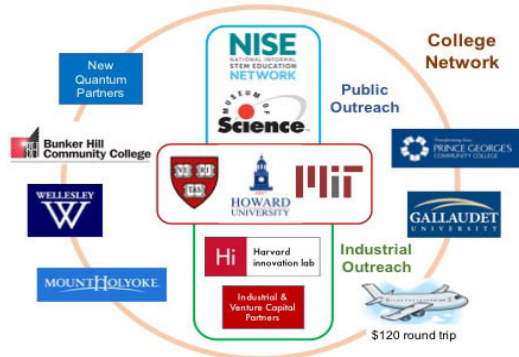


## ABOUT US

Our Center for Integrated Quantum Materials is a collaboration between Harvard University, Howard University Massachusetts Institute of Technology, Museum of Science, Boston, and our College Network Partners with a vision to take extraordinary new quantum materials to enable atomic-scale electronics and photonics that transform signal processing and computing.

### Mission

- To engineer quantum materials allowing electronics and photonics to pass beyond the limits of conventional semiconductors. Atomic-layer materials such as graphene enable ultrafast devices, topological insulators give error-free data channels, and nitrogen vacancy (NV) centers in diamond form atomic memory sites and sensors.
- To attract young students to careers in Science, Technology, Engineering, and Mathematics (STEM).
- To have the gender and racial balance of our country.
- To engage young students and public audiences in the quest for new frontiers
- To commercialize research on quantum materials and devices into new products and innovative technologies.



## CIQM CONTACT INFORMATION

Robert Westervelt, Director  
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## RESEARCH FACILITIES

Harvard Center for Nanoscale Systems  
Harvard iLab  
Howard Nanoscience & Engineering Facility  
Howard Quantum Express  
MIT Microsystems Technology Laboratories and  
MIT Materials Processing Center



Student Atefeh Rahmani in the labs at CNS



CIQM student Amber Wingfield giving tours of the Quantum Express



New Building 12 MIT.nano

## EDUCATIONAL ACTIVITIES

Education Mission Statement: Develop education, outreach, and professional development programs that leverage the strengths of Center partners and prepare students to become leaders in the field of quantum materials through outstanding performance in research, education, collaboration and outreach.

The CIQM Education Program's collaborative efforts will develop Center-wide tools that integrate Science and Education to create pathways for students to STEM careers and to inform students and the public about quantum materials and devices.

The College Network schools extend the science & education program of our Center to a diverse group of students at Community and 4-year colleges, who would not normally gain experience in this area.



BACON+ Meeting broadcast via WebEx to all CIQM Participants

CIQM enjoys a unique partnership with the Museum of Science in Boston for Public Engagement and Science Communication workshops. MoS develops and disseminates educational strategies, materials and programs for engaging broader audiences in the quest to explore and harness newly-discovered atomic-scale materials and phenomena, as well as increasing CIQM participant's capacity to share the motivation, process, and outcomes of their research with broader audiences.



Summer School Interns during orientation week at Harvard

## INTERDISCIPLINARY RESEARCH

The Center has 4 main research projects that arise from Quantum Materials' specific physical factors - strong quantum phenomena in atomic layers that are only one atom/molecule thick, topological locking of the electron spin and momentum directions in topological insulators due to the strong spin-orbit coupling, and the ability to store 1 bit of information on an NV electron spin for > 1 msec at room temperature, due to isolation provided by the diamond crystal.

**Novel van der Waals Heterostructures**

**Discovery of New Topological Crystals**

**Topologically Protected Qubits**

**Quantum Networks with Engineered Solid State Quantum Emitters**

## KNOWLEDGE TRANSFER

CIQM has internships for our students and postdoctoral fellows with our industrial partners. CIQM also hosts scientists from industrial and national laboratories to expand our community and facilitate exchange of ideas, and organizes Harvard i-Lab networking events and disseminate i-Lab videos about general entrepreneurship topics to all Center participants and through the CIQM website.



### CIQM Industrial Partners



For more information, please visit:  
[ciqm.harvard.edu](http://ciqm.harvard.edu)

## CIQM PARTICIPANTS

**Robert M. Westervelt:** Director, Harvard  
**Carol Lynn Alpert:** Co-PI, Museum of Sci., Boston  
**Raymond Ashoori:** Co-PI, MIT  
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**Gary L. Harris:** Co-PI, Howard

**Naomi Brave:** Managing Director, Harvard  
**Kathryn Hollar,** Educ Co-Director, Harvard  
**Tomas Palacios,** Knowledge Transfer Coord., MIT

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**Marko Loncar,** Harvard  
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**Liang Fu,** MIT  
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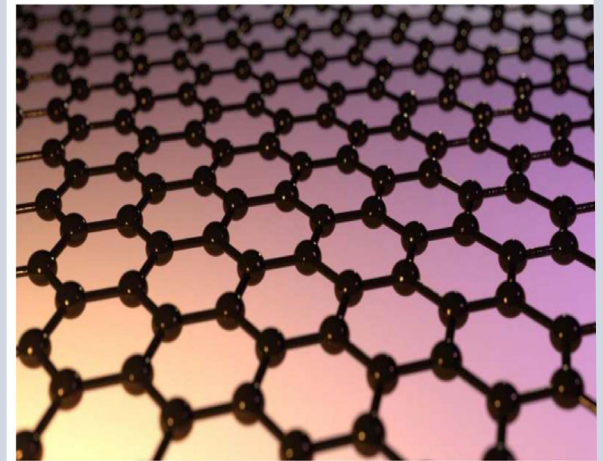
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**Evelyn Hu,** Harvard  
**Long Ju,** MIT

### Efthimios Kaxiras, Harvard

**Jing Kong,** MIT  
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**JoDe LaVine,** Bunker Hill  
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Dirac Photocurrent in Pristine Graphene  
photo courtesy QMO Labs and Max Grossnickle

NSF Science and Technology  
Center for Integrated Quantum Materials

Harvard University  
Howard University  
Massachusetts Institute of  
Technology  
Museum of Science, Boston

### College Network Schools:

Bunker Hill Community College, Gallaudet,  
Mt Holyoke, Prince George's Community  
College, Wellesley College

[www.ciqm.harvard.edu](http://www.ciqm.harvard.edu)