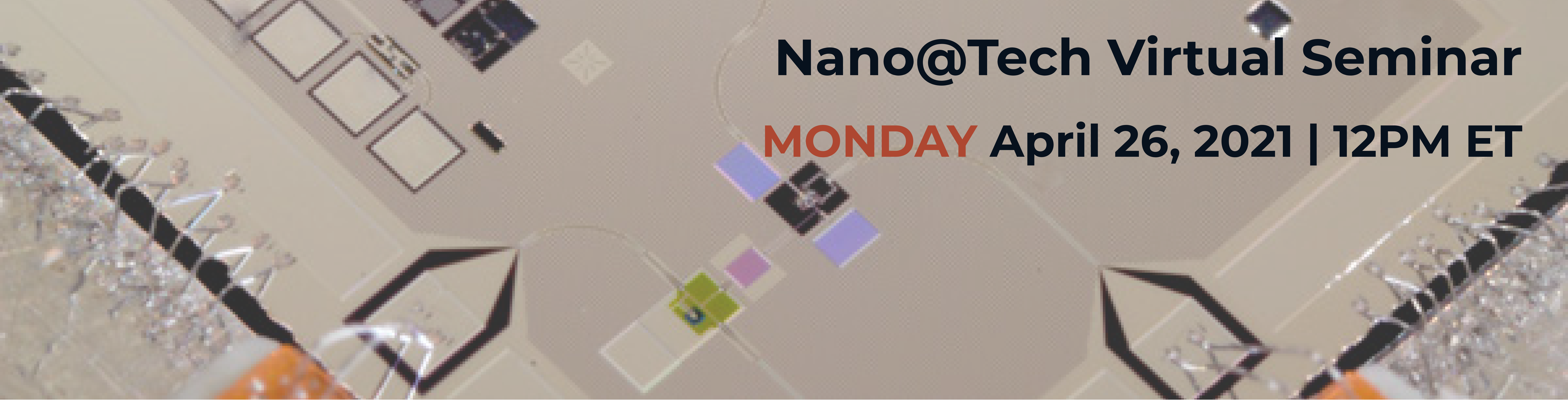


Nano@Tech Virtual Seminar

MONDAY April 26, 2021 | 12PM ET

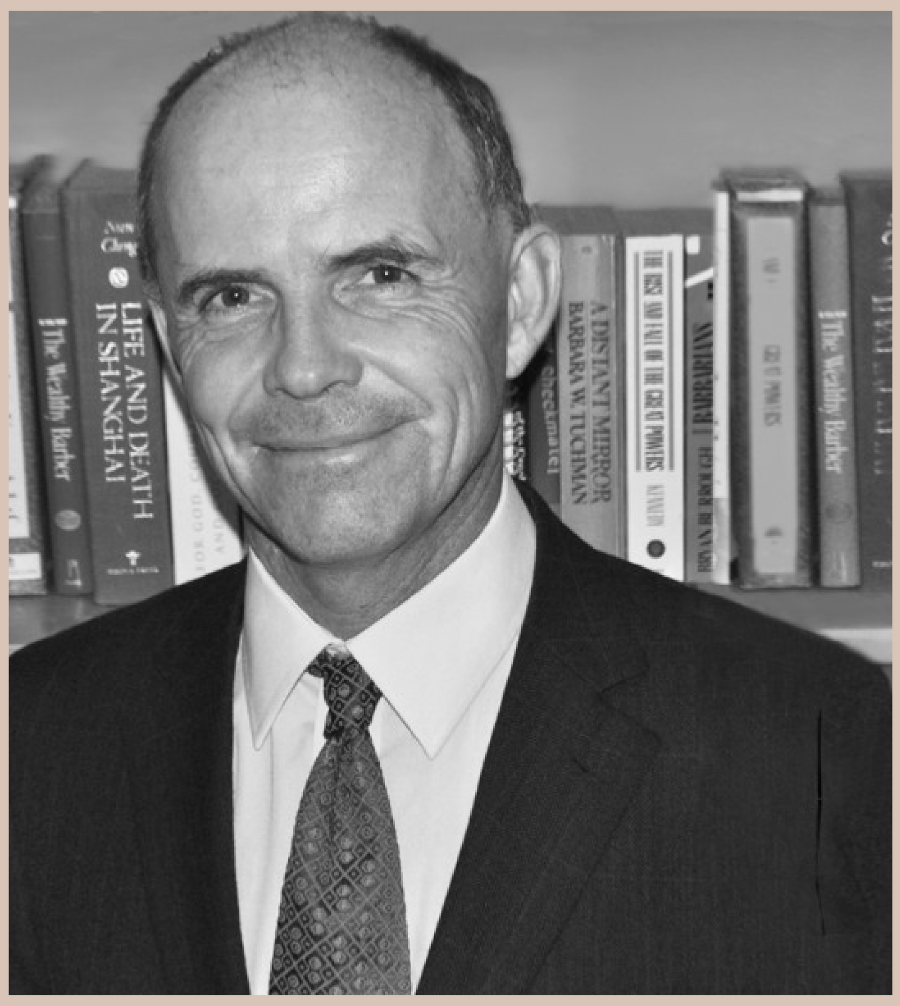
Microelectromechanical Devices in the Quantum Limit

Andrew N. Cleland | Pritzker School of Molecular Engineering, University of Chicago

Link: https://tinyurl.com/NanoTechCleland

Abstract: Recent advances in quantum technology and hardware have advanced MEMS systems to where these can now be designed and operated in the quantum regime, albeit using sophisticated quantum methods to control and measure the mechanics, and requiring cryogenic systems to enable operation in the quantum ground state. Quantum MEMS promise exciting new opportunities for applications in quantum information processing and storage, and for quantum sensing. Applications are particularly relevant to superconducting qubits, which provide a high fidelity, scalable platform for information processing but are lacking a compact means for quantum information storage. Superconducting qubits integrate easily with mechanical devices through the use of piezoelectric materials, and combined with the recent demonstration of ultrahigh quality factor, microwave-frequency mechanical devices points to fascinating opportunities for sub-mm scale memories and sensors. I will discuss the current state-of-the-art for integrating superconducting qubits with mechanical devices, focusing on operation of MEMS resonators and surface acoustic wave devices operating at the single phonon limit. I welcome discussion following my talk regarding future prospects for this novel technology.

Bio: Andrew N. Cleland is the John A. MacLean Sr. Professor for Quantum Engineering Innovation, and is a member of the Pritzker School of Molecular Engineering at the University of Chicago. He is the Director of the Pritzker Nanofabrication Facility and a Senior Scientist at Argonne National Laboratory. His research focuses on developing superconducting quantum circuits and nanoscale optical and mechanical devices. His accomplishments include the first demonstration of a mechanical system cooled to its quantum ground state; the demonstration of a high fidelity, scalable superconducting quantum bit operating at the threshold for quantum error-correction; and the development of a piezo-optomechanical system transducing between the microwave and optical frequency domains. Cleland is the author of over 130 peer-reviewed publications. His work was recognized as the Science "Breakthrough of the Year" for 2010, and selected as one of the "Top Ten Discoveries in Physics" by the Institute of Physics (United Kingdom) in both 2010 and 2011. He is a Fellow of the American Association for the Advancement of Science and a Fellow of the American Physical Society. Cleland earned a BS in engineering physics and a PhD in physics from the University of California, Berkeley. Prior to joining the University of Chicago, Cleland was a Professor of Physics at the University of California, Santa Barbara, and served as the Associate Director of the California Nanosystems Institute.



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