Erik Granstedt

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Education

- **Princeton University**, Princeton, NJ
  Ph.D. Plasma Physics, expected graduation: January 2013, expected
- **California Institute of Technology**, Pasadena, CA
  M.S. Applied Physics, GPA: 3.6, June 2005
  B.S. with Honors, Applied Physics, GPA: 3.7, June 2004

Awards

- **National Science Foundation Graduate Fellowship** (2009 – present)
- **DOE Fusion Energy Sciences Fellowship** (2007 – 2009)
- **Thomas H. Stix Graduate Prize** (2007)
  Awarded for academic standing and proposal merit.
- **Princeton Merit Fellowship and First-Year Science and Eng. Fellowship** (2006)
- **American Physical Society, Division of Plasma Physics, Undergraduate Student Poster Award:** *High-Speed Scintillator for X-Ray Detection in Spheromak Plasma* (2003)
- **Perpall Speaking Competition Semi-Finalist** (2003):
  Awarded for clear presentation of original scientific research to a non-technical audience.
- **Achievement Rewards for College Scientists (ARCS) Scholar** (2003):
  Awarded for academic record, scientific research, and demonstrated leadership as a varsity team captain.
- **Kingsley Scholarship** (2002):
  Awarded for for academic excellence and space research.
- **McLean Brothers Scholarship** (2001):
  Awarded for academic achievement and leadership.
- **Thrivent Financial Scholar** (2000-04):
  Awarded for academic achievement.

Skills

- Working independently while also advancing the shared goals of a research group; collaborating with people from other research groups and institutions; experience with SBIR process.
- Communicating research findings clearly to both technical and non-technical audiences through oral presentations, posters, and written materials; near-fluent in Spanish.
- Developing mathematical models for physical problems, implementing with numerical methods; experience with algorithms for solving hyperbolic equations found in neutral fluids and plasmas.
- Designing, developing, and using diagnostics including interferometers and holographic optical systems, spectrometers, Langmuir probes, and photon detectors from X-ray to IR energies.
- Working with both low and high-temperature plasmas, vacuum systems, lasers, data acquisition equipment, and designing low-noise electronic circuits.
- Programming in Python, C/C++, Mathematica, Matlab, and LabView in Windows and Linux; interfacing with Fortran codes; running massively parallel codes on high-performance computing platforms; visualizing computational and experimental data sets; some experience with OpenMP, MPI, OpenACC, CUDA.

Research Experience

- **Doctoral Thesis**, *The Lithium Wall Boundary and Implications for Transport*
  Lithium Tokamak Experiment (LTX), Princeton Plasma Physics Lab: (2008–present)
  Advisors: Dr. Greg Hammett, Dr. Robert Kaita, Dr. Richard Majeski
  - Integrated a suite of visible spectroscopy diagnostics including filtered PMTs, filtered cameras, and spectrometers to study plasma-material interactions.
  - Designed, built, and tested filtered VUV diode array instruments to measure hydrogen Lyman-α emission and characterize hydrogen recycling from the lithium surface.
  - Integrated data from various diagnostics including magnetics, a Langmuir probe, and interferometer to constrain spectroscopic measurements and develop an interpretive model of the experimental data.
  - Performed first-principles simulations using a massively-parallel code to investigate how changes in the boundary plasma affect the microturbulence-driven transport in a fusion experiment. Developed an analytic model to capture qualitative features of the simulations.

- **Digital Holography Diagnostic Development**, Princeton Plasma Physics Lab: (2009–present)
  Advisor/Collaborator: Dr. C.E. (Tommy) Thomas, Third Dimension Technologies
  - Learned how to select components for an optical system, operate visible/IR lasers and AOMs, eliminate spurious reflections, and minimize vibrational noise.
  - Learned how to process digital holograms using FFTs to extract phase and amplitude information, place the focal plane, optimize spatial resolution, and characterize the system noise level.
  - Applied the diagnostic to measure density in a super-sonic flow from a gas nozzle injected into vacuum.
- **FES Fellowship Practicum Project**, Princeton Plasma Physics Lab: (2008)
  Advisor: Professor William Tang
  - Developed a software interface in C between a plasma microturbulence code and a full-wave electromagnetic code to model a reflectometer diagnostic.
  - Implemented an interpolation and root-finding algorithm to map different coordinate systems.
- **Theoretical Research Project**, Princeton Plasma Physics Lab: (2007–2008)
  Advisor: Dr. Leonid Zakharov
  - Developed an analytic model for the ambipolar sheath potential necessary to maintain equal ion and electron loss rates when the sheath is sourced by a low-collisionality plasma.
  - Learned how to take an analytic model, implement it numerically in Python, and speed-up bottlenecks by interfacing with compiled C libraries.
- **Computational Project**, Princeton Plasma Physics Lab: (2007)
  Advisor: Professor Gregory Hammett
  - Wrote a code in C using finite-volume methods to examine the collisional damping of numerical artifacts from a finite velocity-space discretization in the numerical solution of the 1D Vlasov equation.
  - Learned best practices for writing numerical codes, and how to analyze data with Python.
- **Experimental Research**: Hall Thruster Experiment, Princeton Plasma Physics Lab: (2006–2007)
  Advisors: Dr. Yevgeny Raitses, Professor Nathaniel J. Fisch.
  - Investigated the effect of the neutralizing electron source on the plasma plume divergence and operating efficiency of a cylindrical Hall thruster.
  - Learned how to operate low-pressure plasmas, build vacuum-compatible instruments, build Langmuir probes, use vacuum instrumentation (gas analyzers, gages, and flow controllers), and use LabView to control experiments.
- **Senior Thesis**, *Measuring X-Rays in the Caltech Spheromak Formation Experiment*
  Bellan Plasma Group, California Institute of Technology: (2003–2004)
  Advisor: Professor Paul M. Bellan
  - Developed a high-speed (10 ns) scintillator/PMT instrument, calibrated the photon energy measurement with known gamma-ray sources, and minimized EMI via protective shielding.
  - Correlated signals with other magnetic and soft X-ray diagnostics to find the operational regimes with energetic electrons and potential magnetic reconnection events.
  - Learned how to operate pulsed-power systems, detect X-rays and gamma rays, use extremely fast cameras, and analyze experimental data using Matlab and IDL.
- **Summer Research**: Center for Space Mission Architecture and Design, JPL/NASA: (June–Aug 2002)
  Advisors: Lloyd C. French and Paul M. DiGiacomo
  - Worked in a group to perform a space mission concept study for an ocean observation mission.
  - Interacted with engineers to develop a preliminary design outline for a hyper-spectral visible-NIR imager.
- **Engineering Assistant**: Instrument Dev. Group, Scripps Institute of Oceanography: (2000–2001)
  - Assisted engineers with development/testing of SOLO CTD profilers and the SPRAY CTD ocean glider program.
  - Learned how to use solid modeling software, perform stress analysis, program in C/C++, and debug electronics.

Published Papers

- *Cathode effects in cylindrical Hall thrusters* **E.M. Granstedt**, Y. Raitses, N.J. Fisch. Journal of Applied Physics 104, 103302 (2008)
- *Measuring X-Rays in the Spheromak Formation Experiment* **E.M. Granstedt**, P.M. Bellan. Caltech Applied Physics Senior Thesis, Accepted June 2004
- *Spectral emission measurements of lithium on the lithium tokamak experiment* T.K. Gray, et. al. Review of Scientific Instruments 83, 10D537 (2012)
- *High speed digital holography for density and fluctuation measurements* C.E. Thomas, et. al. Review of Scientific Instruments 81, 10E527 (2010)
- *Experiments with liquid metal walls: Status of the lithium tokamak experiment* R. Kaita, et. al. Fusion Engineering and Design 85, 874–881 (2010)
- *The impact of lithium wall coatings on NSTX discharges and the engineering of the Lithium Tokamak eXperiment (LTX)* R. Majeski, et. al. Fusion Engineering and Design 85, 1283–1289 (2010)

Conference Posters & Presentations

- *Changes in Hydrogen Recycling with Lithium Surfaces and its Effect on Spherical Tokamak Plasmas* **E.M. Granstedt**, R. Kaita, R. Majeski, and the LTX team. Gordon Research Conference on Plasma Processing Science, July 2012
- *Spectroscopic Measurements on the Lithium Tokamak eXperiment* **E.M. Granstedt**, R. Majeski, R. Kaita, T.K. Gray, R. Maingi, K. Tritz, V.A. Soukhanovskii. APS DPP Conference, poster PP9.00016, Nov. 2011
- *Effect of Lithium Wall Conditioning on Impurities in LTX* **E.M. Granstedt**, et. al. 2nd International Symposium on Lithium Applications for Fusion Devices, Princeton, NJ, May 2011
- *Transport predictions for density-gradient-dominated regimes* **E.M. Granstedt**, G.W. Hammett. U.S. Transport Task Force Workshop, San Diego, CA, April 2011
- *Spectroscopic Measurements on the Lithium Tokamak eXperiment* **E.M. Granstedt**, R. Kaita, R. Majeski, T.K. Gray, R. Maingi, K. Tritz, V.A. Soukhanovskii. APS DPP Conference, poster CP9.00059, Nov. 2010
- *Recycling Measurements for the Lithium Tokamak Experiment* **E.M. Granstedt**, et. al. 18th Topical Conference on High-Temperature Plasma Diagnostics, Wildwood, NJ, May 2010
- *Predicted Transport in the Lithium Tokamak Experiment* **E.M. Granstedt**, G.W. Hammett. U.S. Transport Task Force Workshop, Annapolis, MD, April 2010
- *Density Fluctuation and Transport Studies for the Lithium Tokamak eXperiment* **E.M. Granstedt**, R. Majeski, R. Kaita, G.W. Hammett, C.E. Thomas Jr. APS DPP Conference, poster PP8.00093, Nov. 2009
- *Ambipolar Potential of a Collisionless Scrape-off-Layer* **E.M. Granstedt**, L. Zakharov. APS DPP Conference, poster NP6.00015, Nov. 2008
- *Characterization of the plasma plume in the current overrun regime of cylindrical Hall thrusters* **E.M. Granstedt**, Y. Raitses, N.J. Fisch. APS DPP Conference, poster UP8.00108, Nov. 2007

Teaching Experience

- **Teaching Assistant**, General Plasma Physics II, Princeton University (2009 – 2011)
  Formulated original review materials covering MHD, collisional and drift-wave transport; held weekly review sessions, graded homework, and lectured during professor's absence.
- **Teaching Assistant**, California Institute of Technology (2004 – 2005)
  Undergraduate Thermodynamics, Undergraduate Nuclear Physics Laboratory

Societies

- **American Physical Society** (2006 – present)

Leadership Experience

- **Coordinator**, Cross-Cultural Community College-Level Course (2010)
  Formulated lesson plans, review exercises, and enrichment activities to complement material presented by invited speakers; assembled a team to handle other tasks for course which drew 40 students from community.
- **Organizer**, PPPL Math Boot Camp, Princeton University, (2009 – 2010)
  Pioneered intensive course to prepare new graduate students; taught major concepts in complex analysis.
- **Coordinator**, PPPL Preliminary Exam Reviews, Princeton University, (2007)
  Organized weekly review sessions to prepare students for the physics preliminary exam.
- **Captain**, Caltech Intercollegiate Water Polo Team (2001–2003):
  Solved inter-personal disputes, taught basic skills.
- **Upper-Class Counselor** (2003–2004):
  Advised students regarding personal and academic issues.