

Jim Schroeder, Ph.D.

CONTACT INFORMATION	Wheaton College Department of Physics & Engineering 501 College Avenue Wheaton, IL 60187	<i>E-mail:</i> jim.schroeder@wheaton.edu
RESEARCH INTERESTS	Laboratory plasma astrophysics, plasma waves and antennas, space and astrophysical plasmas, measurements of particle distributions in plasmas, kinetic plasma physics	
EDUCATION	Ph.D. Physics, 2017 University of Iowa, Iowa City, IA <i>Thesis:</i> Exploring the Alfvén-Wave Acceleration of Auroral Electrons in the Laboratory B.S. Physics; Summa Cum Laude, 2009 Wheaton College, Wheaton, IL	
APPOINTMENTS	2018-Present	Assistant Professor of Physics Wheaton College, Wheaton IL
	2018-Present	Assistant Research Scientist University of Iowa, Iowa City IA
	2017-2018	Postdoctoral Research Scholar University of Iowa, Iowa City IA
	Summer 2017	Adjunct Instructor of Physics University of Iowa, Iowa City IA
	2011-2017	Graduate Fellow University of Iowa, Iowa City IA
	2009-2011	High School Math & Science Teacher Chicago Hope Academy, Chicago IL
MEMBERSHIPS	2012-Present	American Physical Society Division of Plasma Physics, Topical Group in Plasma Astrophysics
	2017-Present	American Astronomical Society Laboratory Astrophysics Division
TEACHING	Wheaton College PHYS 231 Introductory Physics 1 & Lab: Kinematics, dynamics, conservation laws, and thermodynamics. Making and evaluating scientific arguments. Fall 2018 and 2019. PHYS 232 Introductory Physics 2 & Lab: Oscillations, waves, ray and wave theories of light, and electricity and magnetism. Spring 2020. PHYS 331 Spacetime & Quanta: Special relativity, quantum mechanics, and applications of modern physics. Spring 2019 and 2020. PHYS 342 Electromagnetic Theory: Electrostatics, magnetostatics, linear materials, Maxwell's equations, and electromagnetic waves. Fall 2018. PHYS 353L Introductory Optics Lab: Interference, diffraction, and optical instruments. Spring 2019.	

PHYS 362 Plasma Physics: Single particle motion, magnetohydrodynamics, plasma waves, space and research applications. Spring 2019.

PHYS 495 Independent Study: Supervised student research on helicon plasma sources. Fall 2020.

University of Iowa

PHYS 1511 College Physics 1: Mechanics, motion, sound, heat, and thermodynamics for pre-medical, pre-dental, and other students needing a physics course without calculus. Primary instructor. Summer 2017.

Graduate Certificate in College Teaching: Took two courses in classroom theory and practice. Practica in undergraduate physics recitation and lecture. 2014-2017.

Hawkeyes on Science: Community outreach events, interactive physics demonstration shows. 2013-2014.

Chicago Hope Academy High School

Physics and Algebra: College preparation for socioeconomically and racially diverse student population. 2009-2011.

PUBLICATIONS

Schroeder, J. W. R., Howes, G. G., Kletzing, C. A., Skiff, F., Carter, T. A., Vincena, S., and Dorfman, S. Laboratory measurements of the physics of auroral electron acceleration by Alfvén waves, *Nature Communications* **12**: 3103 (2021).

Schroeder, J. W. R., Skiff, F., Howes, G. G., Kletzing, C. A., Carter, T. A., and Dorfman, S. Linear theory and measurements of electron oscillations in an inertial Alfvén wave, *Physics of Plasmas* **24**: 032902 (2017).

Schroeder, J. W. R., Skiff, F., Kletzing, C. A., Howes, G. G., Carter, T. A., and Dorfman, S. Direct measurement of electron sloshing of an inertial Alfvén wave, *Geophysical Research Letters* **43**: 4701-4707 (2016).

Drake, D. J., Howes, G. G., Rhudy, J. D., Terry, S. K., Carter, T. A., Kletzing, C. A., **Schroeder, J. W. R.**, and Skiff, F. Measurements of the nonlinear beat wave produced by the interaction of counterpropagating Alfvén waves, *Physics of Plasmas* **23**: 022305 (2016).

Schroeder, J. W. R., Skiff, F., Howes, G. G., Kletzing, C. A., Carter, T. A., and Dorfman, S. Alfvénic oscillations of the electron distribution function: Linear theory and experimental measurements, *American Institute of Physics Conference Series* **1689**: 030001 (2015).

Drake, D. J., **Schroeder, J. W. R.**, Shanken, B. C., Howes, G. G., Skiff, F., Kletzing, C. A., Carter, T. A., and Dorfman, S. D. Analysis of magnetic fields in inertial Alfvén wave collisions, *IEEE Transactions of Plasma Science* **42**: 10 (2014).

Howes, G. G., Nielson, K. D., Drake, D. J., **Schroeder, J. W. R.**, Skiff, F., Kletzing, C. A., and Carter, T. A. Alfvén Wave Collisions, The Fundamental Building Block of Plasma Turbulence III: Theory for Experimental Design, *Physics of Plasmas* **20**: 072304 (2013).

Drake, D. J., **Schroeder, J. W. R.**, Howes, G. G., Kletzing, C. A., Skiff, F., Carter, T. A., and Auerbach, D. W. Alfvén Wave Collisions, The Fundamental Building Block of Plasma Turbulence IV: Laboratory Experiment, *Physics of Plasmas* **20**: 072901 (2013).

HONORS AND AWARDS	2018	National Research Council Postdoctoral Fellowship - Naval Research Laboratory - Declined to accept faculty position at Wheaton College
	2015	Pfeiffer Family Space Physics Scholarship - University of Iowa
	2013	Graduate Research Fellowship - National Science Foundation (NSF)
	2013	NASA Earth and Space Science Fellowship - Declined to accept NSF fellowship
	2013	Best Student Presentation - International Workshop on the Interrelationship Between Plasma Experiments in the Laboratory and in Space (IPELS) - Nagano, Japan.
	2011	Presidential Fellowship - University of Iowa
	2009	Scholastic Honor Society - Wheaton College
	2008	National Undergraduate Fellowship - Summer Research at the Princeton Plasma Physics Laboratory (PPPL) - U.S. Department of Energy
	2008	Outstanding Undergraduate Poster Award - American Physical Society Division of Plasma Physics - Dallas, Texas
2008	Physics Merit Scholarship - Wheaton College	

MENTORING Austin Richardson: Summer research building vacuum system for a new plasma physics experiment at Wheaton. Summer 2019.

Walker Kennedy: Independent study reviewing literature and performing calculations to design a helicon plasma source for a new plasma physics experiment at Wheaton. Fall 2019.

Jonathan Barrett: Studying benchmark comparison data from wave absorption and energy analyzer measurements of the electron distribution in the Space Physics Simulation Chamber. 2021.

FUNDING *A feasibility study to explore establishing a mentoring program in STEM for underrepresented students.* Wheaton College Alumni Faculty Development Grant. \$5,200 total funding.

Supporting Structures: Innovative Collaborations to Enhance STEM Research at CCCU Member Institutions. Collaborative proposal in which I am one of three Wheaton College faculty members granted a pre-tenure research sabbatical. \$167,952 total funding and \$25,784 in funding for research sabbatical.

Wheaton College Aldeen Grant. Four-hour course release funded for collaborative research with the Naval Research Laboratory. Fall 2021. \$5,500 total funding.

Investigating Magnetospheric Whistler-Mode Chorus Features Using SPSC Laboratory Experiments. NASA Heliophysics Technology and Instrument Development. Co-investigator, 2020-2022. \$972,000 total funding, sub-contract of \$121,000.

Wheaton College Faculty Travel Grant. Funding to attend American Physical Society Division of Plasma Physics. October 2019. \$1,500 total funding.

PRESENTATIONS

June 2021	American Astronomical Society, Laboratory Astrophysics Division Online Contributed Talk - <i>The Alfvén wave acceleration of auroral electrons: laboratory measurement, theory, and simulation.</i>
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September 2020 Princeton University Heliophysics Seminar
Online
Invited Seminar - *Studying the Alfvén wave acceleration of auroral electrons in the laboratory using field-particle correlations*

October 2019 American Physical Society - Division of Plasma Physics - Student Day
Fort Lauderdale, FL
Invited Tutorial - *Alfvén wave turbulence and wave particle interactions*

October 2019 American Physical Society - Division of Plasma Physics
Fort Lauderdale, FL
Contributed Talk - *A comparison of electron velocity distribution measurements in the SPSC*

March 2019 NSF/DoE review of UCLA's user facility the Large Plasma Device
Online session highlighting user research
Invited Talk - *Progress toward laboratory measurements of the acceleration of auroral electrons by Alfvén waves*

November 2018 American Physical Society - Division of Plasma Physics
Portland, OR
Contributed Talk - *Progress toward laboratory measurements of the acceleration of auroral electrons by Alfvén waves*

June 2018 International Congress of Plasma Physics
Vancouver, BC
Invited Talk - *Using field-particle correlations to study wave-particle interactions in the LAPD*

January 2018 International Union of Radio Science - Commission H
Boulder, CO
Invited Talk - *A study of auroral electron acceleration in the LAPD*

October 2017 American Physical Society - Division of Plasma Physics
Milwaukee, WI
Contributed Talk - *Using field-particle correlations to study auroral electron acceleration in the LAPD*

October 2017 American Physical Society - Division of Plasma Physics
Milwaukee, WI
Poster Presentation - *Exploring the Alfvén-wave acceleration of auroral electrons in the laboratory*

October 2017 Naval Research Laboratory Seminar
Washington, DC
Invited Seminar - *Exploring the Alfvén-wave acceleration of auroral electrons in the laboratory*

June 2017 International Workshop on the Interrelationship between Plasma Experiments in the Laboratory and in Space (IPELS)
San Diego, CA
Invited Talk - *Measurement of electron acceleration by inertial Alfvén waves in the LAPD*

February 2017 Grinnell College Physics Seminar
Grinnell, IA
Invited Seminar - *Clear with a chance of electron precipitation*

January 2017 International Union of Radio Science - Commission H
Boulder, CO
Invited Talk - *Electron oscillations associated with inertial Alfvén waves*

October 2016 American Physical Society- Division of Plasma Physics
San Jose, CA
Poster Presentation - *Progress towards a laboratory test of Alfvénic electron acceleration*

- May 2016 University of Iowa - Plasma Physics Seminar
Iowa City, IA
Departmental Seminar - *Laboratory investigation of Alfvén wave-particle interactions in the magnetosphere*
- November 2015 American Physical Society - Division of Plasma Physics
Savannah, GA
Invited Talk - *Laboratory measurements of linear electron acceleration by inertial Alfvén waves*
- April 2015 Radio Frequency Power in Plasmas
Lake Arrowhead, CA
Invited Talk - *Experimental measurements of the electron distribution function using whistler wave absorption*
- April 2015 École de Physique des Houches - Turbulence, Magnetic Fields and Self Organization in Laboratory and Astrophysical Plasmas
Les Houches, France
Poster - *Kinetic signatures of inertial Alfvén waves: theory and laboratory experiments*
- October 2014 American Physical Society - Division of Plasma Physics
New Orleans, LA
Poster - *Measurements of the linear kinetic plasma response to inertial Alfvén waves*
- February 2014 University of Iowa - Plasma Physics Seminar
Iowa City, IA
Talk - *Study of auroral electron acceleration in the laboratory*
- November 2013 American Physical Society - Division of Plasma Physics
Denver, CO
Poster - *Study of auroral electron acceleration in the laboratory*
- July 2013 International Workshop on the Interrelationship Between Plasma Experiments in the Laboratory and in Space (IPELS)
Nagano, Japan
Talk - *Analysis of magnetic fields in Alfvén wave collisions*
- November 2012 American Physical Society - Division of Plasma Physics
Providence, RI
Poster - *Experimental measurement of the nonlinear interaction between counterpropagating Alfvén waves in the LAPD*
- November 2008 American Physical Society - Division of Plasma Physics
Dallas, TX
Poster - *Study of effects of external drive on MRX reconnection*

MEDIA

- June 2021 *Auroras form when electrons from space ride waves in Earth's magnetic field*, Science News ([article](#))
- June 2021 *The northern lights are caused by electrons hurtling toward Earth—and now we know how they get there*, The Academic Times ([article](#))
- June 2021 *The mystery behind what powers the Northern Lights has now been solved*, MSN ([article](#))
- June 2021 *Electrons surfing on Alfvén waves*, Nature Astronomy Community ([blog](#))
- June 2021 *Making heaven in a lab: Scientists solve aurora mystery*, Daily Maverick, South Africa ([article](#))
- June 2021 *Physicists have finally proven how aurora borealis, northern lights, occur*, KCBS San Francisco ([radio interview](#))
- June 2021 *We finally know what sparks the Northern Lights*, Popular Science ([article](#))

- June 2021 *What Causes The Northern Lights? Scientists Finally Know For Sure*, NPR ([article](#))
- June 2021 *The mysterious origin of the northern lights has been proven*, CNN ([article](#))
- June 2021 *Wheaton Professor Discovers the Force Behind Northern Lights*, Wheaton College press release ([press release](#))
- June 2021 *American Astronomical Society Press Conference*, Press conference presenting measurements showing that Alfvén waves can accelerate auroral electrons ([press conference video](#))
- June 2021 [An extended list of media coverage is available here](#)
- March 2017 *A step toward deciphering auroras*, Physics Today article about experimental results in my thesis ([article](#), [cached version](#))
- April 2016 *Bringing Earth's light show down to earth*, Iowa Now article about my research of auroral physics in the laboratory ([article](#), [cached version](#))