ELECTRICAL & COMPUTER ENGINEERING SEMINAR

"Integrated Ultracold Atom Optics"

by

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Monday, April 30, 2007 4:10 p.m.
Hammond Auditorium, Engineering B120

Abstract & Biography

Abstract. Cold and ultracold atoms have enormous practical potential and have already proven their utility in ultra stable clocks and frequency standards, measurements of gravity, and inertial sensing for navigation. In many respects ultracold atom science and technology is at the stage lasers were in the early 1960's: an enormous potential in need of technology in order to become realized. This talk emphasizes the developments of atom chips and more generally integrated atom optics aimed at providing a technology infrastructure for ultracold atom applications. What typically occupies a few square meters, integrated atom optic technology has reduced to a portable system that can be held in one hand. Such miniature systems can have significant impact on both the progress of ultracold atom science and the development of sensors. I will put these developments in the context of atom gyroscopes as one important near-term example of an applications arena for cold and ultracold atoms. In recent work we have demonstrated an atom Michelson interferometer on a chip. Atom chip technology is likely to enable a more distant horizon, too, where we are beginning to contemplate atom transistors and other atom semiconductor device analogs. If such devices can be made practical, "atomtronics" is bound to find its way into quantum computing as well as into sensor applications much as conventional electronics has come to provide the foundation for most modern technology.

Biographical Sketch. Dana Z. Anderson is Professor of Physics at the University of Colorado and a Fellow of the JILA Institute. He also serves as the Director of the Optical Science and Engineering Program at CU. Prof. Anderson received a B.S.E.E. from Cornell University in 1975 and a Ph.D. in Physics from the University of Arizona in 1981. He spent three years as a Research Associate at the California Institute of Technology working on a prototype gravitational wave optical interferometer. Upon coming to the University of Colorado, Prof. Anderson worked extensively on laser gyroscopes and served as a consultant to Litton Guidance and Control Systems and Rockwell, International. Also at the University of Colorado Prof. Anderson developed a new class of optical techniques for information processing based on dynamic holography. Prof. Anderson was awarded the Optical Society of America's R. W. Wood Prize in 1994 for his work in this area. His current work centers on the development of integrated atom optics and practical applications of ultracold matter. Prof. Anderson is a Fellow of the Optical Society of America and the American Physical Society. He was a National Science Foundation Presidential Young Investigator, an Alfred P. Sloan Research Fellow and a Humboldt Research Fellow.

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