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# Discovery of "Hidden" Quantum Order Helps Development of Quantum Super Computers

*Interesting phenomenon discovered in atoms*

An international team of scientists has recently discovered a hidden magnetic "quantum order" that manifests itself over long chains of almost 100 atoms in a material that normally displays a magnetic disorder. This finding could help the development of new materials and devices for super quantum computers, that make direct use of distinctively quantum mechanical phenomena, such as superposition and entanglement, to perform operations on data.The basic principle of quantum computation is that the quantum properties of particles can be used to represent and structure data and that quantum mechanisms can be devised and built to perform operations with these data.Discovered by scientists from The Johns Hopkins University, along with colleagues from the United Kingdom, the phenomenon is important because it accurately proves that the magnetic moments, which represent the measure of the strength of a magnetic source, of a large number of atoms can band together to form quantum states much like those of a very large molecule.Looking like atomic "compass needles", apparently disordered on the surface, these phenomena were found to form "a beautiful, underlying quantum order," said team member Collin Broholm, professor in the Henry A. Rowland Department of Physics and Astronomy at Johns Hopkins' Krieger School of Arts and Sciences."Quantum mechanics is normally appreciated only on the atomic scale. However, here we present evidence for a very long and very quantum mechanical magnetic molecule," Broholm said. "While disordered to a classical observer, the magnetic moments of almost 100 nickel atoms arranged in a row within a solid were shown to display an underlying quantum coherence limited only by chemical and thermal impurities. The progress we made is really a demonstration of quantum coherence among a larger number of atoms in a magnet than ever before."The team also found the factors that affect the distance over which the hidden "quantum order" can be maintained, an important aspect since controlling quantum phenomena is crucial, yet very hard, in quantum computing applications.