

# Science in the Headlines

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## The Science Behind Today's News

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### New Research Mimics Nuclear Matter

By Lisa Pickoff-White

**January 24** - Scientists have discovered a new way in which gaseous materials can be superfluid, a state characterized by resistance-free flow similar to that of gas found at the core of neutron stars. Previously it was believed that a superfluid could exist only if there was a balance in spin between different types of particles.

Scientists at the Massachusetts Institute of Technology working with superfluid gases found that up to 70 percent of ultra cold atoms could spin in one direction and the gas remained superfluid. Extra atoms would float to the edge creating a halo around a superfluid core. The unbalanced gas mimicked the subatomic particles at the dense center of a neutron star. Another group of scientists at Rice University also inferred the existence of imbalanced superfluidity. This new work may help scientists understand other imbalances, such as those found in magnetized superconductors.



Several National Research Council reports deal with nuclear and condensed-matter physics. *Nuclear Physics: The Core of Matter, The Fuel of Stars* examines research goals for physicists, including understanding the structure and behavior of strongly interacting matter, to describe the properties of nuclei, and address fundamental symmetries that manifest themselves in the nuclear processes in the cosmos and in low-energy laboratory tests of these symmetries. *Frontiers in High Energy Density Physics: The X-Games of Contemporary Science* looks at why it is important for U.S. scientists to develop a fundamental understanding of this growing field as laboratory and high-power computing allows for experimentation never before possible. *Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century* poses 11 science questions including, "What are the new states of matter at exceedingly high density and temperature?"

- Nuclear Physics: The Core of Matter, The Fuel of Stars (1999)
- Frontiers in High Energy Density Physics: The X-Games of Contemporary Science (2003)
- Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century (2003)

#### Other Resources:

- MIT Superfluidity Research
- Rice University Superfluidity and Superconductors Research

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