



Andrew Cleland

John A. MacLean Sr. Professor for Molecular Engineering, Innovation, and Enterprise
Director, Pritzker Nanofabrication Facility
Senior Scientist, Argonne National Laboratory

Areas of Research Expertise

Superconducting electronics, mechanics, optics, and microfluidics, with applications to quantum information, nanomechanical devices, and biomedical instrumentation

Research Overview: The Cleland Group

Andrew Cleland's research group is presently focused on three areas of research: the development of superconducting circuits to quantum information, including both computation and communication; the development of nanoscale devices integrating electronic, mechanical, and optical fields, targeting quantum control and quantum measurement of mechanical, spin and optical degrees of freedom; and the development of microfluidic technology for practical applications, with a focus on high-throughput nanoparticle analysis.

Contact

Phone

773.834.9182

Address

Eckhardt Research Center
Room 235
5640 South Ellis Avenue
Chicago, IL 60637

Email

anc@uchicago.edu

Website

clelandlab.uchicago.edu

Assistant

Mary Pat McCullough

Research

Andrew Cleland is an internationally recognized leader in the fields of superconducting electronics, nanomechanics, and microfluidic devices. His research specializes in the application of Josephson-based superconducting circuitry to the controlled manipulation and measurement of quantum systems, including electromagnetic and nanomechanical resonators, as well as coupling to spins in solid systems. He also develops optomechanical devices with applications in classical as well as quantum communication. His research in microfluidic devices has led to the formation of a start-up company pioneering the high-throughput detection and sizing of individual nanoparticles in fluid using resistive pulse sensing.

Cleland led the team that built the first quantum machine, producing quantum states that can only be described with the laws of quantum mechanics, and violate classical concepts. Named “Breakthrough of the Year 2010” by *Science* magazine, this work also was selected as one of the “Top Ten Discoveries in Physics” by the Institute of Physics (IOP, United Kingdom) in 2010. In addition, Cleland led a separate project involving the coherent synthesis of complex microwave photon states that was also named a “Top Ten Discovery” by IOP in 2011.

Bio

Cleland earned a BS in engineering physics and a PhD in physics from the University of California at Berkeley. He pursued research as a postdoctoral scientist at the Centre de Physique de Saclay (CEA) in Paris, France, followed by an appointment as a Senior Research Fellow at the California Institute of Technology. He then joined the faculty of the Department of Physics at the University of California at Santa Barbara; during this time he also served as the Associate Director of the UCSB California Nanosystems Institute. Professor Cleland joined the University of Chicago’s IME faculty in 2014.

Cleland is a fellow of the American Association for the Advancement of Science and the American Physical Society.