

John H. Huckans, Ph.D.

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PROFESSIONAL EXPERIENCE

National Institute of Standards and Technology, Atomic Physics Division Summer 2010
Research Assistant in the Laser Cooling and Trapping Group of Dr. William D. Phillips

- Designed and began construction of a novel two-dimensional accordion lattice optical device with Dr. Ian Spielman.
- Provided laboratory assistance and guidance to graduate students.

Bloomsburg University of Pennsylvania, Department of Physics 2009-present
Assistant Professor

- Fall 2009 and spring 2010 semesters: Introductory physics lecturing for class of approximately 100 non-physics majors. Conducted attendant laboratory sections. Created and graded homework assignments, quizzes, and examinations. Regularly tutored students outside of class hours.
- Spring 2010 semester: Worked with three undergraduate biology students on independent study research into acoustical noise of MRI machines. Prepared poster for presentation at the Acoustical Society of America 2010 conference (Baltimore, MD), and the College of Science and Technology Student Research Day 2010. Began preparation of peer-reviewed manuscript.
- Continued ultra-cold atom research at Penn State University. Constructed UHV vacuum system and studied atomic beam collimation. Presented preliminary work at the American Physical Society DAMOP 2010 conference (Houston).
- Summer 2010: Introductory physics lecturing for class of approximately 60 non-physics majors. Conducted attendant laboratory sections. Created and graded homework assignments, quizzes, and examinations. Regularly tutored students outside of class hours.
- Fall 2010 semester: Quantum mechanics lecturing for class of approximately 10 physics majors. Created and graded homework assignments and examinations. Regularly tutored students outside of class hours.
- Fall 2010 semester: Introductory physics lecturing for class of approximately 100 non-physics majors. Conducted attendant laboratory sections. Created and graded homework assignments, quizzes, and examinations. Regularly tutored students outside of class hours.
- Fall 2010 semester: Research with two undergraduate biology students and biology professor on signal analysis of mating calls of *Bufo woodhousii* toads.
- Fall 2010 semester: Working with two undergraduate physics students to develop ultra-cold atomic physics laboratory. Beginning construction of diode laser and sorption high vacuum pumps.
- Instituted Science Seminar Series within physics department. Invited three speakers and arranged all logistics including obtaining funding, making reservations, promoting events, and setting up before/cleaning up after talks.
- Instituted weekly physics department faculty lunch program, attended departmental meeting, conducted open house events for visiting students and parents, served on three departmental committees including student awards committee, attended SPS meetings.

Pennsylvania State University, Department of Physics

2007-2009

Postdoctoral Researcher in the group of Dr. Kenneth M. O'Hara

- Created the first degenerate Fermi gas at Penn State—the fifth in the U.S.
- Studied degenerate Fermi gases in optical traps focusing on two- and three-state mixtures and the effect of two- and three-state resonances on stability at ultra-cold temperatures.
- Created an ultra-stable 100 nK optical trap with magnetic levitation for achieving sufficiently low temperatures to permit the observation of Efimov physics for fermions.
- Lectured sophomore level calculus-based physics classes.

National Institute of Standards and Technology, Atomic Physics Division

2002-2007

Research Assistant in the Laser Cooling Group of Dr. William D. Phillips (Nobel laureate)

- Studied Bose-Einstein condensates in optical lattices focusing on low-dimensional physics, strong correlations, adiabaticity issues, and quantum information processes.
- Created an array of quasi-one-dimensional degenerate Bose gases and measured a seven-fold suppression in the three-body decay rate which was interpreted as a partial *fermionization* of the atoms. Observed the quasi-one-dimensional superfluid-Mott insulator quantum phase transition.
- Measured quasi-one-dimensional degenerate Bose gas transport in the vicinity of the superfluid-Mott insulator transition. Discovered significant reductions in the superfluid fraction well below the predicted transition point.
- Created an array of quasi-two-dimensional degenerate Bose gases, coherently excited a variable fraction of atoms to the first- or second-excited vibrational state in the confining direction, and then monitored the decay channels in detail. Found enhanced lifetimes due to modification of the final density of states, in analogy with inhibited spontaneous emission.
- Loaded a Bose-Einstein condensate into a one-dimensional lattice with a dynamically adjustable lattice constant and optically resolved the individual lattice sites. Investigated adiabaticity issues associated with loading and dynamically varying the lattice constant.

University of Maryland, Center for Superconductivity Research

2002

Research Assistant for Professor Fred Wellstood

- Designed and built prototype attachments for a scanning HTS SQUID microscope to enable rapid NDE of superconducting wires.
- Investigated non-metallic thin-wall tubes capable of maintaining vacuum while allowing SQUID in vacuum at 77 K to be 1-2 mm away from superconducting wires at atmosphere and normal room temperature.

Miller Henning Associates, McLean, Virginia

Acoustical Engineer

- Co-founder of company. Performed precision noise and vibration measurements and developed methods to reduce noise and vibration.
- Built and tested physical scale models to help predict effects of ground-borne vibration. Calculated spatial and temporal statistics of distributed noise sources.
- Prepared technical manuals. Reviewed government noise studies. Provided acoustical expert witness testimony.
- Designed/built custom electronics. Developed noise prediction and analysis software.

EDUCATION

University of Maryland, College Park, Maryland, Physics. Thesis supervised by Prof. William D. Phillips, thesis title and completion date:
Quantum Degenerate Rubidium-87 in Reduced Dimensions, Dec. 2006.
Johns Hopkins University, Baltimore, Maryland, MS, Computer Science, 1996.
Cornell University, Ithaca, New York, B.A., Physics and Mathematics, 1996.

SELECTED AWARDS, HONORS, INVITED TALKS AND PROFESSIONAL ASSOCIATIONS

Invited speaker, University of Chicago, (sponsor: Dr. Cheng Chin) 2009.
Invited speaker, National Inst. of Standards and Technology, Gaithersburg, MD, 2007.
Invited speaker, Williams College, (sponsor: Dr. Kevin Jones) 2006.
Finalist, Am. Assoc. of Phys Teachers Apparatus Competition ("Bernoulli box") 2005.
Duncan Fellowship (The Pennsylvania State University), 2002.
Duncan Fellowship (The Pennsylvania State University), 2001.
Mount Vernon College, Washington, DC, 1998.
Cornell University Tradition Fellowship (academic scholarship)
American Physical Society
Optical Society of America
Acoustical Society of America

RECENTLY AWARDED RESEARCH GRANTS

Faculty Professional Development Travel: DAMOP 2010 conference	\$1,633
Research and Science: MRI noise research	\$1,500
Faculty Professional Development Council: Atomic beam collimation	\$10,580
Research and Disciplinary Program: One-dimensional accordion lattice	\$14,350
Margin of Excellence: Two-dimensional accordion lattice	\$9,882
Faculty Professional Development Travel: DAMOP 2011 conference	\$1,826

PUBLICATIONS

1. M. A. Busada, C. L. Eshleman, G. Ibrahim, and J. H. Huckans, "Acoustic Noise of MRI Scans of the Internal Auditory Canal and Potential Effects on the Auditory Nerve," arxiv.org
2. J. R. Williams, J. H. Huckans, R. W. Stites, E. L. Hazlett and K. M. O'Hara, "Preparing a Highly Degenerate Fermi Gas in an Optical Lattice," Phys. Rev. A **82**, 011610(R) (2010).
3. J. R. Williams, E. L. Hazlett, J. H. Huckans, R. W. Stites, Y. Zhang and K. M. O'Hara, "Evidence for an Excited-State Efimov Trimer in a Three-Component Fermi Gas," Phys. Rev. Lett. **103**, 130404 (2009).
4. J. H. Huckans, I. B. Spielman, B. L. Tolra, J. V. Porto and W. D. Phillips, "Quantum and Classical Dynamics of a BEC in a Large-Period Optical Lattice," Phys. Rev. A **80**, 043609 (2009).

5. J. H. Huckans, J. R. Williams, E. L. Hazlett, R. W. Stites and K. M. O'Hara, "Three-Body Recombination in a Three-State Fermi Gas with Widely Tunable Interactions," *Phys. Rev. Lett.* **102**, 165302 (2009).
6. J. H. Huckans, D. C. Walker, C. Zemal-Saul, N. A. Kurz, K. H. Mitchell, D. S. Reed and M. W. Cole, "A Wind Tunnel in Your Classroom: The Design and Implementation of a Portable Wind Tunnel for Use in the Science Classroom," arxiv:0208039, also appears in *Science Scope* **30** n6 p27-31 (Feb 2007).
7. J. H. Huckans, "An Accordion Optical Lattice for Cold Atoms" (in preparation).
8. I. B. Spielman, P. R. Johnson, J. H. Huckans, C. D. Fertig, S. L. Rolston, W. D. Phillips and J. V. Porto, "Collisional De-excitation in a Quasi-2D Degenerate Bose Gas," *Phys. Rev. A* **73**, 020702(R) (2006).
9. C. D. Fertig, K. M. O'Hara, J. H. Huckans, S. L. Rolston, W. D. Phillips and J. V. Porto, "Strongly Inhibited Transport of a Degenerate 1D Bose gas in a Lattice," *Phys. Rev. Lett.* **94**, 120403 (2005).
10. B. L. Tolra, K. M. O'Hara, J. H. Huckans, M. Anderlini, J. V. Porto, S. L. Rolston and W. D. Phillips, "Study of a 1D Interacting Quantum Bose Gas," *J. Phys. IV France* **116** (2004).
11. B. L. Tolra, K. M. O'Hara, J. H. Huckans, J. V. Porto, S. L. Rolston and W. D. Phillips, "Observation of Reduced Three-Body Recombination in a Correlated 1D Degenerate Bose Gas," *Phys. Rev. Lett.* **92**, 190401 (2004).
12. W. D. Phillips, M. Anderlini, J. Huckans, B. L. Tolra, K. M. O'Hara, J. V. Porto and S. L. Rolston, "Experimental Study of a Bose Gas in One Dimension," *Proc. of the 16th International Conf. on Laser Spectroscopy*, Ed.: P. Hannaford, A. Sidorov, H. Bacher, K. Baldwin (World Scientific, 2003).
13. C. D. Fertig, J. H. Huckans, K. M. O'Hara, W. D. Phillips, J. V. Porto, "Superfluid-to-Mott-Insulating Transition in a One-Dimensional Atomic Gas," NIST TechniPubs, February 19, (2004).
14. J. H. Huckans, "Drag on a Toy Flying Ring," *Journal of Cornell Scientists*.
15. J. H. Huckans, "Determination of Tau, the Optical Density of a Cometary Coma," *Journal of Cornell Scientists*.

PROFESSIONAL REFERENCES

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