



CENTER *for* QUANTUM COHERENT SCIENCE

Campbell Hall
University of California
Berkeley, CA 94720-7300

MISSION STATEMENT: *To create novel quantum machines that harness coherence to explore and exploit fundamental properties of quantum mechanics.*

Quantum mechanics is one of the greatest intellectual achievements of the physical sciences. Its counterintuitive predictions are applied billions of times every day in lasers and transistors, which are two of the fundamental technologies of our era. Quantum coherent properties of matter appear in states of electrons and atoms that achieve the quantum coherence of photons in a laser. Understanding quantum coherent matter is essential for multiple scientific and technological challenges of the 21st century.

This center seeks to answer scientific questions about the nature of quantum-mechanical measurement and decoherence, the possible states of coherent quantum systems, and the role of quantum entanglement in gravity and cosmology. In some cases we did not even have the proper theoretical language to pose these questions in the past, while in others new experimental techniques are enabling tests of basic quantum principles that were previously inaccessible. Research on these questions is strongly coupled to the development of new quantum coherent devices, which will contribute to the future of computing and other technologies. Berkeley has a long history at the forefront of quantum devices and quantum theory, and CQCS will ensure its continued role at the center of this exciting field of science.

Center members define a decorated faculty in both theory and experiment, with world-renowned experts in condensed matter and material physics, atomic/molecular/optical science, and high energy physics. Select topics of contemporary research include quantum information and fundamentals of quantum theory, string theory, gravity, superconducting circuits, cold atom and trapped ion devices, and engineered nanoscale surfaces and materials. The Berkeley physics department, consistently ranked amongst the very best world-wide, provides a natural home for the center, with dedicated state-of-the-art interaction and seminar spaces in the CQCS complex in Campbell Hall. In close proximity in the basement of Campbell Hall are newly constructed experimental labs where new frontiers of quantum research are explored.

An integral part of the CQCS mission is to continue the Berkeley tradition of free discussion and critical examination, while preparing the next generation of scientific leaders. The center sponsors fellowships for top graduate students and post-doctoral associates. Through cross-disciplinary seminars, focused workshops, and international conferences, researchers gather to continue the quantum revolution. The visiting scholar program attracts leaders in the field for short and long term sabbaticals in the new interactive CQCS visitor center. It is within this framework that we seek to unravel and harness perhaps the most successful of scientific theories—quantum mechanics.

EXECUTIVE BOARD

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The CQCS interactive seminar space (top) provides a state of the art facility for both local and remote collaboration.

Situated adjacent to the main CQCS facility, the visitor center (bottom) houses both short and long term guests, providing a vibrant environment for developing new ideas and experiments.