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EDUCATION AND TRAINING

2004 – Kavli Institute Fellow, University of Chicago, Center for Cosmological Physics
2004 Ph.D. Physics, Harvard University
1998 A.M. Physics, Harvard University
1995 B.S. Physics with Honors, Stanford University

AWARDS AND HONORS

2006 Arthur H. Compton Lecturer, Enrico Fermi Institute, University of Chicago
2006 Division of Atomic, Molecular Optical Physics (DAMOP) Thesis Award, American Physical Society
2004 Kavli Institute Fellowship, University of Chicago

RESEARCH ACCOMPLISHMENTS

Electron g-factor research at Harvard University

In my Ph.D. thesis, I reported the first fully quantum measurement of the electron magnetic moment. This 0.8 parts per trillion result for the g-factor is slightly shifted from the best previous measurement and is six times more accurate. Using existing QED theory, we also obtain the most accurate value for the fine structure constant.

Selected Contributions (in collaboration with B. D'Urso, D. Hanneke, and G. Gabrielse)

- New HEMT amplifier heatsinking, reducing electron axial temperature by a factor of 50.
- Discovery of sub-Kelvin nuclear paramagnetism problem of copper Penning trap and implementation of silver trap, reducing B-field temperature coefficient by a factor of 400.
- Analysis of spectroscopic data, leading to the improved g-factor measurement and the first comparison between predicted and observed cavity shifts of the g-factor.

Dark matter research at University of Chicago

In my KICP postdoctoral fellowship, I work with the COUPP (Chicagoland Observatory for Underground Particle Physics) collaboration to develop heavy-liquid bubble chambers as direct detectors for dark matter. Advantages of this approach include optimal choice of target liquid, low cost, good scalability, room temperature operation, and extraordinary intrinsic rejection of minimally-ionizing backgrounds. We currently claim the best spin-dependent limits on WIMP-proton coupling, for low- to intermediate-mass WIMPs.

Selected Contributions

- Part of the three-person analysis team which used data from a 2 kg engineering prototype run to obtain improved spin-dependent dark matter limits, to be published in *Science*.
- Development of windowless bubble chamber design, allowing for cheap ~50 kg modules.
- Leadership of a team, consisting of two graduate students and two undergraduates, building a 20 kg windowless chamber expected to turn on in December 2007.
- Phenomenological investigation into utility of dark matter detectors with spin-dependent sensitivity, *Phys. Rev. Lett.* 99, 151301 (2007), showing that Kaluza-Klein and SUSY dark matter can be distinguished using a detector such as COUPP.

INVITED PRESENTATIONS

- 2008 University of California, Santa Barbara. HEP Seminar. Santa Barbara, CA.
- 2008 University of California, Berkeley. AMO Seminar. Berkeley, CA.
- 2008 Massachusetts Institute of Technology. Nuclear and Particle Colloquium. Boston, MA.
- 2008 University of Michigan. CM/AMO Seminar. Ann Arbor, MI.
- 2008 New York University. Physics Colloquium. New York, NY.
- 2008 New York University. CCPP Seminar. New York, NY.
- 2008 University of Chicago. James Franck Institute Seminar. Chicago, IL.
- 2007 Stanford Linear Accelerator Center. Experimental Seminar. Menlo Park, CA
- 2006 Argonne National Laboratory. Medium Energy Physics Seminar. Argonne, IL
- 2006 Yale University. Weak Interactions Seminar. New Haven, CT
- 2006 University of Maryland. Combined Nuclear/HEP Seminar. College Park, MD
- 2006 Northwestern University. Physics Colloquium. Evanston, IL
- 2006 Division of Nuclear Physics. Dark Matter Mini-Symposium. Nashville, TN
- 2006 Arthur H. Compton Lecturer. Enrico Fermi Institute. University of Chicago, IL
<http://kicp.uchicago.edu/~odom/compton>
- 2006 6th International Workshop on The Identification of Dark Matter. Rhodes, Greece
- 2006 APS Division of Atomic Molecular Physics, Thesis Prize presentation. Knoxville, TN
- 2005 SNOLAB 2005 Workshop. Lively, Canada
- 2005 Northwestern University. HEP seminar. Evanston, IL
- 2004 University of Chicago. Kavli Institute seminar. Chicago, IL
- 2004 Argonne National Laboratory. AMO seminar. Argonne, IL
- 2004 Third Meeting on CPT and Lorentz Symmetry. Bloomington, IN
- 2003 University of Chicago. HEP seminar. Chicago, IL
- 2002 Fermi National Accelerator Laboratory. Special seminar. Batavia, IL
- 1999 Smithsonian Institute for Astrophysics. AMO seminar. Cambridge, MA

CONTRIBUTED PRESENTATIONS

- 2007 IEEE Nuclear Science Symposium. Honolulu, HI
- 2007 Topics in Underground and Particle Physics (TAUP). Sendai, Japan
- 2006 Neutrino 2006. Santa Fe, NM
- 2005 IEEE Nuclear Science Symposium. Fajardo, Puerto Rico
- 2005 Topics in Underground and Particle Physics (TAUP). Zaragoza, Spain

TEACHING EXPERIENCE

- 2002 Reality Physics, Harvard University, Prof. Jerry Gabrielse
- 1996-7 Undergraduate Electricity and Magnetism Lab, Harvard University, Prof. John Doyle
- 1995-6 Undergraduate Quantum Mechanics, Stanford University, Prof. Michael Peskin

PUBLICATIONS

1. "Spin-Dependent WIMP Limits from a Bubble Chamber," E. Behnke, J.I. Collar, P.S. Cooper, K. Crum, M. Crisler, M. Hu, I. Levine, D. Nakazawa, H. Nguyen, B. Odom, E. Ramberg, J. Rasmussen, N. Riley, A. Sonnenschein, M. Szydagis, and R. Tschirhart. *Science* 319, 933 (2008).
2. "WIMP identification through a combined measurement of axial and scalar couplings," G. Bertone, D.G. Cerdeno, J.I. Collar, and B. Odom. *Phys. Rev. Lett.* 99, 151301 (2007).
3. "Dark Matter Detection with Bubble Chambers," E. Behnke, J.I. Collar, P.S. Cooper, K. Crum, M. Hu, I. Levine, S. Mishra, D. Nakazawa, B. Odom, E. Ramberg, J. Rasmussen, N. Riley, A. Sonnenschein, M. Szydagis, R. Tschirhart, and N. Vander Werf. *J. Phys.:Conf. Series*, in press.
4. "Development of Bubble Chambers With Enhanced Stability and Sensitivity to Low-Energy Nuclear Recoils," W.J. Bolte, J.I. Collar, M. Crisler, J. Hall, D. Holmgren, D. Nakazawa, B. Odom, K. O'Sullivan, R. Plunkett, E. Ramberg, A. Raskin, A. Sonnenschein, and J.D. Vieira. *Nucl. Instrum. Meth. A* 577, 569 (2007).
5. "New Measurement of the Electron Magnetic Moment Using a One-Electron Quantum Cyclotron," B. Odom, D. Hanneke, B. D'Urso, and G. Gabrielse. *Phys. Rev. Lett.* 97, 030801 (2006).
6. "New Determination of the Fine Structure Constant from the Electron g Value and QED," G. Gabrielse, D. Hanneke, T. Kinoshita, M. Nio, and B. Odom. *Phys. Rev. Lett.* 97 030802 (2006).
7. "A Bubble Chamber for Dark Matter Detection (the COUPP Project Status)," W.J. Bolte, J.I. Collar, M. Crisler, J. Hall, J. Krider, K. Crum, D. Holmgren, C.M. Lei, D. Nakazawa, H. Nguyen, B. Odom, K. O'Sullivan, R. Plunkett, E. Ramberg, A. Raskin, J. Rasmussen, R. Schmit, A. Sonnenschein, M. Szydagis, and J.D. Vieira. *Journal of Physics: Conference Series* 39 126 (2006).
8. "Single-Particle Self-excited Oscillator," B. D'Urso, R. Van Handel, B. Odom, and G. Gabrielse. *Phys. Rev. Lett.* 94, 113002 (2005).
9. "Fully Quantum Measurement of the Electron Magnetic Moment," B. Odom. Thesis supervised by Gerald Gabrielse, Harvard University (2004).
<http://hussle.harvard.edu/~gabrielse/gabrielse/papers/2004/OdomThesis2004.pdf>
10. "COUPP: A Heavy-Liquid Bubble Chamber for WIMP Detection," J. Bolte, J.I. Collar, M. Crisler, D. Holmgren, D. Nakazawa, B. Odom, K. O'Sullivan, R. Plunkett, E. Ramberg, A. Raskin, A. Sonnenschein, J.D. Vieira. *Proceedings from IDM2004*, Edinburgh, Scotland (2004).
11. "Feedback Cooling of a One-Electron Oscillator," B. D'Urso, B. Odom, and G. Gabrielse. *Phys. Rev. Lett.* 90, 043001 (2003).
12. "One-Electron Cyclotron (and Implications for Cold Antihydrogen)," G. Gabrielse, S. Peil, B. Odom, and B. D'Urso. In *Atomic Physics 17*, Vol. 551, edited by E. Arimondo, P. DeNatale, and M. Inguscio. American Institute of Physics, Melville, New York, pp. 108-120 (2001).
13. "QND Observation of Quantum Jumps between Fock States: a One-Electron Cyclotron Oscillator at 70 mK to 4.2 K," G. Gabrielse, S. Peil, B. Odom, and B. D'Urso. *Proceedings from Quantum Electronics and Laser Science Conference*, Baltimore, MD, USA (1999).
14. "Spectroscopy of Buffer-Gas Cooled Vanadium Monoxide in a Magnetic Trapping Field," J.D. Weinstein, R. deCarvalho, K. Amar, A. Boca, B.C. Odom, B. Friedrich, J.M. Doyle. *J. Chem. Phys.* 109, 2656 (1998).
15. "Quantum Interference in Electron Collision," R. Liu, B. Odom, Y. Yamamoto, and S. Tarucha. *Nature* 391, 6664 (1998).

SECONDARY REPORTS ON THESIS RESEARCH

1. "The Physics Story of the Year for 2006," P. Schewe, B. Stein, and D. Castelvecchi. *Physics News Update* 804. Dec. 5, 2006.
2. "Finer Fine-Structure Constant," *Riken Research Highlights*, Nov. 2, 2006.
3. "In Constant Search of 'Alpha'," M. Inman. *New Scientist* 2568, Sept. 12, 2006.
4. "For Quantum Theory, A Jump," J. Zhang. *Harvard Crimson*. Sept. 11, 2006.
5. "Gyromagnetic ratio of a lone trapped electron is measured better than a part per trillion," B. Schwarzschild, *Physics Today, Search and Discovery*, Aug. 2006.
6. "A Finer Constant," A. Czarnecki. *Nature* 442. Aug. 3, 2006.
7. "Refining the Fine-Structure Constant," *PhysicsWeb Summaries*. Aug. 1, 2006.
8. "A More Precise Fine Structure Constant," D. Kleppner. *Science* 313. July 28, 2006.
9. "Plumbing the Electron's Depths," P. Schewe and B. Stein. *Physics News Update* 783. July 5, 2006.