecular ions at interstellar space temperatures. Methods for storing and cooling atoms and ions at temperatures just above absolute zero are among the most important atomic

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physics methods to be developed over the past few years. Recently, scientists at the Raman Research Institute, Bangalore in India and the Institute of Physics at Johannes Gutenberg University Mainz developed a technique that counters the predictions that ions would actually be heated from their collisions with cold atoms. The researchers' experiment combined two methods. They captured neutral atoms in a magneto-optic trap, cooled them with laser light to -273.15 °C, and stored charged particles in an ion trap. Experiments with rubidium ions and rubidium atoms showed that the particles did, in fact, exchange energy. The ions were effectively cooled during a collision with the cold atoms. The outcome was determined by two fundamental processes: During continuous cooling, the atoms indirectly extract energy from the trapped ions; the collision between ions and atoms causes both to exchange charges, transforming a "hot" ion into a "cold" ion. The system was able to cool a larger number of ions without immediate exhaustion of the atom reservoir because the magneto-optic trap makes it possible to maintain a constant concentration of atoms in the reservoir. This interaction between ions and atoms is interesting to physicists because it is similar to interactions that might occur in the low temperatures of outer space.