Scientists discover novel type of magnetic wave

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A team of international researchers led by physicists in the University of Minnesota's College of Science and Engineering have made a significant breakthrough in an effort to understand the phenomenon of high-temperature superconductivity in complex copper-oxides—one of the most studied scientific topics in history.

The University of Minnesota researchers and their international colleagues from Germany, France and China report the discovery of a novel type of magnetic wave involving oxygen atoms. The new findings could have implications for improving superconducting electric wires used in national electrical grids.

The study by lead author Martin Greven, an associate professor in the university's School of Physics and Astronomy, is published in the Nov. 11 issue of *Nature* together with a "News and Views" introduction. The research is also scheduled to be highlighted in the journal *Science*.

"Following the Nobel-Prize winning discovery of high-temperature superconductivity in complex copper-oxide materials in the mid 1980s, the effort to understand this phenomenon has been one of the major scientific challenges in the field of physics for the past quarter century, with more than 100,000 publications on the topic," Greven said.

"While the commercialization of these complex copper-oxide materials, in the form of superior electric wires, has recently begun, physicists have not yet been able to solve the mystery of why these exotic materials are

superconducting in the first place. The materials' unusual magnetism is often argued to be responsible for their superconductivity," Greven added.

In their experiments, the researchers bombarded the copper-oxide crystals with intense beams of neutrons. The neutrons themselves are magnetic, and by carefully measuring how these particles are scattered from the crystals, the research team was able to show the existence of unusual magnetic waves involving oxygen atoms.

"We believe that our discovery sheds new light on this hotly debated subject of superconductivity," Greven said.

More information: www.nature.com/nature/journal/ … ull/nature09477.html

Provided by University of Minnesota

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