JENE A. GOLOVCHENKO

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Education:

Ph.D. (Nuclear Science) Rensselaer Polytechnic Institute, 1972
Thesis: Channeling in Very Thin Crystals
M.E.E. (Electro-Physics) Rensselaer Polytechnic Institute, 1968
B.E.E. (Electro-Physics) Rensselaer Polytechnic Institute, 1967
Elected Tau Beta Pi Honorary Society
A.M. (Honorary), Harvard University (1986)

Professional Record:

Harvard University, Cambridge, Massachusetts. Rumford Professor of Physics and Gordon McKay Professor of Applied Physics, 1987 - Present
Rowland Institute, Cambridge Massachusetts, Member of Research Staff, 1988-Present
Bell Laboratories, Murray Hill, New Jersey. Distinguished Member of Technical Staff, 1985 - 1986
Bell Laboratories, Murray Hill, New Jersey. Member of Technical Staff, Radiation Physics and High Speed Materials & Phenomena Research Departments, 1976 - 1985
Aarhus University, Institute of Physics, Denmark.
Associate Professor of Physics, 1974 - 1976
Brookhaven National Laboratory & Bell Laboratories, Murray Hill, New Jersey.
Research Assoc., Physics Department, 1973 - 1974
Aarhus University, Institute of Physics, Denmark. Research Associate (Postdoctoral Fellow), 1972 - 1973
N.A.S.A., Langley, Virginia. Aerospace Technologist (grade GS-11), 1969

Biographical Sketch:

Jene Golovchenko is a senior professor in the physics department in the Faculty of Arts and Sciences and Gordon McKay Professor of Applied Physics in the School of Engineering and Applied Sciences at Harvard. These two appointments reflect Professor Golovchenko's interests and contributions to various areas of fundamental and applied physics. He is also a member of the research staff at the Rowland Institute for Science, a nonprofit multi-disciplinary basic research organization founded by Edwin Land. He has served as a member of the Board of Directors of BSA, the governing institution of Brookhaven National Laboratory. Professor Golovchenko has served on numerous review panels, editorial boards of journals and corporate advisory boards. His research activities have been supported by DARPA, the National Science Foundation, the Department of Energy, and the Office of Naval Research and the National Institutes of Health. He is also an organizer of, and participant in, the Agilent Technologies - Harvard University Collaborative Research Agreement.

Prior to his appointments at Harvard, Golovchenko was a Distinguished Member of the Technical Staff at AT&T Bell Laboratories, Murray Hill. His total tenure at Bell Labs spanned 15-year

period encompassing his Ph.D. experimental thesis work, a postdoctoral appointment and tenure as a member of the research staff, in the Radiation Physics Department and in the High Speed Materials and Phenomena Research Departments. Golovchenko also spent three years in postdoctoral and faculty appointments at Aarhus University in Denmark. Significant aspects of his research during these years required extended stays at accelerator facilities at CERN and DESY.

Golovchenko's research career has spanned many disciplines with one main unifying theme being the study of the fundamental interactions of radiation and matter and the application of this knowledge to revealing and controlling the properties of materials. A significant component of this research has been related to accelerators and energetic beams of electrons, protons, optical photons, X-rays and ions. A second theme has involved the use of quantum mechanical electron transport to reveal the atomic structure of matter through the development and application of instruments like tunneling microscopes. Finally Golovchenko has contributed to scientific developments and discoveries in the field of laser interactions and cold atomic beams.

The Cambridge Accelerator for Materials Science (CAMS) at Harvard is a 2 MeV tandem ion accelerator currently run under the auspices of an NSF MRSEC by Golovchenko. It is a user facility that provides Boston area researchers with RBS, Channeling, PIXE, and Nuclear Reaction Analysis capabilities. The facility, including installation of a commercial accelerator, development of experimental beam lines and data analysis capabilities, was planned, constructed and is now operated under the direction of Golovchenko. A 5 nm focused ion beam facility has also recently been added. Professor Golovchenko has analogous experience developing and operating experimental X-ray beam line facilities at Synchrotron (DESY) and Storage Ring (Cornell, NSLS) facilities. He has conducted high energy particle experiments at the CERN PS and BNL's AGS and Dynamitron accelerators requiring similar skills. He has lately designed and developed the MeV positron channeling beam line at the LLNL Pelletron facility. Golovchenko's recent positron research has focused on understanding and developing a quantitative view of positron channeling phenomena in crystals

Golovchenko has also contributed to the understanding of laser solid interactions, and has made major contributions to understanding laser annealing and processing of semiconductors while at Bell Labs, and the demonstration of optically organized matter at the Rowland Institute. He has also participated in the development of one of the early cold atom Bose Einstein Condensation capabilities, at the Rowland Institute, currently yielding multi-million atom sodium condensates. That facility has grown to become the center for "slow light" research under the direction of Lene Hau. In the area of X-ray physics he is responsible for the development of X-ray standing wave techniques and their evolution into a quantitative tool for locating atoms in crystals and on their surfaces. Golovchenko's tunneling microscope laboratory at Bell Labs was the first uhv instrument working in the US and was responsible for fundamental new insights into the surface physics of semiconductors and the fundamental physics behind the operation of the instrument. Recently he has been investigating electronic methods of very rapidly detecting, characterizing and sequencing single molecules of DNA. This activity has lead to the development of a new ion beam based method for creating nanoscale structures in semiconductors called "ion beam sculpting". One of these structures, the solid state nanopore, first developed in the Golovchenko laboratory at Harvard, is the basis of a new class of devices for single molecule detection and characterization that is now the focus of an intense international effort to develop a method to supply all individuals with a map of their entire genome.

Golovchenko's research career is reflected in more than 155 published physics and applied physics journal articles. His students occupy many teaching and/or research position at universities, national laboratories and industrial research laboratories. In addition to advising undergraduate, graduate and post graduate students Professor Golovchenko has been actively involved in teaching at Harvard at the undergraduate level (Freshman Seminar Laboratory, Quantum Mechanics, Advanced Undergraduate Laboratory) and the graduate level (Advanced Quantum Mechanics, Advanced Electromagnetism, Solid State Physics, and Modern Optics).