

## 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 CO<sub>2</sub>* (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 was the college Radiation Safety Officer for 5 years from 2007 – 2012, served a term on the Faculty Executive Committee, and most recently completed a term of service on 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 (eEDM) candidate molecules at the Leibniz Universität Hannover \$9,000

Sontag Fellowship Grants & Research Committee, Pomona College (2008 – current) Supplies, student research stipends, and travel support for myself and 2-3 students most years to continue eEDM and alkali halide structure research in Hannover, Germany \$92,240 (plus 22 SURP grants & some 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

Timothy C. Steimle, Damian L. Kokkin, Yongrak Kim, Richard J. Mawhorter, & Colan Linton, *Characterization of the  $[18.42]0^+ - X^1\Sigma^+(0,0)$  Band of Tantalum Nitride, TaN*, Chemical Physics Letters **664**, 138–142 (2016).

Jacob L. Bouchard, Timothy Steimle, Damian L. Kokkin, David J. Sharfi and Richard J. Mawhorter, *Branching Ratios, Radiative Lifetimes, and Transition Dipole Moments for Tantalum Nitride, TaN*, Journal of Molecular Spectroscopy **325**, 1-6 (2016).

L. F. Pašteka, R. J. Mawhorter, and P. Schwerdtfeger, *Dirac-Hartree-Fock Coupled-Cluster Calculations of the  $^{173}\text{Yb}$  Nuclear Quadrupole Coupling Constant for the YbF Molecule*, Molecular Physics **114**, 1110-1117 (2016).

L.V. Skripnikov, A.N. Petrov, A.V. Titov, R.J. Mawhorter, A.L. Baum, T.J. Sears, and J.-U. Grabow, *Further investigation of g-factors for lead monofluoride ground state, PbF*, Physical Review A **92**, 032508 (2015).

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

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  $O^{6+}$  Ions at 1.17 keV/u and 2.33 keV/u Impacting He and H<sub>2</sub>*, Physical Review A **90**, 052708 (2014).

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).

## Selected Recent Research Presentations

*$^{207}\text{PbF}$  near-degeneracy &  $\text{BaF}$  microwave global fit*, a poster presentation I gave at the American Physical Society (APS) Division of AMO Physics conference (DAMOP) in Fort Lauderdale, Florida in late May, 2018. Co-authors are Andreas Biekert '16, José Muñoz-Lopez '19 and Luke (Yongrak) Kim '18, Trevor Sears (Stony Brook University), Jens-Uwe Grabow (Leibniz Universität Hannover), and A. D. Kudashov, L. V. Skripnikov, A. V. Titov, & A. N. Petrov (St. Petersburg State University).

I also presented the same poster by invitation at the Third Annual Workshop of the Group on Precision Measurements and Fundamental Constants (GPMFC) the day before DAMOP in Fort Lauderdale, FL.

*3 Diverse Diatomics for Fundamental Physics:  $\text{YbF}$ ,  $\text{PbF}$ , and  $\text{TaN}$* , invited talk at the 17<sup>th</sup> European Symposium on Gas Electron Diffraction, Hirschegg (Kleinwalsertal), Austria, July 2017.

*Polar Molecules & Physics:  $\text{RbCl}$  and  $\text{BaF}$* , poster presentation given with Pomona student co-authors Yongrak Kim '18, José Muñoz-Lopez '19, and Alexander Nguyen '18 at the 17<sup>th</sup> European Symposium on Gas Electron Diffraction, Hirschegg (Kleinwalsertal), Austria, July 2017. The other co-author is Jens-Uwe Grabow (Leibniz Universität Hannover).

*Near-degeneracy in Excited Vibrational States of  $^{207}\text{PbF}$* , research talk I gave at the American Physical Society DAMOP (Division of Atomic, Molecular, and Optical Physics) meeting held in Sacramento, CA, June 2017. My co-authors are Alex Nguyen '18, Yongrak Kim '18, & Andreas Biekert '16, Trevor J. Sears (Stony Brook U. and Brookhaven), Jens-Uwe Grabow (Hannover), and A. D. Kudashov, L. V. Skripnikov, A. V. Titov, & A. N. Petrov (St. Petersburg).

*Spectroscopy of  $\text{TaN}$  in Support of Fundamental Physics*, poster presentation I gave at the American Physical Society DAMOP (Division of Atomic, Molecular, and Optical Physics) meeting held in Providence, RI, May 2016. Co-authors are David Sharfi '16 and Yongrak Kim '18, Damian Kokkin, Jacob Bouchard, & Timothy Steimle (Arizona State University)

*Polar Molecules and Parity Violation*, research seminar presented to the UCLA AMO physics group on February 26, 2016.

*Electrons In & Near Nuclei: 3 Tales*, invited talk at the 16<sup>th</sup> European Symposium on Gas Electron Diffraction, Fraueninsel (Chiemsee), Germany, June 2015.

*Electron-Nucleus Overlap & Quadrupole Moment Ratios in  $\text{RbF}$ ,  $\text{RbCl}$ ,  $\text{RbBr}$ , and  $\text{RbI}$* , poster presentation given with Pomona student co-authors David Sharfi '16 and Alexander Hof '18 at the 16<sup>th</sup> European Symposium on Gas Electron Diffraction, Fraueninsel, Germany, June 2015. Other co-authors include Carson Witte '16, Andreas Biekert '16, Zachary Glassman '14 (now at University of Maryland), & Jens-Uwe Grabow (Leibniz Universität Hannover)

*Hyperfine & Vibrational Spectra of  $\text{YbF}$  &  $\text{PbF}$* , poster presentation given by Andreas Biekert '16 and myself at the 62<sup>nd</sup> Pacific Conference on Spectroscopy and Dynamics in Asilomar, California, January 2015. Co-authors are Carson Witte '16, Zachary Glassman '14, Anh Le & Timothy Steimle of Arizona State University, and Jens-Uwe Grabow of Leibniz Universität Hannover.

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

*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).

**Personal Data**

Born in Atlanta, Georgia, United States on March 21, 1956; married to Jennifer Lynn Forman on August 23, 1980; four children, Sarah (34), Peter (32), John (30), & Ross HMC Dec. '18 (24).