ELIZABETH TOLMAN

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EXPERIENCE

Flatiron Institute Center for Computational Astrophysics 2022 - Present
Flatiron Research Fellow *New York, NY*

- Fellowship jointly offered by the Institute for Advanced Study (2 years) and the Flatiron Institute Center for Computational Astrophysics (3 years)

Institute for Advanced Study 2020 - 2022
Member *Princeton, NJ*

- Fellowship jointly offered by the Institute for Advanced Study (2 years) and the Flatiron Institute Center for Computational Astrophysics (3 years)

EDUCATION

Massachusetts Institute of Technology *September 2020*
Ph.D. in Physics
GPA: 4.9/5.0
Adviser: Professor Nuno Loureiro
Thesis topic: H-mode access, H-mode pedestals, and alpha-driven Alfvén eigenmodes in high field tokamaks
Coursework includes: Quantum Field Theory II, General Relativity, Plasma Waves

Princeton University *June 2015*
A.B. in Physics with High Honors, Certificate in Latin American Studies
GPA: 3.9/4.0
Senior thesis adviser: Professor Herman Verlinde
Senior thesis: Force-Free Magnetohydrodynamics Near Kerr Black Holes
Coursework includes: Quantum Field Theory I, Topological Matter

SELECTED HONORS AND AWARDS

Rising Star in Physics (Program postponed to fall 2022 due to COVID-19) *2020*
Invited to participate in a Heising-Simons Foundation program for the next generation of physics academic leaders.
Plasma Science and Fusion Center (PSFC) Outreach Award *2017, 2018, 2019*
Given to top leaders of PSFC tours, outreach talks, and exposition nights.
First Place Student Presenter at the US/EU Transport Task Force *2017*
Kurt Forrest Fellowship *2015*
"Prestigious award…initiated to attract the most promising physics graduate students" to MIT.
Allen G. Shenstone Prize in Physics *2015*
Given by Princeton Physics Department for "excellence in course work and promise in independent research."
Elected to Phi Beta Kappa *2015*
Elected to Society of Sigma Xi *2015*
National Defense Science and Engineering Graduate Fellowship (Declined) *2015*
National Science Foundation Graduate Research Fellowship *2015*
Rhodes Scholarship Finalist *2014*
National Undergraduate Fellowship *2014*
Fellowship to work with Samuel Cohen on Field-Reversed Configuration Device research.
Kusaka Memorial Prize in Physics *2014*

Given by Princeton Physics Department for "excellence in course work and promise in independent research."

Princeton Environmental Institute Grand Challenges Grant *2013*

Grant to support independently-arranged internship at Eindhoven University of Technology.

Shapiro Prize for Academic Excellence *2012*

Given by Princeton for "outstanding academic achievement."

Pyka Memorial Prize in Physics *2012*

Given by Princeton Physics Department for "excellence in course work and promise in independent research."

TEACHING EXPERIENCE

Lecturer, Simons Collaboration on Extreme Electrodynamics of Compact Sources Summer School *2024*

Lecturer, NSF/APS DPP GPAP Summer School on Plasma Physics for Astrophysicists *2021, 2023*

Lecturer, IAS learning seminars on plasma physics and gravitational waves *2021, 2023*

Research Internship Advisor for Trystin McCann, Princeton Junior *2021*

Grader, Fusion Energy (MIT Course 22.62) *2019*

TA, Engineering Principles for Fusion Reactors (MIT Course 22.63) *2018*

Undergraduate Research Advisor for Sean Parks, MIT Sophomore *2017*

SELECTED TALKS AND SEMINARS

"High Energy Plasma Phenomena in Astrophysics" Workshop, Munich Institute for Astro-, Particle and Bio-Physics *2024*

Topic: Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas I. Onset and linear evolution

Flatiron Institute Scientific Advisory Board *2024*

Topic: Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas I. Onset and linear evolution

Fifth Purdue Workshop on Relativistic Plasma Astrophysics *2024*

Topic: Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas I. Onset and linear evolution

Canadian Institute for Theoretical Astrophysics *2024*

Topic: Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas I. Onset and linear evolution

University of Michigan Nuclear Engineering and Radiological Sciences Department *2024*

Topic: Using tokamak physics to advance the understanding of light and energetic particle production in extreme plasmas

Princeton Astrophysics Department Astroplasmas Seminar *2023*

Topic: Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas I. Onset and linear evolution

APS Division of Plasma Physics Annual Meeting *2023*

Topic: Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas I. Onset and linear evolution

"Modeling Plasmas Around Black Holes" Workshop, Lorentz Center *2023*

Topic: Electric field screening by pair discharges in pulsar polar caps

CCA Observational Astrophysics Discussion Series *2023*

Topic: Pulsar radio emission variability

"Improving Black Hole Accretion Models with Plasma Theory" Workshop, Princeton Gravity Initiative/Princeton Center for Theoretical Science *2023*

Topic: Basic plasma theory for black-hole accretion physics

Princeton Plasma Physics Laboratory Theory Department *2022*

Topic: Electric field screening in pair discharges and generation of pulsar radio emission

West Virginia University Physics and Astronomy Department *2022*

Topic: Electric field screening in pair discharges and generation of pulsar radio emission

APS Division of Plasma Physics Annual Meeting *2022*

Topic: Onset of magnetic reconnection in poorly ionized plasmas

University of Maryland Astronomy Center for Theory and Computation *2022*

Topic: Electric field screening in pair discharges and generation of pulsar radio emission

"Coherent Structures in Astro-Geo-Turbulence" Workshop, Flatiron Institute *2022*
Topic: Turbulence in fusion plasmas
Fourth Purdue Workshop on Relativistic Plasma Astrophysics *2022*
Topic: Electric field screening in pair discharges and generation of pulsar radio emission
APS April Meeting *2022*
Topic: Electric field screening in pair discharges and generation of pulsar radio emission
Joint UCLA/UCSD/UCI Virtual Seminar *2022*
Topic: Electric field screening in pair discharges and generation of pulsar radio emission
Institute for Advanced Study Seminar *2022*
Topic: Electric field screening in pair discharges and generation of pulsar radio emission
Princeton Astrophysics Department Astroplasmas Seminar *2021*
Topic: Electric field screening in pair discharges and generation of pulsar radio emission
Institute for Advanced Study Astrophysics Group Learning Seminar *2021*
Topics: Pulsar timing arrays, How to measure magnetic fields
Journal of Plasma Physics Frontiers of Plasma Physics Colloquium *2021*
Topic: Drift kinetic theory of alpha particle transport by tokamak perturbations
APS Division of Plasma Physics Annual Meeting *2020*
Topic: Drift kinetic formulation of alpha particle transport by tokamak MHD perturbations
Plasma Physics Seminar at University of Maryland *2020*
Topic: Drift kinetic theory of tokamak alpha particle transport by MHD modes and ripple
18th European Fusion Theory Conference, Ghent, Belgium *2019*
Topic: Theory and modeling of fusion-alpha-driven TAEs in high magnetic field devices
12th Plasma Kinetics Working Meeting, Vienna, Austria *2019*
Topic: Implications of the high magnetic field path to fusion energy for Alfvén eigenmode stability
Aalto University, Espoo, Finland *2019*
Topic: MIT's high magnetic field path to fusion energy and implications for Alfvén eigenmode stability
APS Division of Plasma Physics Annual Meeting *2017*
Topic: Tearing Instability of a Current Sheet Forming by Sheared Incompressible Flow
U.S. Transport Task Force Meeting *2017*
Topic: H-mode Access and Pedestal Characteristics at High Magnetic Field (7.8 T) in Alcator C-Mod Discharges (Invited plenary talk, recipient of first place student presentation award)

SELECTED SERVICE

Member, CCA Retreat Planning Committee *2023*

Organizer, PGI/PCTS Workshop on Improving Black Hole Accretion Models with Plasma Theory *2023*

Member-at-Large, APS Topical Group in Plasma Astrophysics Executive Committee *2022-2025*
Position won with 76% of the vote

Attendee, Aspen Center for Physics Workshop Plasmas in Strong Gravity *2022*

Attendee, 2022 Multi-Petawatt Physics Prioritization (MP3) Workshop *2022*

Reviewer, Journal of Plasma Physics, Astrophysical Journal Letters, Nature Communications Physics, National Science Centre (Poland) *2021-*

Advisory Board Member, Journal of Plasma Physics *2019-2023*
Provided advice to Journal editorial board and participated in or led a variety of initiatives to improve the Journal, in-

cluding the creation of the Journal Twitter feed and the selection of featured articles

Plasma Science and Fusion Center Outreach Volunteer and Event Coordinator *2016-2020*

Co-Captain and Co-Founder, PSFC FC (Intramural Soccer Team) *2017*

Player, PSFC FC (Intramural Soccer Team) *2017-2020*

Resident Assistant, The Warehouse Graduate Residence *2016-2019*

Member, MIT Radiation Protection Committee *2015-2019*

Co-Leader and Co-Founder of the MIT Plasma Physics Graduate Student Group *2019-2023*
Group to advocate for the interests of plasma physics students to Physics Department leadership and Visiting Committee

Delegate, U.S. Magnetic Fusion Research Strategic Directions Workshop *2017*

Panelist, Fellowship Opportunities for Graduate Students in Plasma Physics (Panel at the Annual Meeting of the APS Division of Plasma Physics) *2017*

FIRST AUTHOR JOURNAL PUBLICATIONS

1. **E.A. Tolman**, M.W. Kunz, J.M. Stone, L. Arzamasskiy, *Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas: II. Nonlinear evolution*, In preparation.
2. **E.A. Tolman** and P.J. Catto, *Quasilinear drift kinetic theory of alpha transport by neoclassical tearing modes*, accepted to Journal of Plasma Physics (arXiv:2406.13884).
3. **E.A. Tolman**, M.W. Kunz, J.M. Stone, L. Arzamasskiy, *Tearing-mediated reconnection in magnetohydrodynamic poorly ionized plasmas: I. Onset and linear evolution*, ApJ 967(2), 136 (2024).
4. **E.A. Tolman**, A.A. Philippov, and A.N. Timokhin, *Electric field screening in pair discharges and generation of pulsar radio emission*, ApJL 933 L37 (2022).
5. **E.A. Tolman** and P.J. Catto, *Drift kinetic theory of alpha transport by tokamak perturbations*, Journal of Plasma Physics 87(2), 855870201 (2021).
6. A. J. Creely,* L. M. Milanese,* **E. A. Tolman**,* J. H. Irby, S. B. Ballinger, S. Frank, A. Q. Kuang, B. L. Linehan, W. McCarthy, K. J. Montes, T. Mouratidis, J. F. Picard, P. Rodriguez-Fernandez, A. M. Rosenthal, A. J. Sandberg, F. Sciortino, R. A. Simpson, R. A. Tinguely, M. Zhou, and A. E. White, Design study of a combined interferometer and polarimeter for a high-field, compact tokamak, Physics of Plasmas 27, 042516 (2020). **shared first authorship*
7. **E.A. Tolman**, N.F. Loureiro, P. Rodrigues, J.W. Hughes, E.S. Marmar, *Dependence of alpha-particle-driven Alfvén eigenmode linear stability on device magnetic field strength and consequences for next-generation tokamaks*, Nuclear Fusion 59, 046020 (2019).
8. **E.A. Tolman**, N.F. Loureiro, D.A. Uzdensky, *Development of Tearing Instability in a Current Sheet Forming by Sheared Incompressible Flow*, Journal of Plasma Physics 84, 905840115 (2018).

9. **E.A. Tolman**, J.W. Hughes, S.M. Wolfe, S.J. Wukitch, B. LaBombard, A.E. Hubbard, E.S. Marmar, P.B. Snyder, and M. Schmidtmayr, *Influence of high magnetic field on access to stationary H-modes and pedestal characteristics in Alcator C-Mod*, Nuclear Fusion 58, 046004 (2018).

CO-AUTHORED JOURNAL PUBLICATIONS

1. P.J. Catto, **E.A. Tolman**, F.I. Parra, *Merging of the superbanana plateau and $\sqrt{\nu}$ transport regimes in nearly quasisymmetric stellarators*, Journal of Plasma Physics 89(1), 905890106 (2023).
2. C. Hamilton, **E.A. Tolman**, L. Arzamasskiy, and V.N. Duarte, *Galactic bar resonances with diffusion: an analytic model with implications for bar-dark matter halo dynamical friction*, ApJ 954 (2022).
3. P.J. Catto and **E.A. Tolman**, *Collisional broadening of nonlinear resonant wave–particle interactions*, Journal of Plasma Physics 87(6), 905890106 (2021).
4. P.J. Catto and **E.A. Tolman**, *Reimagining full wave RF quasilinear theory in a tokamak*, Journal of Plasma Physics 87(2), 905870215 (2021).
5. A.J. Creely et al. (45 authors), *Overview of the SPARC Tokamak*, Journal of Plasma Physics, 86(5), 865860502 (2020).
6. S. Scott, G. Kramer, **E.A. Tolman**, A. Snicker, J. Varje, K. Särkimäki, J. Wright, and P. Rodriguez-Fernandez, *Fast ion physics in SPARC*, Journal of Plasma Physics 86(5), 865860508 (2020).
7. R.A. Tinguely, A. Rosenthal, R. Simpson, S.B. Ballinger, A.J. Creely, S. Frank, A.Q. Kuang, B.L. Linehan, W. McCarthy, L.M. Milanese, K.J. Montes, T. Mouratidis, J.F. Picard, P. Rodriguez-Fernandez, A.J. Sandberg, F. Sciortino, **E.A. Tolman**, M. Zhou, B.N. Sorbom, Z.S. Hartwig and A.E. White, *Neutron diagnostics for the physics of a high-field, compact, $Q \geq 1$ tokamak*, Fusion Engineering and Design 143, 212-225 (2019).
8. A.Q. Kuang, N.M. Cao, A.J. Creely, C.A. Dennett, J. Hecla, B. LaBombard, R.A. Tinguely, **E.A. Tolman**, H. Hoffman, M. Major, J. Ruiz Ruiz, D. Brunner, P. Grover, C. Laughman, B.N. Sorbom, and D.G. Whyte, Conceptual design study for heat exhaust management in the ARC fusion pilot plant, Fusion Engineering and Design 137, 221 (2018).
9. J.W. Hughes, P.B. Snyder, M.L. Reinke, B. LaBombard, S. Mordijck, S. Scott, **E.A. Tolman**, S.G. Baek, T. Golfinopoulos, R.S. Granetz, M. Greenwald, A.E. Hubbard, E. Marmar, J.E. Rice, A.E. White, D.G. Whyte, T. Wilks, S. Wolfe, Access to pedestal pressure relevant to burning plasmas on the high magnetic field tokamak Alcator C-Mod, Nuclear Fusion 58, 112003 (2018).
10. M. Schmidtmayr, J.W. Hughes, F. Ryter, E. Wolfrum, N.M. Cao, A.J. Creely, N.T. Howard, A.E. Hubbard, Y. Lin, M.L. Reinke, J.E. Rice, **E.A. Tolman**, S.J. Wukitch, Y. Ma, *Investigation of the critical edge ion heat flux for L-H transitions in Alcator C-Mod and its dependence on* B_T, Nuclear Fusion 58, 056003 (2018).
11. A.E. Hubbard, S.-G. Baek, D. Brunner, A.J. Creely, I. Cziegler, E. Edlund, J.W. Hughes, B. LaBombard, Y. Lin, Z. Liu, E.S. Marmar, M.L. Reinke, J.E. Rice, B. Sorbom, C. Sung, J. Terry, C. Theiler, **E.A. Tolman**, J.R. Walk, A.E. White, D. Whyte, S.M. Wolfe, S. Wukitch, X.Q. Xu and the Alcator C-Mod team, *Physics and performance of the I-mode regime over an expanded operating space on Alcator C-Mod*, Nuclear Fusion 57, 126039 (2017).
12. J.E. Rice, J.W. Hughes, P.H. Diamond, N. Cao, M.A. Chilenski, A.E. Hubbard, J.H. Irby, Y. Kosuga, Y. Lin, I.W. Metcalf, M.L. Reinke, **E.A. Tolman**, M.M. Victora, S.M. Wolfe and S.J. Wukitch, *On the $\rho_\star$ scaling of intrinsic rotation in C-Mod plasmas with edge transport barriers*, Nuclear Fusion 57, 116004 (2017).

CONFERENCE PROCEEDINGS AND WHITE PAPERS

1. T. Tala et al., "Core density peaking experiments in JET, DIII-D and C-Mod in various operational scenarios—driven by fueling or transport?" *Preprint for IAEA Fusion Energy Conference*, Oct. 22-27, 2018, IAEA-CN-123/45.
2. E.A. Tolman et al., "Conceptual design study for heat exhaust management in the ARC fusion pilot plant" *Preprint for IAEA Fusion Energy Conference*, Oct. 22-27, 2018, IAEA-FIP-P1-22.

3. J. Boguski, M. Brown, R. Buttery, R. Churchill, W. Guttenfelder, G. Hammett, J. Hanson, D. Hatch, C. Hegna, M. Knolker, X. Liu, L. Lodestro, R. Majeski, R. Pinsker, M. Shafer, D. Sutherland, R.A. Tinguely, **E. Tolman**, and D. Weisberg. "Discussion Group 5 Summary of USMFRSD Workshop in Austin, TX" Submitted to The National Academy of Sciences regarding A Strategic Plan for US Burning Plasma (2018).