

# Joshua M. Grossman

---

Department of Physics  
St. Mary's College of Maryland  
18952 E. Fisher Rd.  
St. Mary's City, MD 20686

Phone: (240) 895-4367 (w)  
Phone: (240) 237-8387 (h)  
Fax: (240) 895-4996  
E-mail: JMGrossman@smcm.edu

## Education

**State University of New York at Stony Brook**, Stony Brook, NY

Doctor of Philosophy in Physics, Spring 2002

- Research Thesis: "Spectroscopy of Trapped Francium."
- Advisor Dr. Luis A. Orozco.

**Williams College**, Williamstown, MA

Bachelor of Arts in Physics, June 1996

- Honors, Cum Laude, Sigma Xi, Sigma Pi Sigma, Dean's List 5 of 8 semesters.
- Research Thesis: "Realizing Generalized Quantum Measurements on the Polarization of Photons."

## Experience

**Saint Mary's College of Maryland**, Saint Mary's City, MD

*Assistant Professor*, Fall 2007 to present, full time

- Teach General Physics I-III, College Physics II, Quantum Mechanics, Statistical Mechanics, Advanced Physics Laboratory, and First Year Seminar: It's About Time.
- Lead research on microscopic magnetic surface traps for individual neutral atoms and collaborate in research on bichromatic laser forces and magnetometry with Dr. Frank Narducci (Patuxent River NAS) and Dr. Charles Adler (SMCM).
- Lead research on quantum walks and implementation of positive operator-valued measurements (POVMs) on photon polarization states.
- Direct student research in St. Mary's Projects (five to date) and multiple summer assistantships.
- Serve on Core Curriculum Committee and Physics Lab Development Committee; served on Physics Faculty Search Committee.
- Pioneered use of Peer Instruction technologies ("clickers") at St. Mary's College of Maryland.
- Serve as Hillel faculty advisor.

**Adelphi University, Department of Physics**, Garden City, NY

*Assistant Professor*, Fall 2004 to Spring 2007, full time

- Taught Perspectives in Physics, The Ascent of Physics, Electromagnetic Theory, Physics Colloquium, Physics for Science Majors I & II Labs, and Independent Study courses on Laser Cooling & Trapping and Atomic Physics.
- Researched microscopic magnetic surface traps for individual neutral atoms and directed nine undergraduate students (one Honors Thesis student) and one high school student in associated research projects.
- Researched implementation of positive operator-valued measurements (POVMs) on photon polarization states and directed two students (one Honors Thesis student) in research.
- Organized new series of Physics Department colloquia.
- Designed two new courses: How Things Work and Physics Colloquium.
- Initiated new MS program in physics with a concentration in optics; chaired Graduate Admissions Committee.
- Served on Committee to Restructure the Office of Sponsored Programs, search committee for Associate Provost for Research, and College of Arts & Sciences Academic Affairs Committee.

**National Institute of Standards and Technology**, Gaithersburg, MD

*Post-Doctoral Researcher* in Dr. William D. Phillip's Laser Cooling & Trapping Group, Summer 2002 to Summer 2004, full time

- Studied quantum random walks and quantum chaos with ultra-cold atoms, photoassociation of Bose-Einstein condensates and properties of condensates loaded in optical lattices.
- Trained graduate and exchange students on research and experimental techniques.
- Operated, maintained, and upgraded apparatus incorporating lasers, optics, ultra-high vacuum technology, data acquisition systems, imaging systems, and electronics.

**State University of New York at Stony Brook**, Stony Brook, NY

*Research Assistant*, Spring 1998 to Spring 2002, full time

- Performed precision measurements of hyperfine splittings to obtain the hyperfine anomaly and nuclear magnetization distribution information in a chain of five francium isotopes.
- Located the previously unobserved 7D states of francium and measured their energies, hyperfine splittings, and lifetimes.
- Designed and constructed new apparatus for efficient trapping of francium.
- Worked with technologies including lasers, ultra-high vacuum, ion transport, LINAC, data acquisition, programming, and electronics.

*Teaching Assistant and Research Assistant*, Spring to Fall 1997, part time

- Taught laboratory sections, graded work and exams for introductory physics, and tutored students.
- Participated in research on laser cooling with Dr. Harold Metcalf.

**Williams College**, Williamstown, MA

*Research Assistant, Teaching Assistant, and Tutor*, Fall 1993 and Fall 1994 to Spring 1996, part time

- Designed methods for realizing several classes of positive operator valued measurements and investigated quantum teleportation via noisy channels, working with Dr. William K. Wootters.
- Helped with lab instruction and grading of introductory and mid-level physics classes.
- Tutored physics students on an individual basis and as part of Math & Science Resource Center.

**Naval Air Warfare Center Aircraft Division**, Patuxent River Naval Air Station, MD

*Guest Researcher* in laboratory of Dr. Frank Narducci, Summer 2007, part time

- Researched Raman transitions in laser-cooled atoms.
- Assisted in supervision of high-school, undergraduate, and graduate student researchers.

## Grants

- Senior personnel on multi-million dollar magnetometry proposal to Defense Advanced Research Programs Agency (DARPA) for Fall 2010 submission.
- “Large-Number and Individual-Atom Microchip Traps for Sensor Applications and Fundamental Studies,” Office of Naval Research Defense University Research Instrumentation Program (DURIP) grant in March 2009.
- “High atom number in micro-sized atom traps,” Office of Naval Research grant in December 2008.
- SMCM Faculty Development grant in April 2008 and SMCM Grant Writing Workshop award in May 2008.
- “Microscopic magnetic surface traps for individual atoms,” Research Corporation’s Cottrell College Science Award in November 2005 (re-initiated at SMCM in November 2007).
- “Microwave Oven Physics,” Bauder Fund grant from American Association of Physics Teachers in July 2005.
- Adelphi University President’s Faculty Development grant in January 2006.
- Adelphi University President’s Faculty Development grant in January 2005.
- Gordon Research Conference (GRC) travel grant to attend Atomic Physics GRC (Tilton, NH) in June 2009.
- American Association of Physics Teachers travel grant to attend American Physical Society (APS) Division of Atomic, Molecular, and Optical Physics (DAMOP) conference and New Physics & Astronomy Faculty Workshop follow-up workshop (Lincoln, NE) in May 2005.
- American Association of Physics Teachers travel grant to participate in New Physics & Astronomy Faculty Workshop (College Park, MD) in November 2004.

## Publications

“Quantum walk analog of optical phenomena,” D.D. Powell, R. Ding, and J.M. Grossman, in preparation for submission to *Phys. Rev. A*.

“Frames of Reference in the Classroom,” J.M. Grossman, to be submitted to *The Physics Teacher*.

“High-Order Quantum Resonances Observed in a Periodically Kicked Bose Condensate,” C. Ryu, M. Andersen, A. Vaziri, M. B. d’Arcy, J. M. Grossman, K. Helmerson, and W. D. Phillips, *Phys. Rev. Lett.* **96**, 160403 (2006).

“Traps for neutral radioactive atoms,” G. D. Sprouse, R. P. Fliller III, J. S. Grossman, L. A. Orozco, and M. R. Pearson, *Nucl. Phys. A* **701**, 597c (2002).

“Atomic probes of electromagnetic and weak interactions with trapped radioactive atoms,” G. D. Sprouse, S. Aubin, E. Gomez, J. M. Grossman, L. A. Orozco, M. R. Pearson, and M. True, *Eur. Phys. J. A* **13**, 239 (2002).

“Francium spectroscopy and a possible measurement of the nuclear anapole moment,” S. Aubin, E. Gomez, J. M. Grossman, L. A. Orozco, M. R. Pearson, G. D. Sprouse, D. P. DeMille, *Laser Spectroscopy: XVth International Conference*, edited by S. Chu and V. Vuletic (World Scientific, Singapore, 2002).

“Energies and hyperfine splittings of the 7D levels of atomic francium,” J. M. Grossman, R. P. Fliller III, T. E. Mehlstaubler, L. A. Orozco, M. R. Pearson, G. D. Sprouse, and W. Z. Zhao, *Phys. Rev. A* **62**, 052507 (2000).

“Lifetime measurements of the 7D levels of atomic francium,” J. M. Grossman, R. P. Fliller III, L. A. Orozco, M. R. Pearson, and G. D. Sprouse, *Phys. Rev. A* **62**, 062502 (2000).

“Spectroscopy of Francium Isotopes,” J. S. Grossman, L. A. Orozco, M. R. Pearson, and G. D. Sprouse, *Phys. Scr.* **T86**, 16 (2000).

“Spectroscopy of francium in a magneto-optical trap,” G. D. Sprouse, J. S. Grossman, L. A. Orozco, and M. R. Pearson, *Hyp. Int.* **127**, 381 (2000).

“Hyperfine anomaly measurements in francium isotopes and the radial distribution of neutrons,” J. S. Grossman, L. A. Orozco, M. R. Pearson, J. E. Simsarian, G. D. Sprouse, and W. Z. Zhao, *Phys. Rev. Lett.* **83**, 935 (1999).

“Spectroscopy of francium and perspectives of an atomic parity non-conservation measurement,” J. E. Simsarian, S. Aubin, J. S. Grossman, L. A. Orozco, M. R. Pearson, G. D. Sprouse, and W. Z. Zhao in *Parity Violations in Atoms and Polarized Electron Scattering*, edited by Bernard Frois and Marie-Anne Bouchiat (World Scientific, Singapore, 1999), p. 312.

“Hyperfine anomaly measurements in francium isotopes and the radial distribution of neutrons,” J. S. Grossman, L. A. Orozco, J. E. Simsarian, G. D. Sprouse, and W. Z. Zhao, *Hyp. Int.* **121**, 657 (1999).

## External Talks

“An Atom-Interferometric Magnetic Gradiometer,” Defense Advanced Research Programs Agency (DARPA) Quantum-Assisted Sensing and Readout workshop, Arlington, Virginia, 2010.

“Quantum-Walk Analogues of Optical Phenomena,” Daniel Powell, Division of Atomic, Molecular, and Optical Physics Meeting of the American Physical Society, Charlottesville, Virginia, 2009.

“Quantum Computers,” invited colloquium, St. Mary’s College of Maryland, 2008.

“Trapping an Atom on a Microchip: An Architecture for a Quantum Computer,” invited colloquium, Fordham University, 2006.

“Implementation of a quantum random walk with a sodium Bose-Einstein condensate,” Division of Atomic, Molecular, and Optical Physics Meeting of the American Physical Society, Tucson, Arizona, 2004.

“Realization of a quantum random walk with a sodium Bose-Einstein condensate,” International Quantum Electronics Conference, San Francisco, California, 2004.

“Ultracold atoms go for a quantum random walk,” invited talk, Adelphi University, Garden City, New York, 2004.

“Ultracold atoms go for a quantum random walk,” invited talk, Ithaca College, Ithaca, New York, 2004.

“Magnetic Trapping of Atoms,” invited lesson, Penn State Berks-Lehigh Valley College, Reading, Pennsylvania, 2004.

“Spectroscopy of trapped francium: What can we learn from the least stable natural element?,” invited colloquium, Union College, Schenectady, New York, 2002.

“Spectroscopy of trapped francium,” invited talk, National Institute of Standards and Technology, Gaithersburg, Maryland, 2002.

“Lifetimes of the 7D excited states of francium,” Division of Atomic, Molecular, and Optical Physics Meeting of the American Physical Society, Storrs, Connecticut, 2000.

“Lifetimes of the 7D excited states of francium,” Quantum Electronics and Laser Science Conference, San Francisco, California, 2000.

“Location of the 7D excited state of francium,” American Physical Society Centennial Meeting, Atlanta, Georgia, 1999.

## External Presentations

“High atom number using bichromatic forces in microsized atom traps,” J. M. Grossman, S. A. DeSavage, and F. A. Narducci, Division of Atomic, Molecular, and Optical Physics Meeting of the American Physical Society, Houston, TX, 2010.

“Bichromatic forces for high atom number in microsized atom traps,” J. M. Grossman, C. L. Adler, S. A. DeSavage, G. R. White, and F. A. Narducci, Atomic Physics Gordon Research Conference, Tilton, New Hampshire, 2009.

“Francium spectroscopy and a proposed direct measurement of the nuclear anapole moment,” S. Aubin, E. Gomez, J. M. Grossman, L. A. Orozco, M. R. Pearson, G. D. Sprouse, Gordon Research Conference on Atomic Physics, Williamstown, Massachusetts, 2001.

“Francium spectroscopy and the possible direct measurement of the nuclear anapole moment,” S. Aubin, E. Gomez, J. M. Grossman, L. A. Orozco, M. R. Pearson, G. D. Sprouse, International Conference on Laser Spectroscopy, Snowbird, Utah, 2001.

“New apparatus for magneto-optical trapping of francium,” J. M. Grossman, S. Aubin, E. Gomez, L. A. Orozco, M. E. Pearson, G. D. Sprouse, M. E. True, Quantum Electronics and Laser Science Conference, Baltimore, Maryland, 2001.

“Magneto-Optical Trap for On-line Fr Spectroscopy,” J. S. Grossman, R. P. Fliiller III, C. Friegang, M. Ifferte, L. A. Orozco, M. R. Pearson, B. Peker, J. E. Simsarian, G. D. Sprouse, and W. Z. Zhao, American Physical Society Centennial Meeting, Atlanta, Georgia, 1999.

“Francium Spectroscopy,” J. S. Grossman, S. Aubin, S. D. Christe, R. P. Fliiller III, L. A. Orozco, M. R. Pearson, B. Peker, and G. D. Sprouse, Gordon Research Conference on Atomic Physics, Plymouth, New Hampshire, 1999.

“Laser Spectroscopy on Trapped Francium,” J. E. Simsarian, J. S. Grossman, L. A. Orozco, M. Pearson, G. D. Sprouse, and W. Z. Zhao, Sixteenth International Conference on Atomic Physics, Windsor, Ontario, 1998.

## Student External Presentations

“Quantum-Walk Analogues of Optical Phenomena,” Daniel Powell, paper presented at Division of Atomic, Molecular, and Optical Physics Meeting of the American Physical Society, Charlottesville, Virginia, 2009.

“A Magneto-Optical Trap for an Individual Atom Microchip,” V. Singh, paper presented at Adelphi University Research Conference, April 2007.

“A Magneto-Optical Trap for an Individual Atom Microchip,” V. Singh, paper presented at National Conference on Undergraduate Research, Dominican University of California, April 2007.

“Engineering ‘Atom Microchip’ Trapping Potentials,” F. Ledetsch, paper presented at Adelphi University Research Conference, April 2006.

“Optical Spectroscopy and Laser Locking Electronics,” D. John, poster presented Adelphi University Research Conference, April 2006.

“Positive Operator-Valued Measurements,” M. Sukhanova, paper presented at Adelphi University Research Conference, April 2006.

“Design Considerations for the Vacuum Chamber of a Single-Atom Microchip Magneto-Optical Trap,” V. Singh, poster presented at Adelphi University Research Conference, April 2006.

“Engineering Trapping Potentials for an ‘Atom Microchip’,” T. Palermo and J. Grossman, poster presented at “Einstein in the City” student research conference, City College, NY, April 2005.

“Engineering Trapping Potentials for an ‘Atom Microchip’,” T. Palermo, paper presented at Adelphi Undergraduate Research Conference, April 2005.

---

## Professional Memberships

- American Physical Society: Division of Atomic, Molecular, and Optical Physics; Division of Laser Sciences.
- Optical Society of America.
- American Association of Physics Teachers.
- American Association for the Advancement of Science.
- Founding Vice-President of Society of Physics Students Williams College chapter (1995-1996).

## Awards and Fellowships

- Norton T. Dodge Award for Scholarly and Creative Achievement by a Junior Faculty Member (2010).
- Peter B. Kahn Prize, State University of New York at Stony Brook, Department of Physics & Astronomy (2000).
- Government Assistance for Areas of National Need Fellowship (1996-1998).

## Student Awards

- Sara DeSavage's research featured in *The SPS Observer* magazine (Spring 2010).
- Daniel Powell, "Geneva Boone Award for Outstanding St. Mary's Project," 2009.
- Vivek Singh, "Best Presentation" and "Best Science Presentation," Adelphi University Research Conference, April 2007.
- Vivek Singh, "Best Thesis" and "Best Science Thesis," Adelphi University Honors College, 2007.

## Miscellaneous

- Designed physics-based activities for Science Camp for 8<sup>th</sup> grade girls (2008).
- Selected to participate in summer-long grant writing workshop at SMCM (2008).
- Participated in New Physics & Astronomy Teachers Workshop (2004) in College Park, MD, and workshop follow-up session (2005) in Lincoln, NE.
- Judged New York State Science and Engineering Fair (2002), Montgomery County Science Fair (2003), Long Island Junior Science and Humanities Symposia (2005, 2006), Adelphi Undergraduate Research Conference (2005, 2006), and Rohm and Haas Science Fair (2006).
- Spoke by invitation at Somerset Elementary School Career Day, Bethesda, Maryland (2004).
- Trained in week-long Coherent 899-21 Ti:Sapph Ring Laser Customer Training Course.
- Participated in Australian National University 13<sup>th</sup> Physics Summer School on Bose-Einstein Condensation (2000).
- Review manuscripts for professional journals.
- Review grant proposals for National Science Foundation.