Jeffrey B. Parker

Curriculum Vitae

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Education

2014 **Ph.D., Astrophysical Sciences, Program in Plasma Physics**, Princeton University, Princeton, NJ.

2008 **B.S. - Engineering Physics**, Cornell University, Ithaca, NY.
Graduated *summa cum laude*

Honors and Awards

2018 LLNL Research Slam, First-place winner

2013 Best Student Poster Award (Sherwood Fusion Theory Conference)

2010 U.S. Department of Energy Fusion Energy Sciences Fellowship

2009 Thomas H. Stix Plasma Physics Prize (Princeton University)

2008 Carl Oberman Fellowship (Princeton University)

2008 National Science Foundation Graduate Research Fellowship

Research

2018 – **Staff Scientist**, *Lawrence Livermore National Laboratory*.
Multiple-timescale methods for gyrokinetic turbulence and transport simulations; fundamental zonal flow processes

2016 – 2018 **Postdoctoral Research Scientist**, *Lawrence Livermore National Laboratory*.
Explored methods to extend first-principles gyrokinetic simulations to the transport timescale using multiple-timescale techniques

2010 – 2014 **Research Assistant**, *Princeton University*, Ph.D. Advisor: Dr. John Krommes.
Dissertation Title: Zonal Flows and Turbulence in Fluids and Plasmas

2011 **Summer Research Fellow**, *Massachusetts Institute of Technology*, Advisor: Dr. Peter Catto.
Investigated neoclassical transport in the large-radial-electric-field regime

2008 – 2010 **Research Assistant**, *Princeton University*, Advisor: Dr. Yevgeny Raitses.
Investigated a rotating spoke in a cylindrical Hall Thruster and its consequences for anomalous electron transport

2007 **Undergraduate Summer Research Intern**, *Princeton Plasma Physics Laboratory*, Mentor: Dr. Cynthia Phillips.
Studied propagation and power deposition of high-harmonic fast waves in the spherical tokamak NSTX using ray tracing

2005 – 2007 **Undergraduate Research Assistant**, *Cornell University*, Advisor: Prof. George Malliaras.
Fabricated and characterized electroluminescent devices based on ionic transition metal complexes

2006 **Undergraduate Summer Research Intern**, *LIGO Hanford Observatory*, Mentor: Dr. Rick Savage.
Explored propsects for observation and analysis of high-frequency gravitational waves

Proposals

2018 **LLNL LDRD**, *Topological Waves in Plasmas*.
PI on submitted Labwide LDRD. Advanced to shortlist.

2017 – 2022 **US DOE SciDAC Award**, *Partnership for Multiscale Gyrokinetic (MGK) Turbulence*.
Co-PI for LLNL on multi-institutional award totaling ∼$900,000 per year for five years

2017 – 2018 **LLNL Computing Grand Challenge**, *Towards Transport-Timescale, First-Principles Simulations of Tokamak Fusion Reactors*.
PI on winning proposal for millions of CPU-hours

Teaching

2010 – 2013 **Assistant Instructor for AST 554: Irreversible Processes in Plasmas**, *Princeton University*.
Graded and provided feedback on biweekly problem sets

2009 **Physics Review Session Leader**, *Princeton University*.
Held review sessions for first year graduate students in plasma physics preparing for the Princeton University Physics Preliminary Exam

2007 – 2008 **Academic Excellence Workshop Lead Facilitator**, *Cornell University*.
Helped create biweekly training sessions for Academic Excellence Workshop facilitators. Played a major role in the interviewing and hiring process for new facilitators. Observed and provided feedback for facilitators.

2005 – 2008 **Academic Excellence Workshop Facilitator**, *Cornell University*.
Held weekly, supplementary, cooperative-learning math workshops for engineering underclassmen. Designed problem sets.

2007 **Course Assistant for Math 191**, *Cornell University*.
Facilitated cooperative-learning recitation sections for introductory engineering math

Mentorship

2019 **SULI Mentor**, *LLNL*.
Mentored Jack Paulson, rising junior at California State Sacramento, through DOE's SULI summer internship program.

Other Experience

2017 – 2018 **Organizer for Early Career Fusion Scientists**.
One of the main organizers for the Early Career Fusion Scientists, which initiated discussions and polling among early career scientists, leading to submission of a whitepaper to the NAS Burning Plasma Research panel

2016 – 2018 **Girls Who Code**, *Livermore, CA*.
Volunteered to teach principles of computer science in local middle schools and high schools

2013, 2014 **Fusion Day**.
Advocated for fusion energy on Capitol Hill in Washington, D.C.

2013 – 2014 **Prison Teaching Initiative**, *Princeton University*.
Volunteered to teach math to inmates in state prisons

May 2014 **Scientific Advisory Board**, *Girl Scout STEM Fair, Princeton Plasma Physics Laboratory*.
Organized a College STEM discussion panel consisting of women in STEM, including undergraduate and graduate students, faculty and admissions officers, and women from the private sector. Set up a College Fair where girls could talk to representatives from local colleges.

Jan 2014 **Princeton University Wintersession Lecture**.
Gave a Princeton University Wintersession lecture *Personal Investing for Beginners*

2009 – 2014 **Science Bowl**.
Vet questions for and help run a middle school and high school science quizbowl competition

2011 – 2014 **Departmental Graduate Student Committee Chair**, *Princeton University*.
Led the committee in acting as liaison between the plasma physics faculty and graduate students. Organized graduate student feedback in the process of a curriculum revision. Instituted new departmental social events.

2008 – 2011 **Departmental Graduate Student Committee Member**, *Princeton University*.

Professional Societies

2008 – Present
- American Physical Society, Member

Publications

Journal Articles

1 J. B. Parker and N. C. Constantinou, *Magnetic eddy viscosity of mean shear flows in two-dimensional magnetohydrodynamics*, Phys. Rev. Fluids, 4, 083701 (2019).

2 N. C. Constantinou and J. B. Parker, *Magnetic suppression of zonal flows on a beta plane*, The Astrophysical Journal, 836:46 (2018).

3 J. B. Parker, L. L. LoDestro, and A. Campos, *Investigation of a Multiple-Timescale Turbulence-Transport Coupling Method in the Presence of Random Fluctuations*, plasma 1, 12 (2018).

4 J. B. Parker, L. L. LoDestro, D. Told, G. Merlo, L. F. Ricketson, A. Campos, F. Jenko, and J. A. F. Hittinger, *Bringing global gyrokinetic turbulence simulations to the transport timescale using a multiscale approach*, Nucl. Fusion 58, 054004 (2018).

5 J. B. Parker, *Numerical simulation of the geometrical-optics reduction of CE2 and comparisons to quasilinear dynamics*, Phys. Plasmas 25, 055708 (2018).

6 D. E. Ruiz, J. B. Parker, E. L. Shi, and I. Y. Dodin, *Zonal-flow dynamics from a phase-space perspective*, Phys. Plasmas 23, 122304 (2016).

7 Jeffrey B. Parker, *Dynamics of zonal flows: failure of wave-kinetic theory, and new geometrical optics approximations*, J. Plasma. Phys. (2016), 82, 595820602.

8 Jeffrey B. Parker and John A. Krommes, *Generation of zonal flows through symmetry breaking of statistical homogeneity*, New J. Phys. 16 (2014) 035006.

9 Jeffrey B. Parker and John A. Krommes, *Zonal flow as pattern formation*, Phys. Plasmas, 20, 100703 (2013).

10 I. R. Goumiri, C. W. Rowley, Z. Ma, D. A. Gates, J. A. Krommes, and J. B. Parker, *Reduced-order model based feedback control of the modified Hasegawa-Wakatani model*, Phys. Plasmas, 20, 042501 (2013).

11 Peter J. Catto, Felix I. Parra, Grigory Kagan, Jeffrey B. Parker, Istvan Pusztai, and Matt Landreman, *Kinetic effects on a tokamak pedestal ion flow, ion heat transport and bootstrap current*, Plasma Phys. Control. Fusion, 55, 045009 (2013).

12 Jeffrey B. Parker and Peter J. Catto, *Variational calculation of neoclassical ion heat flux and poloidal flow in the banana regime for axisymmetric magnetic geometry*, Plasma Phys. Control. Fusion, 54, 085011 (2012).

13 J. B. Parker, Y. Raitses, and N. J. Fisch, *Transition in electron transport in a cylindrical Hall thruster*, Appl. Phys. Lett., 97, 091501 (2010).

14 J. Hosea, R. E. Bell, B. P. LeBlanc, C. K. Phillips, G. Taylor, E. Valeo, J. R. Wilson, E. F. Jaeger, P. M. Ryan, J. Wilgen, H. Yuh, F. Levinton, S. Sabbagh, K. Tritz, J. Parker, P. T. Bonoli, and R. Harvey, *High harmonic fast wave heating efficiency enhancement and current drive at longer wavelength on the National Spherical Torus Experiment*, Phys. Plasmas, 15, 056104 (2008).

15 E. Zysman-Colman, J. D. Slinker, J. B. Parker, G. G. Malliaras, and S. Bernhard, *Improved Turn-On Times of Light-Emitting Electrochemical Cells*, Chem. Mater., 20, 388 (2008).

16 J. D. Slinker, J. Rivnay, J. S. Moskowitz, J. B. Parker, S. Bernhard, H. D. Abruña, and G. G. Malliaras, *Electroluminescent devices from ionic transition metal complexes*, J. Mater. Chem., 2976 (2007).

Book Chapters

17 Jeffrey B. Parker and John A. Krommes, *Zonal Flow as Pattern Formation*, Chapter in preparation for the book *Zonal Jets*, a project of the International Space Science Institute (2017).

18 John A. Krommes and Jeffrey B. Parker, *Statistical Closures and Zonal Flows*, Chapter in preparation for the book *Zonal Jets*, a project of the International Space Science Institute (2017).

Invited Talks and Seminars

Multiple-timescale global gyrokinetic turbulence and transport simulations for tokamaks, 11th Plasma Kinetics Working Meeting, Wolfgang Pauli Institute, Vienna, Austria, Aug 1, 2018.

Zonal Flows: A Quasilinear Foothold to Gaining Insight, SIAM Conference on Nonlinear Waves and Coherent Structures, Orange County, CA, June 13, 2018.

Zonal Flows: A Quasilinear Foothold to Gaining Insight, Scripps Institute of Oceanography, UCSD, San Diego, CA, Jan 12, 2018.

Rethinking wave-kinetic theory applied to zonal flows, APS-DPP meeting, Milwaukee, WI, Oct 23, 2017.

Bringing global gyrokinetic turbulence simulations to the transport timescale using a multi-scale approach, Multiscale Methods in Plasma Physics, CU Boulder, Aug 22, 2017.

Study of zonal flow through statistical dynamics, Berkeley Fluids Seminar, UC Berkeley, Oct 19, 2016.

Self-consistent modeling of multiscale turbulence and transport, Turbulence and Waves in Flows Dominated by Rotation, NCAR, Boulder, CO, Aug 16, 2016.

Zonal Flows and Turbulence in Fluids and Plasmas, Plasma Science and Fusion Center, MIT, June 17, 2014.

Zonal flow as pattern formation, Courant Institute of Mathematical Sciences, NYU, Apr 23, 2013.

A hybrid statistics/amplitude approach to the theory of turbulent states of drift waves and zonal flows, Gyrokinetic Theory Working Group Meeting, Madrid, Spain, June 25, 2012.