

# mattwiebold

assistant professor of physics

## contact

Matt Wiebold  
520 Riverside Drive Northeast  
Saint Cloud, MN 56304

608 628 2796  
[matt@wiebolds.com](mailto:matt@wiebolds.com)

## interests

RF sources, circuitry and antennas; computational electromagnetics and plasma modeling; low temperature plasma sources (inductive, capacitive, helicon); plasma diagnostics and sensor development; optical emission/absorption spectroscopy; data visualization; biomedical applications of plasmas; CAD modeling and 3D printing; lab experiment development; peer and inquiry-based instruction

## education

- 2011 **Ph.D.** in Electrical Engineering University of Wisconsin – Madison  
*The Effect of Radio-Frequency Self-Bias on Ion Acceleration in Expanding Argon Plasmas in Helicon Sources*
- 2008 **M.S.** in Electrical Engineering University of Wisconsin – Madison  
Thesis: *Diagnostics of a Flowing, High-Power Argon Helicon Plasma with a Magnetic Nozzle*  
Concentration: *Applied Physics / Plasmas*, GPA: 3.92/4.00
- 2006 **B.A.** in Physics Gustavus Adolphus College  
*Magna cum laude*, GPA: 3.82/4.00

## teaching

- since 2013 **Assistant Professor, Physics** College of Saint Benedict / Saint John's University
- » PHYS 339: *Physical Mechanics* (20 students) [Fall 2013]
    - Including a *Mathematica*-based exploration of numerical computation
  - » PHYS 105: *Physics for the Life Sciences I* (32 students) [Fall 2013]
    - Includes four sections of two-hour laboratory
  - » PHYS 320: *Modern Physics* [Spring 2014]
  - » PHYS 106: *Physics for the Life Sciences II* [Spring 2013]
- 2012-2013 **Visiting Assistant Professor, Physics** Carleton College
- » PHYS 228: *Atomic and Nuclear Physics Laboratory* (29 students) [Fall 2012]
    - Authored detailed handout outlining writing physics lab reports and making figures
  - » PHYS 165: *Intro to Electricity, Magnetism and Optics* (36 students) [Winter 2013]
    - Developed lab measuring Earth's magnetic field, including web-based data analysis
  - » PHYS 235: *Electricity and Magnetism* (36 students) [Spring 2013]
    - Included *E&M in the Public Sphere*, a persuasive paper and presentation
    - Developed Poisson's equation computational homework
  - » Comprehensive Exercise Advisor (senior-level capstone)
    - Advisor for three senior capstone projects including *Biomimicry*, *Interfacing Renewable Energy with the Power Grid*, and *Fusion Power*.
- 2008-2011 **Facilitator, Teaching Assistant Training** University of Wisconsin – Madison
- » Invited instructor for Teaching Improvement Program and New Educators Orientation
  - » Led orientation meetings for new TAs and development sessions for current TAs
  - » Critiqued lectures given by prospective TAs, monitored discussion on issues facing TAs
- 2007-2009 **Teaching Assistant** University of Wisconsin – Madison
- » ECE 376: *Electrical Circuits* – Weekly lab lectures and lab development
- 2007 **Guest Lecturer** University of Wisconsin – Madison
- » ECE 740: *Advanced Electromagnetics*
- 2003-2006 **Lab Assistant** Gustavus Adolphus College
- » Assist professors in setup and execution for classical physics, thermodynamics, and electronics labs

## research

- since 2013 **Assistant Professor, Physics** College of Saint Benedict / Saint John's University
- » Developing a helicon plasma source with expansion chamber for developing novel, gridless electrostatic propulsion systems
  - » Building a high-voltage pulsed DC argon plasma pencil for biomedical applications
- 2012-2013 **Visiting Assistant Professor, Physics** Carleton College
- » Led a research team of two students over summer working on computational modeling of plasmas and construction of a plasma pencil for biomedical applications
  - » Worked with three undergraduates on computational modeling of low temperature plasmas
  - » Developed a real-time, web-based analysis framework for computational data analysis written in Python and PHP with two research students
  - » Modeled formation of RF self-bias using XOOPIC, a particle-in-cell code
  - » Modeled wave fields in a cylindrical geometry with various RF antenna geometries
  - » Received funding from the College to support one student full-time over winter break and two students over summer break
  - » Presented research results at IEEE-ICOPS 2013 conference
- 2011-2012 **Postdoctoral Researcher, Electrical Engineering** University of Wisconsin – Madison
- » Led a computational project investigating time-dependent formation of ion-accelerating double layers in helicon plasma sources using particle-in-cell method (XOOPIC).
- 2006-2011 **Graduate Research Assistant, Electrical Engineering** University of Wisconsin – Madison
- » Constructed, operated and maintained the MadHeX (Madison Helicon eXperiment) system, a low-pressure helicon wave plasma experiment investigating the basic physics of helicon sources including neutral depletion, ion acceleration, and helicon wave propagation.
  - » Assisted in design, construction and operation of separate excimer-laser-initiated, RF-sustained plasma facility including diagnostic equipment and RF and vacuum systems.
  - » Heavily involved in writing and editing of several National Science Foundation (NSF) and Air Force Office of Scientific Research (AFOSR) grant proposals, whitepapers and progress reports. Two of these proposals received funding, including primary funding for my doctoral thesis research:
    - AFOSR FA9550-10-1-0396: John Scharer (UW), PI with Mitchell Walker (GA Tech). *Helicon Double Layer Advanced Electric Propulsion Device*. \$242k [8/2010 - 8/2011]
    - AFOSR FA9550-09-1-0357: John Scharer (UW), PI. *Advanced Laser and RF Plasmas and Diagnostics*. \$699k [5/2009 - 6/2012]
- 2008-2010 **Project Manager, RFID Lab** University of Wisconsin – Madison
- » Led student team in construction, maintenance and optimization of a pilot program for RFID-controlled parking access to the engineering campus university-owned parking facility
  - » Conducted in-situ and lab research to optimize system including anechoic chamber testing
  - » Designed and implemented a data analysis framework to analyze ~250,000 transactions with more than 800 users, including MySQL database and web-based frontend for data analysis.
  - » Designed and managed tag readability experiments for a large shipping materials company
- 2005 **REU Summer Researcher** University of Minnesota – Twin Cities
- » Simulated large-scale power distribution network failure using MATLAB

## awards

### University of Wisconsin – Madison

- ECE Distinguished Graduate Fellowship
- ECE Department Conference Travel Grant Winner
- Vilas Conference Presentation Travel Grant Winner

### Gustavus Adolphus College

- President's Honor List
- Barry M. Goldwater Foundation Nominee
- Partners in Scholarship Award
- Thrivent Financial College Scholarship
- Trustee Scholarship
- Russell T. Lund Award
- Rodine Scholarship for Physics

## professional

Referee for *Physics of Plasmas*, *IEEE Transactions on Plasma Science*  
Institute of Electrical and Electronics Engineers (IEEE)  
American Physical Society (APS)  
Sigma Pi Sigma Physics Honor Society ( $\Sigma\Pi\Sigma$ )

## publications

[Ion acceleration in a helicon source due to the self-bias effect](#)

**M. Wiebold**, Y. T. Sung, J. E. Scharer. *Physics of Plasmas*, vol. 19, no. 5, pg. 053503 (2012).

[Experimental observation of ion beams in the MadHeX helicon source](#)

**M. Wiebold**, Y. T. Sung, J. E. Scharer. *Physics of Plasmas* vol. 18, no. 6 pg. 063501 (2011).

[Low-pressure helicon discharge initiation via magnetic field ramping](#)

**M. Wiebold**, H. Ren, C. M. Denning, J. E. Scharer. *IEEE Transactions on Plasma Science* vol. 37, no. 11, pg. 2110 (2009).

[Observations of neutral depletion and plasma acceleration in a flowing high-power argon helicon plasma](#)

C. M. Denning, **M. Wiebold**, J. E. Scharer. *Physics of Plasmas* vol. 15, no. 7, pg. 072115 (2008).

## selected conferences & talks

[Particle-in-cell modeling of potential gradients in expanding helicon plasmas using XOOPIC](#)

**M. Wiebold**, S. Z. Lynn. *40th IEEE International Conference on Pulsed Power and Plasma Science*, San Francisco, CA 2013.

[Ion beam observation in the MadHeX helicon source](#)

**M. Wiebold**, Y. Sung, J. E. Scharer. *38th IEEE International Conference on Pulsed Power and Plasma Science*, Chicago, IL 2011.

[Ion acceleration in the Madison helicon experiment](#)

**M. Wiebold**, J. E. Scharer, Y. Sung. *APS 53rd Annual Meeting of the Division of Plasma Physics*. Salt Lake City, UT 2011.

[Electron temperature and ion beam scaling with RF input power in an argon helicon plasma](#)

**M. Wiebold**, J. E. Scharer, Y. Sung. *APS 52nd Annual Meeting of the Division of Plasma Physics*. Chicago, IL 2010.

[Improved matching and plasma formation using frequency tuning during RF pulsing in a helicon source](#)

J. E. Scharer, **M. Wiebold**, Y. Sung. *APS 52nd Annual Meeting of the Division of Plasma Physics*. Chicago, IL 2010.

[Laser-initiated, RF-sustained air plasmas](#)

R. Giar, J. E. Scharer, **M. Wiebold**. *APS 52nd Annual Meeting of the Division of Plasma Physics*. Chicago, IL 2010.

[Testing readability performance: A case study – Orbis BulkPak containers.](#)

B. Bella, A. Gutierrez, **M. Wiebold**, W. Hothschild. *UWEEBC RFID Quarterly Workgroup Meeting*. June 2010.

[Initial laser-induced fluorescence measurements in the MadHeX expansion chamber...](#)

**M. Wiebold**, J. E. Scharer, Y. Sung. *37th IEEE International Conference on Pulsed Power and Plasma Science*, Norfolk, VA 2010.

[RFID and metamaterials: Now things get interesting](#)

**M. Wiebold**, A. Ingle. *UWEEBC RFID Quarterly Workgroup Meeting*. December 2009.

[Low-pressure discharge initiation and LIF diagnostic in a high-power argon helicon plasma](#)

**M. Wiebold**, J. E. Scharer, H. Ren. *APS 51st Annual Meeting of the Division of Plasma Physics*. Atlanta, GA 2009.

[Non-invasive measurement on the pulsed and steady-state, high-power MadHeX helicon plasma thruster](#)

**M. Wiebold**, J. E. Scharer, H. Ren. *31st International Electric Propulsion Conference*. Ann Arbor, MI 2009.

[Measurements of neutral depletion and techniques for initiating low-pressure helicon plasmas](#)

**M. Wiebold**, H. Ren, J. E. Scharer. *36th IEEE International Conference on Pulsed Power and Plas. Sci.*, San Diego, CA 2009.

[Neutral depletion and plasma flows in a pulsed high power helicon plasma](#)

**M. Wiebold**, H. Ren, J. E. Scharer. *36th IEEE International Conference on Pulsed Power and Plas. Sci.*. San Diego, CA 2009.

[Diagnostics and neutral depletion measurements of a high power helicon plasma with magnetic nozzle](#)

**M. Wiebold**, C. M. Denning, J. E. Scharer. *APS 50th Annual Meeting of the Division of Plasma Physics*. Dallas, TX 2008.

[Observations of neutral depletion and ion acceleration in a high-power argon helicon plasma](#)

C. M. Denning, **M. Wiebold**, J. E. Scharer. *35th IEEE International Conference on Pulsed Power and Plas. Sci.*, Karlsruhe, Germany 2008.

[Excited ArII emission characteristics in helicon plasmas](#)

(Invited) J. E. Scharer, C. M. Denning, **M. Wiebold**, A. Degeling, R. Boswell. *APS 49th Annual Meeting of the Division of Plasma Physics*, Orlando, FL 2007.