

Curriculum Vitae Richard J Mawhorter

Professor of Physics
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Education

Ph.D. in Physics, The University of Texas at Austin. Dissertation: *Electron Scattering Studies of Gas Phase Molecular Structure at High Temperature* (1985) Supervisor: Professor Manfred Fink

M.A. in Physics, The University of Texas at Austin. Thesis: *An Experimental Determination of the Vibrationally-Averaged, Temperature-Dependent Structure of CO₂* (1981)

B.S. in Physics & Mathematics with Highest Honor, Wheaton College, Wheaton, Illinois (1978)

Professional Experience Highlights

DAAD Re-Invitation Study Visit Fellow, Leibniz Universität, Hannover, Germany (2013)
Department Chair, Department of Physics & Astronomy, Pomona College (Fall 2008)
Assistant, Associate, and Full Professor, Pomona College (1989/1994/2003-present)
Visiting Research Staff, University of Edinburgh (2006-2010) (sabbatical & summer)
DAAD Re-Invitation Study Visit Fellow, Leibniz Universität, Hannover, Germany (2006-07)
Faculty Fellow & Research Consultant, Jet Propulsion Laboratory (2003-present)
National Research Council Sr. Resident Research Associate, Jet Propulsion Laboratory (2001-02)
Visiting Fellow, Downing College, Cambridge University, Cambridge, England (2001)
Department Chair, Department of Physics & Astronomy, Pomona College (1998-2001)
Research Fellow, Center for Interdisciplinary Research, Universität Bielefeld, Germany (1996-97)
DAAD Study Visit Fellow, Freie Universität, Berlin, Germany (1993)
Research Associate, University of Edinburgh (1992-93) (sabbatical position)
Assistant Professor, Calvin College, Grand Rapids, Michigan (1987-89)
National Research Council Postdoctoral Fellow, Jet Propulsion Laboratory (1985-87)
German Academic Exchange Service (DAAD / Fulbright) Fellow, Marburg (1982-83)
Undergraduate Research Assistant, Argonne National Laboratory (1978)

Administrative Experience

Department of Physics & Astronomy, Pomona College. In 2001 I completed a 3 year term as department chair, a role I reassumed for a second time in Fall 2008, guiding the department through a tough time due to a colleague's serious illness. I have carried out 6 major faculty reviews and a successful tenure-track search, resulting in the hiring and contract renewals of 3 junior faculty members, a positive tenure decision, and 2 promotions to full professor. The Andrew Building was also built and completed during my first tenure as chair. I have served on the Faculty Executive Committee, and have just been elected to the Faculty Personnel Committee.

Recent Research Grants and Fellowships

DAAD Re-Invitation Study Visit Grant (2012-13) to enable experimental studies of electron electric dipole moment candidate molecules at the Leibniz Universität Hannover \$9,000

Sontag Fellowship grants & Research Committee, Pomona College, *Toward Completing a Salt Set: LiRbF₂ & LiCsF₂*, (2008-09), *RbF & CsF, LiRbF₂ & LiCsF₂: Walk, then Run!* (2009-10), and

Molecular Spectra of HfF and PbF: Does the Electron have a Shape? (2010-11); *Zeeman Spectra of PbF and the Search for HfF⁺* (2011-12); *Molecular eEDM Measurements: The Role of Nuclear Spin* (2012-13); *PbF & YbF: The Search for the Anapole* (2013-14); *RbF and YbF: Hyperfine Structure and Beyond* (2014-15). Supplies, student research stipends, and travel support for me and 1-2 student(s) each year to continue this research in Hannover, \$55,050 total (not including 12 SURP grants & some academic year student wages)

Engineering & Physical Science Research Council (UK) Grant, State-Selective Electron Diffraction, visiting researcher, 3 week salary & travel stipend over 3 years, 2008-2010, \$20,000

Mellon Foundation Semester Research Grant, *Mixed Salts and the Ionic Bond*, to fund one semester of my 2006-2007 sabbatical in Europe, \$35,000

DAAD Re-Invitation Study Visit Grant (2006-2007) to enable experimental studies of mixed alkali halide dimers at the Leibniz Universität Hannover \$7,500

National Science Foundation, *Determination of the Electron Neutrino Rest Mass via Tritium Decay*. (2001-2006) I was one of 6 co-PI's on this large grant which received NSF funding of just over \$450,000. My electron diffraction expertise applied here to model the critical energy calibration.

Recent Publications & Current Submitted Manuscripts

J. Machacek, D. P. Mahapatra, D. R. Schultz, Yu. Ralchenko, A. Chutjian, J. Simcic, S. M. Madzunkov, and R. J. Mawhorter, *Measurement and Calculation of Absolute Single and Double Charge Exchange Cross Sections for O⁶⁺ Ions at 1.17 keV/u and 2.33 keV/u Impacting He and H₂*, *Physical Review A*, accepted.

Zachary Glassman, Richard Mawhorter, Jens-Uwe Grabow, Anh Le, and Timothy C. Steimle, *The microwave spectrum of the odd isotope of ytterbium fluoride, ¹⁷¹YbF*, *Journal of Molecular Spectroscopy* **300**, 7-11 (2014). (Contribution to special issue on "Molecular Spectroscopy Tests of Fundamental Physics".)

Philip D. McCaffrey, David W.H. Rankin, Derek A. Wann, Jan M.L. Martin, & Richard J. Mawhorter, *Equilibrium Gas-Phase Structures of Sodium Fluoride, Bromide and Iodide Monomers and Dimers*, *Journal of Physical Chemistry A* **118**, 1927 (2014).

A.N. Petrov, L.V. Skripnikov, A.V. Titov and R. J. Mawhorter, *Centrifugal correction to hyperfine structure constants in the ground state of lead monofluoride, PbF*, *Physical Review A* **88**, 010501(Rapid Communications) (2013).

R. J. Mawhorter, J. B. Greenwood, A. Chutjian, T. Haley, C.D. Mitescu, and J. Simcic, *Measurement of absolute charge exchange cross sections for He²⁺ with He and H₂*, *Physical Review A* **84**, 052714 (2011).

Richard Mawhorter, Benjamin Murphy, Alexander Baum, Trevor J. Sears, T. Zh. Yang, P.M. Rupasinghe, C.P. McRaven, N.E. Shafer-Ray, Lukas D. Alpei and Jens-Uwe Grabow, *Characterization of the Ground X₁ State of ²⁰⁴Pb¹⁹F, ²⁰⁶Pb¹⁹F, ²⁰⁷Pb¹⁹F, and ²⁰⁸Pb¹⁹F*, *Physical Review A* **84**, 022508 (2011).

Lukas D. Alpei, Jens-Uwe Grabow, A.N. Petrov, Richard Mawhorter, Benjamin Murphy, Alexander Baum, Trevor J. Sears, T. Zh. Yang, P.M. Rupasinghe, C.P. McRaven, and N.E. Shafer-Ray, *Precision Spectroscopy of the ²⁰⁷Pb¹⁹F molecule: implications for measurement of P-odd and T-odd effects*, *Physical Review A* **83**, 040501 (Rapid Communications) (2011).

Recent Presentations

The Hyperfine Interaction in ^{171}YbF , an updated version of the DAMOP poster presentation immediately below, given at the Lepton Moments Symposium, Cape Cod, Massachusetts, July 2014.

The Hyperfine Interaction in ^{171}YbF , poster presentation I gave at the American Physical Society DAMOP (Division of Atomic, Molecular, and Optical Physics) meeting held in Madison, Wisconsin, June 2014. Co-authors are Zachary Glassman ('14), Anh Le & Timothy Steimle (Arizona State University) & Jens-Uwe Grabow (Leibniz Universität Hannover).

Electron Still Remains Stubbornly Spherical, colloquium presentations given at Lawrence University in Appleton, Wisconsin on June 2, 2014 (invited by Assoc. Prof. Doug Martin PO '97) and at Pomona College on September 16, 2014.

Molecules and the electron's electric dipole moment, invited talk at the 15th European Symposium on Gas Electron Diffraction, Fraueninsel (Chiemsee), Germany, June 2013.

Born-Oppenheimer Breakdown Analysis of YbF , poster presentation given with Pomona student co-author Zachary Glassman '14 at the 15th European Symposium on Gas Electron Diffraction, Fraueninsel, Germany, June 2013.

High Resolution Rotational Spectroscopy of Zeeman & Hyperfine Effects in PbF & YbF , an updated version of the DAMOP poster below, which I presented at the annual Atomic, Molecular, and Optical Physics meeting of the German Physical Society in Hannover, Germany, March 2013. Co-authors included Pomona students Alex Baum '11, Zach Glassman '14, and Ben Girodias '15 as well as Trevor Sears (Brookhaven National Laboratory), Neil Shafer-Ray (University of Oklahoma), and Lukas Alpei & Jens-Uwe Grabow (Leibniz Universität Hannover).

Electron Remains Stubbornly Spherical, Five colloquium presentations of individually-revised versions of this talk were given at Massey University in Auckland, NZ (Jan. 2013), Canterbury University in Christchurch, NZ and Otago University in Dunedin, NZ (both February, 2013), and University of Ulm, Germany and Groningen University, Netherlands (both April, 2013).

High Resolution Rotational Spectroscopy of Zeeman & Hyperfine Effects in PbF & YbF , poster presentation given with Pomona student co-authors Zachary Glassman '14 and Ben Girodias '15 at the American Physical Society DAMOP (Division of Atomic, Molecular, and Optical Physics) meeting held in Orange County, California, June 2012.

Electron Remains Stubbornly Spherical, colloquium presentations given locally at Harvey Mudd College on February 21, 2012 and also at Cal State LA in Los Angeles on April 19, 2012 and Arizona State University (research group format) on June 1, 2012.

High Resolution Spectroscopy Study of the Zeeman Effect in the $^2\Pi_{1/2}$ Molecule PbF , contributed talk given by student Alex Baum '11 at the 66th OSU International Symposium on Molecular Spectroscopy, Columbus, Ohio, June 2011.

Fourier Transform Microwave Spectroscopy of the PbF Radical, poster presentation with student Alex Baum '11 at the Lepton Moments Symposium, Cape Cod, Massachusetts, July 2010.