Building a Foundation for the Next Generation's Quantum Technologies

Monika Schleier-Smith
Assistant Professor, Physics

CURRENT RESEARCH

Dr. Schleier-Smith's research with laser-cooled atoms pushes the frontier of quantum technologies

Just 40 quantum mechanical particles can contain more information than the world's largest supercomputer. Scientists dream of exploiting the extreme information density in quantum mechanical systems to enable new paradigms of computation or to construct ultra-precise compact sensors. Realizing these visions will require surmounting major experimental and conceptual challenges surrounding the generation and preservation of entanglement--the intricate tapestry of quantum correlations among particles. Dr. Monika Schleier-Smith, of Stanford University, tackles the problem of many-particle quantum control in experiments with laser-cooled atoms. Her top-down approach offers prospects for advancing technologies ranging from timekeeping and navigation to secure telecommunications.

A recipient of the Alfred P. Sloan Research Fellowship, Dr. Schleier-Smith combines a desire to push the frontiers of knowledge with a keen awareness of the power of fundamental research to transform technology. Her track record includes surpassing the standard quantum limit on the stability of an atomic clock by engineering entanglement among many thousands of atoms. One of the greatest challenges in quantum engineering is that a system is necessarily altered whenever it is observed. Thus, Dr. Schleier-Smith works to find ways of manipulating atoms while revealing as little as possible about them to the outside world. One approach is to place atoms between two mirrors (an optical resonator) and let photons shuttle information back and forth between them - allowing the atoms to "talk" to one another discretely without being "overheard." It may sound like mere gossip, but this chit-chat will form the foundation of a versatile new...

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AFFILIATION

Stanford University

EDUCATION

- Ph.D., in Physics, 2011, Massachusetts Institute of Technology
- A.B., in Physics, 2005 , Harvard University

AWARDS

- Alfred P. Sloan Research Fellowship, 2014
- Air Force Office of Scientific research (AFOSR) Young Investigator Award, 2014
- Finalist, American Physical Society DAMOP Thesis Prize, 2012
- Hertz Doctoral Thesis Prize, 2011
- Martin Deutsch Award for Excellence in Experimental Physics (MIT), 2010

RESEARCH AREAS

Life Science, Health IT, IOT, Devices, Data, Space

FUNDING REQUEST

Your contributions will support Dr. Schleier-Smith and her team of graduate students in tackling the challenge of many-particle quantum control. Your donations will help fund the sophisticated custom experimental apparatus required to generate collections of identical atoms at ultra-cold temperatures and engineer novel quantum states for applications ranging from ultra-precise clocks and sensors to quantum information processing.