NATIONAL ACADEMIES Sciences Engineering Medicine

Division on Engineering and Physical Sciences
Board on Physics and Astronomy

"Frontiers of Engineered Coherent Matter and Systems: A Workshop"

Condensed Matter and Materials Research Committee (CMMRC)

October 3, 2024

Hybrid meeting - Room 100, Academies Keck Center, Washington, DC

(Times are in Eastern Time)

OPEN SESSION

View the workshop here

8:00 am	*Welcome and Workshop Logistics (5 mins)*	*Academies staff*
8:05	**Session A - Big Picture/Overview** *(75 mins)*	Nadya Mason (NAS), *The University of Chicago* Charlie Marcus (NAS), *University of Washington, workshop chair* Vedika Khemani, *Stanford University*
9:35	**Panel discussion** *(30 mins)*	Pedram Roshan*, Google LLC*; Ana Maria Rey (NAS), *JILA and NIST (virtual)* Charles Tahan, *Microsoft Corporation*
10:05	*Break (25 mins)*	
10:30	**Session B - Solid state platforms -** *20 min talks, then 10 min Q&A each* *Chair: Prineha Narang, University of California, Los Angeles* "SC Qubits / Quantum Simulation" "NV Centers" "Defects Candidates"	 Will Oliver*, Massachusetts Institute of Technology (virtual)* Chris Laumann, *Boston University* David Awschalom (NAS/NAE), *The University of Chicago (virtual)*
12:00 pm	**Panel discussion** *(30 mins)*	*Session B participants*
12:30 pm	*Working lunch (60 mins)*	
1:30 pm	**Session C - Atoms and Platforms -** *20 min talks, then 10 min Q&A each* *Chair: Fatima Toor, University of Iowa* "Cavities" "Photonic Networks" "Atoms"	 James Thompson, University of Colorado, Boulder Nick Peters, Oak Ridge National Laboratory `Immanuel Bloch, Max Planck Institute of Quantum Optics *(virtual)*
3:00	**Panel discussion** *(30 mins)*	*Session C plus* Sarang Gopalakrishnan, Princeton University
3:30	*Break (15 mins)*	
3:45	**Session D - Quantum Information Dynamics: Natural & Synthetic** *Chair: Vedika Khemani, Stanford University* "Overview" "Monitored Quantum Circuits" "Synthetic Topological Systems"	*20 min talks, then 10 min Q&A each* Matteo Ippoliti, University of Texas at Austin Sarang Gopalakrishnan, Princeton University Eun-Ah Kim, Cornell University
5:15	**Panel discussion** *(30 mins)*	*Session D plus Chris Laumann, Boston University*
5:45	**Workshop Summary Wrap-up** *(30 mins)*	Charlie Marcus (NAS), *University of Washington, workshop chair*
6:15	*Adjourn for day*	

(see more on page 2)

Frontiers of Engineered Coherent Matter and Systems: A Workshop
STATEMENT OF TASK

An ad hoc planning committee of the National Academies of Sciences, Engineering, and Medicine will organize and conduct a public workshop that presents a high-level authoritative view of quantum-coherent networks for physical scientists and policymakers seeking a general grasp of the subject and its potential. The planning committee will develop the agenda for the workshop, select and invite speakers and participants, and moderate the discussions. The workshop would (a) focus primarily on superconducting and atomic networks but will seek connections and universal principles of quantum-coherent networks and (b) review the rapidly emerging implementations of coherent networks and their relation to fundamental problems and applications in condensed matter physics, materials science, and quantum information. A designated rapporteur will prepare workshop proceedings.

Condensed Matter and Materials Research Committee (CMMRC)
STATEMENT OF TASK

The Condensed Matter and Materials Research Committee (CMMRC) is responsible for advising the Board on Physics and Astronomy and the National Academies of Sciences, Engineering, and Medicine on the fields of condensed matter science and materials research, including the physics, chemistry, and biological applications of these fields.

In conducting its work, the CMMRC holds discussions with researchers in academe, industry, and government laboratories; managers of the research enterprise; and policy leaders in science and technology communities. The committee also meets with representatives from federal agencies providing support for the fields noted above, with those discussions focusing on current programs, policies, trends, and issues. The CMMRC may plan and develop concepts for studies and other activities (e.g., workshops), which are to be carried out by separately appointed ad hoc committees/panels and can result in National Academies reports. The CMMRC will also use the findings and recommendations of the sponsor-commissioned decadal survey as an important reference when developing concepts, organizing its meetings, and in discussions with experts and federal agencies.