Igor Teper

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Education

Stanford University (Palo Alto, CA).
Ph.D. in Physics, September 2006.
Dissertation title: Ultracold atoms in microscopic magnetic traps near surfaces and inside optical resonators. Dissertation advisor: Vladan Vuletić.

M.S. in Physics, June 2003.

Harvard University (Cambridge, MA).
B.A. in Physics, *magna cum laude*, June 2000.

Research Experience

Stanford University (Fall 2006—present).
Postdoctoral Researcher in group of Mark Kasevich. Conduct experiments that use high-finesse optical cavity to prepare and study novel atomic states for precision measurement applications. Optimized cavity stabilization system. Investigated fundamental and technical limitations on spin squeezing in cavity with and without presence of optical lattice trap. Implemented and characterized sensitive quantum-nondemolition measurement protocol and studied resulting measurement backaction. Oversaw construction of upgraded experimental apparatus. Supervise two graduate students.

Massachusetts Institute of Technology (Fall 2003—Summer 2006).
Graduate Research Assistant in group of Vladan Vuletić. Continued work on experiment begun at Stanford. Investigated feasibility of novel atom cooling technique. Explored paths toward atom interferometer on chip. Upgraded experimental apparatus to incorporate high-finesse optical cavity around microtrap in order to study cavity-enhanced atom-light interactions. Designed and assembled new diode laser mount to reduce mechanical vibrations at high frequencies. Achieved single-atom measurement sensitivity using cavity-enhanced near-resonant fluorescence detection. Supervised and directed three undergraduate research assistants.

Stanford University (Fall 2000—Summer 2003).
Graduate Research Assistant in group of Vladan Vuletić. Built up and conducted an ultracold rubidium atom chip experiment. Participated in design and construction of most parts of experimental apparatus, including vacuum system, diode laser system and laser frequency locking mechanism, magnetic field controls, electronics, and data acquisition and analysis system. Achieved Bose-Einstein condensation of rubidium in microscopic

magnetic trap and studied effects of nearby conducting and dielectric surfaces on temperature and lifetime of magnetically trapped ultracold atoms and Bose-Einstein condensates.

Harvard-Smithsonian Center for Astrophysics (Spring and Summer, 1998).
Research Assistant in group of Ron Walsworth. Participated in an experiment that used a dual noble gas maser to search for a permanent nuclear electric dipole moment.

Teaching Experience

Pearson Education (Spring 2007—Spring 2008).
Freelance Author. Created interactive online physics tutorials for use in introductory university physics courses.

Pforzheimer House, Harvard University (Fall 2003—Spring 2006).
Nonresident Tutor in Physics. Held weekly office hours to assist undergraduates taking physics and math courses with problem sets and concepts, both one-on-one and in small groups. Advised physics concentrators on their plans of study.

Stanford University (Winter 2002).
Lab Assistant. Led weekly lab section in a writing-intensive optics lab class. Supervised experiments and guided students in presenting their results in Physical Review Letters-style reports. Oversaw editing of paper for which student received university award.

Stanford University (Fall 2000—Winter 2001).
Teaching Assistant. Led weekly discussion sections in mechanics and electromagnetism. Prepared study notes, practice problems, and course-wide review sessions, graded homework assignments and exams. Received combined ratings of 4.6/5 for clarity and 4.5/5 for overall effectiveness on end-of-course evaluations.

Center For Talented Youth (Summers 1997—2002).
Instructor (2000—2002). Taught proof-based college-level number theory and self-paced precalculus at summer academic enrichment program for talented high school students. Supervised study sessions, worked with students one-on-one to facilitate learning, devised enrichment activities, graded assignments and exams, and wrote detailed student performance evaluations. In the number theory course, planned and delivered daily lectures, refined the curriculum, and supervised end-of-session research projects.

Teaching Assistant (1997—1999). Supervised study sessions, graded assignments and exams, and worked with students on an individual basis in theoretical computer science and proof-based number theory courses.

Freelance Tutor (Fall 1999—Spring 2000)
Homeschooling tutor. Tutored a student, who, for health reasons, did not attend high school. Taught courses in algebra, precalculus, and physics. Devised the course curricula, including topics covered, homework assignments, and tests of comprehension.

Bureau of Study Counsel (Fall 1997—Spring 1999).
Award Peer Tutor. Tutored fellow undergraduates in physics and math courses as part of a university program that included paid tutor workshops in effective teaching techniques.

Publications

"Backaction noise produced via cavity-aided quantum nondemolition measurement of an atomic clock state," I. Teper, G. Vrijsen, J. Lee, and M. A. Kasevich, *Phys. Rev. A* **78**, 051803 (R) (2008).

"Microchips for single-atom detection and spin squeezing," M. Schleier-Smith, I. Leroux, Y.-J. Lin, I. Teper, and V. Vuletic, *Proceedings of CLEO/Europe-IQEC 2007*, Munich, Germany, IEEE (2007).

"Influence of grating parameters on the linewidths of external-cavity diode lasers," H. Loh, Y.-J. Lin, I. Teper, M. Cetina, J. Simon, J. K. Thompson, and V. Vuletić, *Appl. Opt***. 45**, 9191 (2006).

"Resonator-aided single atom detection on a microfabricated chip," I. Teper, Y.-J. Lin and V. Vuletić, *Phys. Rev. Lett*. **97**, 023002 (2006).

"Impact of the Casimir-Polder potential and Johnson noise on Bose-Einstein condensate stability near surfaces," Y.-J. Lin, I. Teper, C. Chin, and V. Vuletić, *Phys. Rev. Lett*. **92**, 050404 (2004).

Talks and Presentations

"Many-Atom Correlated States Produced via Cavity-Enhanced Nondemolition Measurement," poster, ICAP 2008, Storrs, CT (August 2008).

"Spin Squeezing for Atomic Clocks and Interferometers," poster, Stanford Center for Position, Navigation, and Time (SCPNT) Symposium (November 2007).

"Spin Squeezing in a High-Finesse Optical Cavity," presentation, gBECi program review, Newport, RI (October 2007).

(invited talk) "Microchips for Single Atom Detection and Spin Squeezing," CLEO/Europe-IQEC 2007, Munich, Germany (June 2007).

"Cavity-Aided Sensitive Atom Detection on an Atom Chip," ten minute talk, DAMOP 2006, Knoxville, TN (May 2006).

"Cavity-Aided Sensitive Atom Detection on an Atom Chip," seminar, Massachusetts Institute of Technology (May 2006).

"Atoms in Magnetic Microtraps near Surfaces and in Optical Resonators," seminar, University of California Berkeley (April 2006).

"Atoms in Magnetic Microtraps near Surfaces and in Optical Resonators," seminar, Stanford University (April 2006).

"Atom Waveguide Interferometer on a Microfabricated Chip," presentation, MURI program review, Stanford University (March 2004).