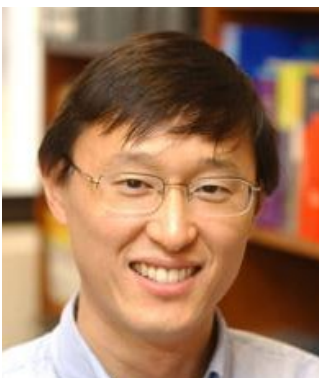


PSEB Working Group



Karsten Heeger, PhD (Chair)

Karsten Heeger is chair of the physics department, professor of physics, and director of the Wright Laboratory at Yale University. His research focuses on the study of neutrino oscillations and neutrino mass. Prof. Heeger received his undergraduate degree in physics from Oxford University and his Ph.D. from the University of Washington in Seattle where he worked on a model-independent measurement of the solar 8 B neutrino flux in the Sudbury Neutrino Observatory (SNO). Before joining the faculty at Yale University he was on the faculty at the University of Wisconsin and a Chamberlain Fellow at Lawrence Berkeley National Laboratory. His work has been recognized with numerous awards including the 2016 Breakthrough Prize in Fundamental Physics. He is a Fellow of the American Physical Society (APS). At Yale Prof. Heeger has led the renovations and transformation of the Wright Nuclear Structure Laboratory into the new Yale Wright Lab and is building a research program in nuclear, particle, and astrophysics. Prof. Heeger has served on national and international advisory committees including the High Energy Physics Advisory Panel (HEPAP), the Nuclear Science Advisory Committee (NSAC), the Natural Sciences and Engineering Research Council (NSERC), and the ASCAC LDRD Independent Review. He has been a member of the DPF Executive Committee, DNP Nominating Committee, DNP NNPS Steering Committee, and the APS Committee on International Scientific Affairs. Prof. Heeger is Associate Editor for the European Physical Journal C and Journal of Physics G and a reviewer for Physics Review, NIM, Physics Letters, and others.



Charles Ahn, PhD

Charles H. Ahn, the William K. Lanman Jr. Professor of Applied Physics, focuses his research on the physics of complex oxide materials, particularly on the physics and technology of thin ferroelectric films, a material expected to be used in many future electronic devices. He also studies the control of density in superconductors and semiconductors with ferroelectric gates. His laboratory research group is affiliated with the Department of Applied Physics and the Center for Research on Interface Structures and Phenomena (CRISP), a National Science Foundation Materials Research Science and Engineering Center. Ahn is the interdisciplinary research group leader for CRISP, a state-of-the-art materials science research program. His lab investigates the electronic and magnetic properties of strongly correlated oxide materials. A member of the faculty since 2004, Ahn is the William K. Lanman Jr. Professor of

Applied Physics and Chair of Applied Physics, a Professor of Mechanical Engineering & Materials Science, a Professor of Physics, the Director of the Center for Research on Interface Structures and Phenomena (CRISP), an NSF Materials Research Science and Engineering Center. Ahn earned his undergraduate degree in chemistry and physics from Harvard University and his master's and doctoral degrees in applied physics from Stanford University. He came to Yale after completing a postdoctoral fellowship at the University of Geneva in Geneva, Switzerland. Ahn's numerous honors include the American Vacuum Society's Peter Mark Memorial Award, an Alfred P. Sloan Fellowship, a Yale Junior Faculty Fellowship, the David and Lucile Packard Fellowship in Science and Engineering, and a National Science Foundation CAREER Award and a Fellowship in the American Physical Society (APS).



Jeffrey Brock, PhD

Jeffrey Brock is the Zhao and Ji Professor of Mathematics, dean of science for the Faculty of Arts and Science, and dean of the School of Engineering & Applied Science. His research focuses on low dimensional geometry and topology, particularly hyperbolic geometry. His work William Thurston's program to understand hyperbolic 3-manifolds led to their geometric classification in joint work with R. Canary and Y. Minsky. More recently, he has worked to study renormalized volume and its gradient flow on deformation spaces. He is also interested in geometric and topological methods in analysis of large, complex data sets. He was an undergraduate at Yale, and obtained his Ph.D. at U.C. Berkeley, after which he held positions at Stanford and U. Chicago before moving to the Brown University math department, which he chaired from 2013 to 2017. In 2016 he served as founding director of Brown's data science initiative. He was a Guggenheim Fellow in 2008 and was recently elected fellow of the American Mathematical Society. He joined the Yale faculty in 2018.



Hui Cao, PhD

Hui Cao is the John C. Malone Professor of Applied Physics and Physics. Cao focuses on understanding and controlling light transport, scattering, absorption, and amplification in complex photonic nanostructures for a wide range of applications. Her research bridges mesoscopic physics, nonlinear dynamics, laser physics, nanophotonics, and biophotonics. Her work involves nanofabrication, material characterization, optical measurement with high spatial, spectral and temporal resolution, and numerical modeling. The current projects include: (i) development of novel light sources and explore their applications in biomedical imaging; (ii) coherent control of light transport in strong scattering media and multimode fibers; (iii) design and fabrication of

multifunctional photonic devices with complex nanostructures. Cao is a fellow of the American Association for the Advancement of Science, the American Physical Society, and the Optical Society of America. Hui is also the recipient of the William E. Lamb Medal for Laser Physics and Quantum Optics, the John Simon Guggenheim Fellowship, and the Maria Goeppert-Mayer Award from American Physical Society.



Judy Cha, PhD

Judy Cha is an assistant professor in the Department of Mechanical Engineering and Materials science at Yale University. Judy was born in Seoul, Korea, and moved to Vancouver, BC, Canada when she was in high school. She received her bachelor's degree in engineering physics from Simon Fraser University, perched on Burnaby Mountain. Then, Judy moved to cold Ithaca, NY to study all things small at Cornell University. After six long winters, she received her Ph.D. in applied & engineering physics. Judy spent four years in San Francisco, sunny CA, working in the Department of Materials Science and Engineering at Stanford University as a post-doc, where she made 2D chalcogenide nanomaterials and studied their electronic properties. Her research interests lie in electronic properties of 2D layered chalcogenides and other 2D nanosheets for fundamental understanding of quantum-mechanical electronic orders and potential future electronic applications. In particular, she's fascinated by the intricate relationship between the atomic structure, composition and the emerging electronic properties. Judy is the recipient of the Microscopy Society of America's Presidential Student Award, the Microbeam Analysis Society's Distinguished Scholar Award, and the Materials Research Society's Silver Student Award.



Steven M. Girvin, PhD

Professor Girvin joined the Yale faculty in 2001, where he is Eugene Higgins Professor of Physics and professor of applied physics. In 2007 he was named deputy provost for science and technology and in 2015 became deputy provost for research. In that role, he helped oversee research and strategic planning in the basic sciences and engineering across the university. He also helped oversee entrepreneurship, innovation and tech transfer at Yale. In 2017, Professor Girvin stepped down from his role as deputy provost for research to return full-time to teaching and research.

After completing his undergraduate degree in physics from Bates College, Dr. Girvin earned his Ph.D. from Princeton University and trained as a postdoctoral fellow at Indiana University and

Chalmers University of Technology in Göteborg, Sweden. He went on to work as a physicist at the National Institute of Standards and Technology from 1979 to 1987, before joining the faculty of Indiana University in 1987.

Throughout his career, Professor Girvin's research has focused on theoretical studies of quantum many-particle systems. Since coming to Yale, his interests have extended to atomic physics, quantum optics and quantum computation. Professor Girvin's academic research is currently focused on 'circuit QED,' the quantum physics of microwave electrical circuits using superconducting Josephson junctions as artificial atoms. He works closely with the experimental team at Yale led by Michel Devoret and Robert Schoelkopf developing circuit QED into a practical architecture for construction of a quantum computer.

In recognition of his research and contributions to the field, Dr. Girvin has been elected fellow of the American Physical Society, the American Association for the Advancement of Science, and the American Academy of Arts and Sciences, Foreign Member of the Royal Swedish Academy of Sciences, and Member of the US National Academy of Sciences. In 2007 he and his collaborators, Allan H. MacDonald and James P. Eisenstein were awarded the Oliver E. Buckley Prize of the American Physical Society, "*For fundamental experimental and theoretical research on correlated many-electron states in low dimensional systems.*" In 2017 Professor Girvin was awarded an honorary degree by Chalmers University of Technology in recognition of his work in circuit QED.



Jack Harris, PhD

Professor Harris studies the quantum aspects of motion in mechanical, optical, and electronic systems. His research addresses long-standing questions in physics, such as how the laws of quantum mechanics lead to the classical behavior of macroscopic objects, and what role the force of gravity may play in this process. His work utilizes the quantum aspects of the force exerted by light on mirrors. These unusual forces offer powerful new means for manipulating both microstructures and light, and have a wide range of applications including areas such as telecommunications and unbreakable encryption systems.

A graduate of Cornell University, Harris earned his Ph.D. at the University of California, Santa Barbara. From 2001 to 2004 he was a postdoctoral researcher in the Harvard/MIT Center for Ultracold Atoms. In 2004 he joined the faculty at Yale as an assistant professor, becoming an associate professor in 2009. He was appointed a professor of physics and applied physics in 2017.

Professor Harris' awards include a Sloan Research Fellowship in 2007, and a Yale University Junior Faculty Fellowship in 2008. His unique abilities were recognized in 2008 by *Discover Magazine* in which he was named one of the country's "20 Best Brains Under 40". In 2009, he

won an Arthur Greer Memorial Prize for his outstanding research in the field of quantum mechanics, and also received a Young Faculty Award from the Defense Advanced Research Projects Agency (DARPA). In 2015, Harris gained an award from the W. M. Keck Foundation to support his studies of quantum gravity. He was appointed an APS Fellow (Division of Atomic, Molecular, and Optical Physics) in 2016 and was appointed a Vannevar Bush Faculty Fellow in 2019.



Rajit Monohar, PhD

Rajit Manohar is the John C. Malone Professor of Electrical Engineering and professor of computer science at Yale. He received his B.S. (1994), M.S. (1995), and Ph.D. (1998) from Caltech. He has been on the Yale faculty since 2017, where his group conducts research on the design, analysis, and implementation of self-timed systems. He is the recipient of an NSF CAREER award, nine best paper awards, nine teaching awards, and was named to MIT technology review's top 35 young innovators under 35 for contributions to low power microprocessor design. His work includes the design and implementation of a number of self-timed VLSI chips including the first high-performance asynchronous microprocessor, the first microprocessor for sensor networks, the first asynchronous dataflow FPGA, the first radiation hardened SRAM-based FPGA, and the first deterministic large-scale neuromorphic architecture. Prior to Yale, he was professor of electrical and computer engineering and a Stephen H. Weiss Presidential Fellow at Cornell. He founded the Computer Systems Lab at both Cornell and Yale. He has served as the associate dean for research and graduate studies at Cornell Engineering, the associate dean for academic affairs at Cornell Tech, and the associate dean for research at Cornell Tech. He founded Achronix Semiconductor to commercialize high-performance asynchronous FPGAs.



Peter Schiffer, PhD

Peter Schiffer is the Frederick W. Beinecke Professor of Applied Physics and Physics. He joined Yale in 2017 as vice provost for research, working to support and enhance the research enterprise across all schools and departments in the university, before returning to a faculty position full time in 2019. Before coming to Yale, he was vice chancellor for research and professor of physics at the University of Illinois at Urbana-Champaign, and previously he served in a number of administrative, faculty, and research roles at Pennsylvania State University. Prior to that, he was on the faculty at the University of Notre Dame, and performed postdoctoral work at AT&T Bell Laboratories. His personal research focuses on artificial spin ice, geometrically frustrated magnets and other magnetic materials. He has co-authored more than 200 papers

and is the recipient of a Career Award from the National Science Foundation, a Presidential Early Career Award for Scientists and Engineers from the Army Research Office, an Alfred P. Sloan Research Fellowship recipient, and he received the Faculty Scholar Medal in the Physical Sciences and the Joel and Ruth Spira Award for Teaching Excellence from Penn State. He is also a fellow of the American Physical Society. He has served as the chair of the Topical Group on Magnetism and its Applications and also as the chair of the Division of Materials Physics in the American Physical Society. He received his B.S. from Yale University in 1988 and his Ph.D. from Stanford University in 1993.



Robert Schoelkopf, PhD

Robert Schoelkopf is the Sterling Professor of Applied Physics and Physics at Yale University. His research focuses on the development of superconducting devices for quantum information processing, which might eventually lead to revolutionary advances in computing. His group is a leader in the development of solid-state quantum bits (qubits) for quantum computing, and the advancement of their performance to practical levels. Together with his collaborators at Yale, Professors Michel Devoret and Steve Girvin, their team created the new field of “circuit quantum electrodynamics,” which allows quantum information to be distributed by microwave signals on wires. His lab has produced many firsts in the field based on these ideas, including the development of a “quantum bus” for information, and the first demonstrations of quantum algorithms and quantum error correction with integrated circuits. A graduate of Princeton University, Schoelkopf earned his Ph.D. at the California Institute of Technology. From 1986 to 1988 he was an electrical/cryogenic engineer in the Laboratory for High-Energy Astrophysics at NASA’s Goddard Space Flight Center, where he developed low-temperature radiation detectors and cryogenic instrumentation for future space missions. Schoelkopf, who came to Yale as a postdoctoral researcher in 1995, joined the faculty in 1998, becoming a full professor in 2003. He is also the director of the Yale Quantum Institute. Professor Schoelkopf has been recognized as a fellow of both the American Association for the Advancement of Science and the American Physical Society. In 2009, he was awarded the Joseph F. Keithley Award of the American Physical Society for the development of high-frequency measurement techniques to probe quantum devices and nanostructures, and in 2013 he shared, with his colleague Michel Devoret, the John Stewart Bell Prize for fundamental and pioneering experimental advances in superconducting qubits. In 2014 he received, together with Devoret and John Martinis (UCSB), the Fritz London Memorial Prize for Low Temperature Physics. In 2015, Professor Schoelkopf was elected to the National Academy of Science.