Paul Oxley

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Physics Department, College of the Holy Cross
1 College St, Worcester, MA 01610

CURRENT POSITION

College of the Holy Cross 2005-present
Associate Professor, Department of Physics.

PREVIOUS POSITIONS

University of Minnesota 2003-2005
Research Associate, Department of Physics and Astronomy.

EDUCATION

Harvard University 1997-2003
Ph.D. in physics. Thesis title: "Production of Slow Antihydrogen from Cold Antimatter Plasmas," 2003
Harlech traveling scholarship, 1997-1998

New College, Oxford University, U.K. 1995-1997
Began Ph.D. in physics, withdrew to take scholarship to Harvard University.

Pembroke College, Oxford University, U.K. 1991-1994
B.A. Honors in physics, First Class, 1994

RESEARCH EXPERIENCE

College of the Holy Cross 2005-present
Assistant and then Associate Professor.
Heading a research program to build a Rydberg atom source for fundamental atomic and plasma physics studies, and performing studies in the field of applied magnetism

University of Minnesota 2003-2005
Research Associate.
Measured optical and electrical properties of microwave detectors at 0.1 Kelvin.
Constructed an apparatus to test a new type of microwave detector at 0.3 Kelvin.
Studied the optical performance of an achromatic half wave plate polarimeter.

Harvard University 1997-2003
Ph.D. thesis research. Advisor: Professor G. Gabrielse.
Captured, cooled, and manipulated positrons and antiprotons in a cryogenic Penning trap at the CERN particle accelerator.
Created large numbers of slow antihydrogen atoms for tests of CPT symmetry.

RESEARCH EXPERIENCE, continued.

New College, Oxford University, U.K. 1995-1997
Ph.D. thesis research. Advisor: Professor J. Silver.
Performed and analyzed ultra-violet, visible, and X-ray spectroscopy experiments on trapped highly-charged ion plasmas.
Made experimental progress towards laser spectroscopy of highly-charged silicon and argon as a test of Quantum Electrodynamics.

TEACHING EXPERIENCE

College of the Holy Cross 2005-present
Topics in Physics (PHYS 100)
Introductory Physics 1 (PHYS 115)
Introductory Physics 2 (PHYS 116)
Electricity and Magnetism in Real Life (PHYS 100)
Modern Physics (PHYS 223)
Modern Physics Laboratory (PHYS 225)
Optics (PHYS 231)
Optics Laboratory (PHYS 233)
Electromagnetic Theory (PHYS 351)
Quantum Mechanics (PHYS 353)
General Research 1 (CHEM 405)
General Research 2 (CHEM 406)
Undergraduate Research (PHYS 471)
Undergraduate Research (PHYS 472)
Supervised the Honors Thesis of Miguel Juarez (2009)
Supervised spring and summer undergraduate research (2006 - present)
Supervised Honors Thesis of Alex DiResta (2022)

University of Minnesota 2003-2005
Supervised research of three graduate and two undergraduate students.
Supervised summer research project of visiting student.

Oxford University 1995-1997
Classical Mechanics
Quantum Mechanics
Atomic Physics
Advanced Atomic and Molecular Physics

PROFESSIONAL EXPERIENCE

Furukawa Research and Engineering Europe Ltd. 1994-1995
Research Scientist.
Created and studied novel microscopic filters in fiber optic cables.
Integrated filters into fiber laser systems.
Investigated filter applications in wavelength division multiplexing systems and as stress, strain and temperature sensors.

SERVICE AT HOLY CROSS COLLEGE

Committee on Tenure and Promotion Member	2020 - 2022
Physics Department Teacher Education Program Liaison	2021- 2022
Honors Program Interviewer	2021- 2022
Summer Research Selection Committee Member	2021- 2022
First Year Advisor	2020 - 2021
Mentor in the Holy Cross faculty mentor program	2017 - 2019
Member of the College Chemical Safety Committee.	2017 - 2018
College representative: National Council for Undergraduate Research.	2008 - present
Chair, Curriculum Committee.	2016 - 2017
Member, Committee on Faculty Affairs.	2016 - 2017
Physics Post Graduate Advisor.	2006/7/13/16
Physics Department Webmaster.	2014 - 2016
Study Abroad Committee Member.	2013 - 2016
Member of the Health Professions Advisory Committee.	2006 - 2013
Physics Department representative on the Academic Affairs Council.	2011
Member of the Educational Technology Advisory Group.	2011
Physics Department Society of Physics Students Faculty Organizer.	2008 - 2010
Co-organizer: New England Section of the American Physical Society and American Association of Physics Teachers Meeting.	2006
Co-organizer: Undergraduate Summer Research Symposium at Holy Cross.	2006

AWARDS AND HONORS

<u>Holy Cross College</u>	
Course Development Summer Faculty Fellowship, 'Redesign of Modern Physics'	2016
Faculty Scholarship Awards:	
'Insights into Molecule-Atom Collision Dynamics using Rapidly Rotating Molecules'	2019
'Ion Beam Profile Monitor for Ion-Atom Collision Studies'	2014
'An Ion Detection System'	2011
'A Laser Interferometer for Laser Wavelength Analysis'	2009
'An Electronic Device For Controlling Magnetism in Magnetic Materials'	2009
'Lithium Atomic Beam Apparatus'	2006
Research Corporation Cottrell College Science Award (total value $82,000)	2006-2008
<u>New College, Oxford University, U.K.</u> Harlech Traveling Scholarship to Harvard University (2 awarded each year).	1997-1998
<u>Pembroke College, Oxford University, U.K.</u> Pembroke College scholarship for academic excellence (2 awarded each year).	1992-1993

TALKS/PRESENTATIONS (Presenting author in bold, Holy Cross students underlined)

'Measurements of Charge Transfer Cross Sections for Hydrogen Ion Impact in Lithium at Low Energies'
Paul Oxley, International Conference on Photonic, Electronic and Atomic Collisions. (Poster Presentation.) — July 2021

'Influence of Reagent Rotation on Exchange Reaction Rates in the $Li+Li_2^*(A^1\Sigma_u^+)$ System'
Jacob Fanthorpe, Ramesh Marhatta, Mark Rosenberry, Paul Oxley, Brian Stewart, Division of Atomic, Molecular, and Optical Physics Conference. (Poster Presentation.) — June 2020

'Lithium-Proton Charge Transfer and Other Collision Studies'
Paul Oxley, Nevis Laboratory, Columbia University, NY (invited talk). — August 2019

'Measurements of Proton-Lithium Charge Transfer Cross Sections at Low and Intermediate Energies'
Paul Oxley, International Symposium on Ion-Atom Collisions, Sorbonne University, Paris, France (oral presentation and poster presentation). — July 2019

'Electron beam production and beam profile monitoring'
Daniel Mendez and Paul Oxley, University of Massachusetts, Dartmouth, MA (poster presentation). — November 2018

'Lithium-Proton Electron Loss Cross-Section Measurements'
Paul Oxley, Nevis Laboratory, Columbia University, NY (invited talk). — June 2018

'Electron Loss Cross-Sections for Low Energy Proton Lithium Collisions'
Paul Oxley, Division of Atomic, Molecular, and Optical Physics Conference, Fort Lauderdale, FL (poster presentation). — May 2018

'Charge Transfer in Ion-Atom Collisions and Antimatter Research'
Paul Oxley, Wesleyan University Department of Physics Colloquium Series (invited talk). — October 2016

'Particle Accelerators'
Paul Oxley, Holy Cross Summer Research Seminar (oral presentation). — June 2016

'Diode Laser Absorption Spectroscopy of Lithium Atomic Beams'
Paul Oxley and Joseph Wihbey, Division of Atomic, Molecular, and Optical Physics Conference, Providence, RI (poster presentation). — May 2016

'Atomic Beam Density Characterization by Diode Laser Absorption Spectroscopy'
Paul Oxley and Joseph Wihbey, Division of Atomic, Molecular, and Optical Physics Conference, Columbus, OH (poster presentation). — June 2015

TALKS/PRESENTATIONS (continued.)

'Over the Hill: Electron transfer in Ion-Atom Collisions'
Paul Oxley, Amherst College Department of Physics and Astronomy Colloquium Series (invited talk) — March 2015

'Progress towards proton-lithium charge transfer collision experiments'
Paul Oxley and Bryan Ptucha, Division of Atomic, Molecular, and Optical Physics Conference, Montreal, Canada (poster presentation). — June 2013

'Measurement of the 10p fine structure interval of ^{7}Li'
Paul Oxley and Pat Collins, Division of Atomic, Molecular, and Optical Physics Conference, Atlanta, GA (poster presentation). — June 2011

'Plasma Physics and the Promise of Free Energy'
Paul Oxley, Holy Cross Summer Research Seminar (oral presentation). — June 2010

'Spectroscopy of low Rydberg np states of ^7Li'
Paul Oxley and Pat Collins, Division of Atomic, Molecular, and Optical Physics Conference, Houston, TX (oral presentation). — May 2010

'High accuracy potential calculations for atom-ion chambers'
Jacob Golde, Janine Shertzer, and **Paul Oxley** Division of Atomic, Molecular, and Optical Physics Conference, Charlottesville, VA (oral presentation). — May 2009

'Optical Sidebands in Extended Cavity Diode Lasers'
Timothy Roach, Josh Ryor, and Paul Oxley, Division of Atomic, Molecular, and Optical Physics Conference, Charlottesville, VA (poster presentation). — May 2009

'The Use of a Lock-In Amplifier to Stabilize the Frequency of a Diode Laser'
Miguel Juarez and Paul Oxley, Boston University Society of Physics Students Zone 1 Meeting, Boston University, Boston, MA (poster presentation). — March 2009

'Diode Laser Excitation of Rydberg Lithium Atoms for Collision Studies'
Paul Oxley and James Daly, Division of Atomic, Molecular, and Optical Physics Conference, State College, PA (poster presentation). — May 2008

'Coherent Elliptical State Atoms For Collision Studies'
Paul Oxley, York University, Toronto, Canada (invited talk). — March 2008

'Atom Smashers: How the World's Largest Machines Study the Universe's Smallest Particles'
Paul Oxley, Center for Talented Youth Conference, Holy Cross College. — 2007

'Charge Exchange Collisions Using Coherent Elliptical State Atoms'
Paul Oxley, Stonybrook University, New York (invited talk). — 2007

REVIEW ACTIVITIES

External Examiner, Richard Thai Ph.D. Thesis *Apparatus for Positronium Production via Rydberg Cesium Charge-Exchange*, York University, Toronto Canada

Reviewer, *Journal of Applied Physics*

Reviewer, *Council on Undergraduate Research - Posters on the Hill*

Reviewer, *Atoms*, open access journal

Reviewer, *IEEE Transactions on Magnetics - Conferences Proceedings*

Reviewer, *Journal of Magnetism and Magnetic Materials*

Editorial board member, *Journal of Experimental Physics*

NASA Astrophysics Research and Analysis proposal review panel member

Reviewer, *Choice* Magazine

PAPERS AND PUBLICATIONS (underlined denotes undergraduate author)

1. *Measurements of charge transfer and target-electron-loss cross sections for H^+, D^+, and He^+ impact on lithium at low energies.*
   Paul Oxley, Physical review A 105, 032824 (2022)

2. *Precision Atomic Beam Density Characterization by Diode Laser Absorption Spectroscopy.*
   Paul Oxley and Joseph Wihbey, Review of Scientific Instruments 87, 093103 (2016).

3. *Frequency Stabilization of Multiple Lasers and Rydberg Atom Spectroscopy.*
   Paul Oxley and Patrick Collins, Journal of Applied Physics B, 101, pp. 23-31 (2010).

4. *Measurement of the Lithium 10p Fine Structure Interval and Absolute Energy*
   Paul Oxley and Patrick Collins, Physical review A 81, 024501 (2010).

5. *Apparatus for Magnetization and Efficient Demagnetization of Soft Magnetic Materials*
   Paul Oxley, IEEE Transactions on Magnetics 45, pp. 3274-3283 (2009).

6. *Magnetic properties of stainless steels at room and cryogenic temperatures*
   Paul Oxley, Jennifer Goodell, Robert Molt, Journal of Magnetism and Magnetic Materials 321, pp. 2107-2014 (2009).

   (a) Magnetic Properties of Stainless Steels included in *Encyclopedia Magnetica* (https://www.e-magnetica.pl/doku.php/database)

7. *Finite element solution of Laplace's equation for ion-atom chambers*
   Jacob Golde, Janine Shertzer, and Paul Oxley, The American Journal of Physics 77, pp. 81-86 (2009).

8. *Finite element solution of Laplace's equation for ion-atom chambers*
   Jacob Golde, Janine Shertzer, and Paul Oxley, selected for publication in the Virtual Journal of Ultra-Fast Science which reports frontier research (Vol. 8, Issue 1, 2009).

PAPERS AND PUBLICATIONS, continued.

9. *A Millimeter-Wave Achromatic Half Wave Plate*
S. Hanany, H. Hubmayr, B. Johnson, T. Matsumura, P. Oxley, M. Thibodeau, Applied Optics 44, pp. 4666-4670 (2005).

10. *Development of a Cryogenic Induction Motor for use with a Superconducting Magnetic Bearing*
T. Matsumura, S. Hanany, J.R. Hull, B. Johnson, T. Jones, P. Oxley, Physica C Vol. 426-431, pp. 746-751, (2005).

11. *The EBEX Experiment*
P. Oxley, P. Ade, C. Baccigalupi, P. deBernardis, H–M. Cho, M.J. Devlin, S. Hanany, B.R. Johnson, T. Jones, A.T. Lee, T. Matsumura, A.D. Miller, M. Milligan, T. Renbarger, H.G. Spieler, R. Stompor, G.S. Tucker, M. Zaldarriaga, Earth Observing Systems IX. Edited by W.L. Barnes and J.J. Butler, Proceedings of the SPIE 5543, pp. 320-331 (2004).

12. *Aperture Method to Determine the Density and Geometry of Antiparticle Plasmas*
P. Oxley, N.S. Bowden, R. Parrott, A. Speck, C. Storry, J.N. Tan, M. Wessels, G. Gabrielse, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, J. Walz, H. Pittner, T.W. Haensch, E.A. Hessels, Physics Letters B 595, 60 (2004).

13. *Observations of Cold Antihydrogen*
J.N. Tan, N.S. Bowden, G. Gabrielse, P. Oxley, A. Speck, C.H. Storry, M. Wessels, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, J. Walz, H. Pittner, T.W. Haensch, E.A. Hessels, Nuclear Instruments and Methods in Physics Research B 214, pp. 22-30 (2004).

14. *Driven Production of Cold Antihydrogen and the First Measured Distribution of Antihydrogen States*
G. Gabrielse, N.S. Bowden, P. Oxley, A. Speck, C.H. Storry, J.N. Tan, M. Wessels, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, J. Walz, H. Pittner, T.W. Haensch, E.A. Hessels, Physical Review Letters 89, 233401 (2002).

15. *Background-Free Observation of Cold Antihydrogen and a Field-Ionization Analysis of Its States*
G. Gabrielse, N.S. Bowden, P. Oxley, A. Speck, C.H. Storry, J.N. Tan, M. Wessels, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, J. Walz, H. Pittner, T.W. Haensch, E.A. Hessels, Physical Review Letters 89, 213401 (2002).

16. *Stacking of Cold Antiprotons*
G. Gabrielse, N.S. Bowden, P. Oxley, A. Speck, C.H. Storry, J.N. Tan, M. Wessels, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, J. Walz, H. Pittner, T.W. Haensch, E.A. Hessels, Physics Letters B 548, 140 (2002).

17. *Cold Antihydrogen and CPT*
G. Gabrielse, J.N. Tan, N.S. Bowden, P. Oxley, C.H. Storry, M. Wessels, A. Speck, J. Estrada, P. Yesley, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, J. Walz, Proceedings of the Second Meeting on CPT and Lorentz Symmetry, edited by V. Alan Kostelecky, World Scientific, Singapore, pp. 225-234 (2002).

PAPERS AND PUBLICATIONS, continued.

18. *Cold Antimatter Plasmas, and Aspirations for Cold Antihydrogen*
G. Gabrielse, J.N. Tan, N.S. Bowden, P. Oxley, C.H. Storry, M. Wessels, A. Speck, J. Estrada, P. Yesley, T. Squires, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, J. Walz, Non-Neutral Plasma Physics IV, AIP Conference Proceedings, volume 606, edited by F. Anderegg, L. Schweikhard, C.F. Driscoll, American Institute of Physics, Melville, NY, pp. 51-62 (2002).

19. *First Positron Cooling of Antiprotons*
G. Gabrielse, J. Estrada, J.N. Tan, P. Yesley, N.S. Bowden, P. Oxley, T. Roach, C.H. Storry, M. Wessels, J. Tan, D. Grzonka, W. Oelert, G. Schepers, T. Sefzick, W. Breunlich, M. Carngelli, H. Fuhrmann, R. King, R. Ursin, H. Zmeskal, H. Kalinowsky, C. Wesdorp, J. Walz, K.S.E. Eikema, T.W. Haensch, Physics Letters B 507, 1 (2001).

20. *Recent Research Using the Oxford Electron Beam Ion Trap*
H.S. Margolis, J. Asada, T.V. Back, D.J. Bieber, F.J. Currell, E.G. Myers, N. Nakamura, S. Ohtani, P.K. Oxley, M. Sakurai, J.D. Silver, H. Watanabe, Hyperfine Interactions 115, 139 (1998).

21. *Laser Spectroscopy of the* $1s^2 2s 2p\,^3P_2 - {}^3P_1$ *Transition in Beryllium-like Argon Using the Oxford EBIT*
T.V. Back, H.S. Margolis, P.K. Oxley, J.D. Silver, E.G. Myers, Hyperfine Interactions 114, 203 (1998).

22. *Laser Spectroscopy of the* $2s$ *Lamb Shift in Hydrogen-like Silicon Using an EBIT*
T.V. Back, P.D. Groves, H.S. Margolis, P.K. Oxley, J.D Silver, Physica Scripta T73, 62 (1997).

23. *Studies of Magnetic Dipole Transitions in Highly Charged Argon and Barium Using an EBIT*
D.J. Bieber, H.S. Margolis, P.K. Oxley, J.D. Silver, Physica Scripta T73, 64 (1997).

24. *Studies of the Ionization Balance in an Electron Beam Ion Trap*
H.S. Margolis, P.D. Groves, P.K. Oxley, J.D. Silver, A.J. Varney, Physica Scripta T73, 375 (1997).