

Adam S. Jermyn

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Education	PhD, Astronomy, University of Cambridge, Churchill College, Institute of Astronomy Dissertation: Turbulence and Transport in Stars and Planets (doi:10.17863/CAM.25347) Funded by UK Marshall Scholarship Supervisors: Christopher Tout and Gordon Ogilvie	2015-18
	BS, Physics, California Institute of Technology Academic Advisors: Tom Tombrello and Jason Alicea Senior Thesis: The Atmospheric Dynamics of Pulsar Companions (Sterl Phinney) GPA: 4.2/4.3, Class Rank: 2/239, In-Major GPA: 4.3/4.3, In-Major Rank: 1/31	2011-15
Research	Flatiron Research Fellow, Center for Computational Astrophysics	2019-21
	KITP Postdoctoral Scholar, UCSB	2018-19
Awards	Institute of Astronomy Paul Murdin Prize (for best paper by a PhD student) Awarded for the best paper by a PhD student at the Institute of Astronomy. "Jermyns paper develops a new mechanism for the problem of swollen, hot Jupiter planets. The paper is particularly noteworthy for its development of analytic theory combining radiative insolation, tidal heating, and vibrational modes."	2017
	APS LeRoy Apker Award For original contributions to understanding how the atmospheres of pulsar companions are heated and for elucidating the observational consequences.	2015
	Caltech George W. Housner Award for Original Research Awarded to a senior selected for an outstanding piece of original scientific research.	2015
	Caltech Frederic W. Hinrichs, Jr. Memorial Leadership Award Awarded to the seniors who, in the opinion of the undergraduate deans, have made the greatest undergraduate contribution to the welfare of the student body and whose qualities of leadership, character, and responsibility have been outstanding.	2015
	Caltech Dr. D. S. Kothari Prize Awarded to a graduating senior in physics who has produced an outstanding research project during the year.	2015
	Caltech Library Senior Thesis Prize For the thesis titled The Atmospheric Dynamics of Pulsar Companions., described by the prize committee as a tour de force in its breadth of scholarship, creativity and significance.	2015
	Caltech Haren Lee Fisher Memorial Award in Physics Awarded to a junior physics major who demonstrates the greatest promise of future contributions in physics.	2014
	Caltech Jack E. Froehlich Memorial Award Awarded to a junior in the upper 5 percent of his or her class who shows outstanding promise for a creative professional career.	2014
	Caltech Perpall Scientific Speaking Competition 2nd Place Awarded after a three-round competition of presentations following a Summer Undergraduate Research Fellowship.	2014
	US Physics Team (top 20 in US on semifinal exam), Member	2011
	First Place Massachusetts State Science Fair Awarded for a project analyzing plasma flow computationally.	2010
	Grants	Hertz Fellowship
NSF Graduate Fellowship		2015
NDSEG Graduate Fellowship (declined)		2015
Marshall Scholarship		2014
Renewed 2017-18		2017
Barry M. Goldwater Fellowship		2014
Flintridge Foundation Summer Undergraduate Research Fellowship		2014
US Department of Energy NERSC Allocation m1824 (PI):		

Renewal Allocation (PI, 50,000 core-hours)	2017
Renewal Allocation (PI, 50,000 core-hours)	2016
Renewal Allocation (PI, 50,000 core-hours)	2015
Renewal Allocation (PI, 15,000 core-hours)	2014
Startup Allocation (15,000 core-hours)	2013
Jean J. Dixon Summer Undergraduate Research Fellowship	2013
Ph11 Summer Research Fellowship	2012

Professional Memberships

Royal Astronomical Society	2016-17
Association of Marshall Scholars	2015-17
American Physical Society	2013-17
Materials Research Society	2012-2015

Papers

Published:

1. **Jermyn, A. S.**, Steinhardt, C. L., Tout, C. A. The Cosmic Microwave Background and the Stellar Initial Mass Function. *Monthly Notices of the Royal Astronomical Society* (2018).
2. Tagliabue, G, **Jermyn, A. S.**, Sundararaman, R, Welch, A. J., DuChene, J. S., Davoyan, A. R., Narang, P, Atwater, H. Hot Carrier Dynamics in Photoexcited Gold Nanostructures: Role of Interband Excitations and Evidence for Ballistic Transport. arXiv:1708.02187. *Nature Communications* (2018).
3. **Jermyn, A. S.**, Tout, C. A., Chitre, S. M. Enhanced Mixing in Massive Rotating Stars. arXiv:1807.08766. *Monthly Notices of the Royal Astronomical Society* (2018).
4. Rasmussen, A*, **Jermyn, A. S.*** Gapless Topological Order, Gravity, and Black Holes. *Physical Review B* (2018, PhysRevB97.165141, arXiv:1703.04772).
5. **Jermyn, A. S.**, Kama, M. Stellar Photospheric Abundances as a Probe of Disks and Planets. *Monthly Notices of the Royal Astronomical Society* (2018, 476 (4): 4418-4434, arXiv:1804.06414).
6. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. Turbulence Closure for Mixing Length Theories. *Monthly Notices of the Royal Astronomical Society* (2018 476 (1): 646-662, arXiv:1803.00579). **Invited listing in the newsletter of the IAU Working Group on Red Giants and Supergiants.**
7. Steinhardt, L., C., **Jermyn, A. S.** Nonparametric Methods in Astronomy: Think, Regress, Observe – Pick Any Three. *Proceedings of the Astronomical Society of the Pacific* (2017, 130, 984, arXiv:1801.06545).
8. Halabi, G. M., Izzard, R. G., Tout, C. A., **Jermyn, A. S.**, Cannon, R. 2DStars: A two-dimensional stellar evolution code. *Mem. S.A.It.* (2017 Vol. 75, 282).
9. **Jermyn, A. S.**, Tout, A. C., Ogilvie, I. G. Tidal heating and solar irradiation of Hot Jupiters. *Monthly Notices of the Royal Astronomical Society* (2017 469 (2): 1768-1782, arXiv:1704.01126).
10. Corts, E, Xie, W, Cambiasso, J, **Jermyn, A. S.**, Sundararaman, R, Narang, P, Schlucker, S, Maier, S. Hot Electron Transport Driven Surface-Chemistry with Nanoscale Spatial Resolution. *Nature Communications* (2017).
11. Narang, P*, Sundararaman, R*, **Jermyn, A. S.**, Atwater, H, Goddard, W. Cubic nonlinearity driven upconversion in high-field plasmonic hot carrier systems. *The Journal of Physical Chemistry C* (2016).
12. Chatwin-Davies, A, **Jermyn, A. S.**, Carroll, S. Retrieving Qubits from Black Holes. *Physical Review Letters* (2015, Phys.Rev.Lett.115,261302, arXiv:1507.03592). **Highlighted in Science News.**
13. Sundararaman, R*, Narang, P*, **Jermyn, A. S.***, Atwater, H, Goddard, W. Theoretical predictions for hot carrier generation from surface plasmon decay. *Nature Communications* 5, 5788 (2014).
14. **Jermyn, A. S.**, Mong, R, Alicea, J. Stability of zero-modes in parafermion chains. *Physical Review B* (2014, PhysRevB.90.165106, arXiv:1407.6376). **Editor's Suggestion (front webpage).**

Submitted: (preprints upon request unless specified)

1. **Jermyn, A. S.**, Loeb, A. Transit Seismology. 2018.
2. **Jermyn, A. S.**, Cao, W., Elam, W. A., De La Cruz, E. M., Lin, M. M. Equilibrium self-assembly of one-dimensional protein structures. 2018.
3. **Jermyn, A. S.** Efficient Decomposition of High-Rank Tensors. arXiv:1708.07471. 2017.

4. **Jermyn, A. S.**, Tagliabue, G, Atwater, H, Goddard, W, Sundararaman, R, Narang, P. Far-from-equilibrium transport of excited carriers in nanostructures. arXiv:1707.07060.
5. **Jermyn, A. S.**, Stevenson, D. J. Levitin, D. J. From Bach to Shamu: $1/f$ laws in non-human music. 2016.

Preprint:

1. **Jermyn, A. S.** Automatic Contraction of Unstructured Tensor Networks. arXiv:1709.03080. 2017.
2. **Jermyn, A. S.** Bounding the Radius of Convergence of Analytic Functions. arXiv:1708.00343. 2017.

Talks

Invited:

1. **Jermyn, A. S.**, Kama, M (2018), Probing the composition of disks and planets through accretion onto radiative stars. Cambridge Stars Group Talk.
2. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. (2017), Enhanced Rotational Mixing in Massive Stars. Caltech Tea Talk.
3. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. (2017), Enhanced Rotational Mixing in Massive Stars. UCSB Lunch Talk.
4. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. (2017), Enhanced Rotational Mixing in Massive Stars. Princeton Lunch Talk.
5. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. (2017), Enhanced Rotational Mixing in Massive Stars. Harvard CfA Group Meeting.
6. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. (2017), Enhanced Rotational Mixing in Massive Stars. MIT Astro Brown Bag Lunch Talk.
7. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. (2017), Mixer: Numerical Perturbation Theory for Turbulence. Harvard ITC Lunch Seminar.
8. **Jermyn, A. S.**, Narang, P., Sundararaman, R. (2017), Charge Transport: Ballistics and Diffusion. Kavli Discussion, Harvard SEAS.
9. **Jermyn, A. S.**, Tout, C. A., Chitre, S. M., Lesaffre, P. (2017), Meridional Flow and Mixing in Massive Stars. Cake Talk, Neils Bohr Institute, University of Copenhagen.
10. **Jermyn, A. S.**, Tout, C. A., Chitre, S. M., Lesaffre, P. (2017), Meridional Flow and Mixing in Massive Stars. Seminar, Institute of Astronomy, University of Cambridge.
11. **Jermyn, A. S.**, Phinney, E.S. (2016). The Atmospheric Dynamics of Pulsar Companions. Invited Talk (Apker Prize), APS April.
12. **Jermyn, A. S.**, Mong, R, Alicea, J (2014), Stability of zero-modes in parafermion chains. Institute for Quantum Information and Matter.

Contributed:

1. **Jermyn, A. S.**, Lesaffre, P, Tout, C. A., Chitre, S. M. (2018), Enhanced Rotational Mixing in Massive Stars. UK National Astronomical Meeting.
2. **Jermyn, A. S.** (2018). Efficient Contraction of Unstructured Tensor Networks. APS March.
3. **Jermyn, A. S.**, Tout, C. A., Chitre, S. M., Lesaffre, P. (2017), Meridional Flow and Mixing in Massive Stars. Bridge Chemical Evolution Meeting (2017).
4. **Jermyn, A. S.**, Tout, C. A., Chitre, S. M., Lesaffre, P. Tidal Heating and Solar Irradiation of Hot Jupiters. Churchill Conference on Everything (2017).
5. **Jermyn, A. S.** (2017). Automatic Renormalization of Local Tensor Networks. APS March.
6. **Jermyn, A. S.**, Phinney, E.S. (2015). Exterior Stellar Heating. APS Apker Finalist Seminar.
7. **Jermyn, A. S.**, Sundararaman, R, Narang, P, Goddard, W, Atwater, H (2015). Plasmonic Hot Carrier Transport and Collection in Nanostructures. APS March.
8. **Jermyn, A. S.**, Phinney, E.S. (2014). Exterior Stellar Heating. Caltech SURF Seminar.
9. **Jermyn, A. S.**, Mong, R, Alicea, J (2014), Robustness of zero-modes in parafermion chains. APS March.
10. **Jermyn, A. S.**, Alicea, J, Mong, R (2013), The Stability of Zero Energy Edge Modes in 1D Quantum Chains. Caltech SURF Seminar.
11. **Jermyn, A. S.** (2010). The Fluid Behavior of Electron Aggregates. Massachusetts Junior Academy of Sciences Symposium.

POSTERS

1. **Jermyn, A. S.**, Lesaffre, P, Tout, C, A 2D Magnetic Mixing Length Theory. Cambridge Fluids Network Meeting 2016.
2. Sundararaman, R, Narang, P, **Jermyn, A. S.**, Brown, A, Goddard, W, Atwater, H, Generation and transport of hot carriers in plasmonic nanostructures. Joint Center for Artificial Photosynthesis All-Hands 2015.
3. Narang, P, Sundararaman, R, **Jermyn, A. S.**, Bouma, L, Goddard, W, Atwater, H, Surface Plasmon Decay Dynamics: A Feynman Diagram Approach. Gordon Research Conference 2014.
4. Sundararaman, R, Narang, P, **Jermyn, A. S.**, Atwater, H, Goddard, W, First principles theory of plasmonic hot carrier generation in nano-structured systems. Gordon Research Conference 2014.
5. Narang, P, Sundararaman, R, **Jermyn, A. S.**, Localized Surface Plasmon Decay Dynamics. MRS Spring 2014.
6. Sundararaman, R, Narang, P, **Jermyn, A. S.**, Atwater, H, Goddard, W, First Principles Calculations for Surface Plasmon Decays and Solvation Models for Surfaces in Solution. Joint Center for Artificial Photosynthesis All-Hands 2014.
7. Narang, P, Sundararaman, R, **Jermyn, A. S.**, Creel, E, Atwater, H, Goddard, W, Plasmon-driven Solar Energy Conversion and Catalysis: A First Principles Study. Joint Center for Artificial Photosynthesis All-Hands 2014.
8. Markovic, N, Silverman, S, **Jermyn, A. S.**, Rivera, R. Optical Properties of Unfunctionalized Ultra-Short Carbon Nanotubes. Poster 135, MRSEC Summer Research Experience Poster Session 2010.

Patents

Jermyn, A. S., Silverman, J, Markovic, N, "System for Lightweight Image Processing," US Patent Number US 9,097,739 B2 (Filed 2011, Awarded 2015).

Software

AstroStatsSuite - Statistical tools for non-parametric regression in astronomy (GPLv3, github) 2017-
PyTNR - Python module for automatically contracting unstructured tensor networks (GPLv3, github) 2017-
TensorDecomp - Python module for computing tree decompositions of tensors (GPLv3, github) 2017-
arrfunc - Python module for treating functions as lazily-evaluated arrays (MIT, github) 2017-
2D Stars - Cambridge 2D Stellar Evolution Code. Cofounding Developer 2015-
QuantumScattr - Quantum carrier transport code. Cofounding Developer 2012-17
AstroMicroPhysics - Python astronomical microphysics package. Lead Developer. 2015
QuantumChains - Numerical Condensed Matter Package (GPLv3, github). Lead Developer. 2013-14
NanoImage - Atomic Force Microscopy Analysis (USPTO 13/534428). Lead Developer. 2010-11

Teaching

Cambridge Supervisor:

Mathematics: Numerical Analysis (Part IB)	2018
Mathematics: Mathematical Biology (Part II)	2017
Mathematics: Binary Stars (Part III - Masters Course)	2017
Mathematics: Computational Projects (Part IB)	2016
Mathematics: Structure and Evolution of Stars (Part III - Masters Course)	2016
Natural Sciences: Mathematics (Part IA)	2016
Physics: Astrophysical Fluid Dynamics (Part II)	2015

Caltech Teaching Assistant:

Ph101 - Order of Magnitude Physics (Prof. E. S. Phinney)	2015
Ph11 - Freshman Research Tutorial (Profs. David Stevenson and Rob Phillips)	2014-15
Ph7 - Radiation Lab (Graduate TA/Section Leader for Dr. Frank Rice)	2014
Ph6 - Atomic Physics Lab (Graduate TA/Section Leader for Dr. Frank Rice)	2014
Ph5 - Analog Circuits Lab (Undergraduate TA for Dr. Frank Rice)	2013
Ph6 - Atomic Physics Lab (Undergraduate TA for Dr. Frank Rice)	2013

Caltech Tutor:

Ph205a - Relativistic Quantum Field Theory	2014-15
Ph106 - Graduate Classical Mechanics and Electromagnetism	2013-15
Ph127 - Graduate Statistical Physics	2013-15
Ph236a - General Relativity	2013-15
Ch1 - Freshmen Chemistry	2012-15
Ma1 - Freshmen Math (Analysis, Linear Algebra, Multivariable Calculus)	2012-15
Ma2 - Sophomore Math (Probability, Statistics, and Differential Equations)	2012-15
Ph2 - Sophomore Physics (Waves, Quantum Mechanics, and Thermodynamics)	2012-15

Ph12 - Advanced Sophomore Physics (Waves, Quantum Mechanics, and Thermodynamics) 2012-15
 ACM95 - Graduate Methods of Applied and Computational Mathematics 2012-15
 Ph125 - Graduate Quantum Mechanics 2012-15

Caltech Guest Lecturer:

Ph50 - Physics League (Seminar) 2017
 Ph11 - Freshman Research Tutorial 2013, 2016, 2017

Unaffiliated Tutor:

High School Physics Olympiad Preparation 2016

Other:

Experimental Design (Thin Film Deposition) for Senior Lab 2014
 Editor, Ph5 Laboratory Manual 2013

Outreach

1. Contributed text on the history of stellar dynamics to an upcoming biography of James Jeans. 2017.
2. Volunteer at Cambridge Science Festival. 2016-17.
3. **Jermyn, A. S.**, Tout, C. A., Chitre, S. M., Lesaffre, P. Mixing in Massive Stars. Churchill MCR ChuTalk (Outreach Talk) (2017).
4. Co-Organized Institute of Astronomy Undergraduate Journal Club. 2016-17.
5. **Jermyn, A.** Gravitational waves open new window to cosmos. Reach for the Stars Guest Column on MassLive. URL: http://www.masslive.com/living/index.ssf/2016/03/reach_for_the_stars_gravitational_waves_open_new_window_to_cosmos.html. March 2016.
6. Volunteer at Cambridge Institute of Astronomy Public Outreach events 2016.
7. Handmer, C. **Jermyn, A. S.**, Paragano, M., Lommen, P, Nosanov, J. The Martian: A Technical Commentary. URL: <http://caseyexaustralia.blogspot.co.uk/2015/10/the-martian-technical-commentary.html>. October 2015.
8. **Jermyn, A. S.**, Hung, P. Caltech Teaching Conference Opening Session. Caltech Center for Teaching, Learning, and Outreach Invited Talk. September 2014.
9. **Jermyn, A. S.** A Summer of Physics. Invited talk at the Skyscrapers Amateur Astronomical Society of Rhode Island. July 2011.
10. Guest speaker at the Springfield Telescope and Reflector Society and Amherst Area Amateur Astronomy Association. 6 times in 2006-2012.

Employment

Undergraduate IT Support 2011-14

Skills

Programming Languages:

Experienced: Python (NumPy/SciPy), Java, Mathematica, C++, Julia, Matlab
 Familiar: C, Fortran, Bash
 Passable: R, Scheme

Other:

Programming and using Finite Element codes
 Density Matrix Renormalization Group methods
 Markov Chain and Nested Sampling methods
 Massively parallel programming
 Finite Difference Time Domain EM Simulations (Meep)
 Familiarity with Unix/Linux environments

Service

Cambridge:

Representative to the Institute of Astronomy Athena SWAN/Juno committee 2016-17
 Institute of Astronomy Computing Users' Committee 2017
 Astronomy Graduate Student Forum Representative 2015-17
 Representative to the School of Physical Sciences Graduate Education Committee Workshop 2016

Caltech:

Search Committee for the Vice President for Student Affairs 2014-15
 Dean's Advisory Council 2014-15
 Contributing Writer - The California Tech 2014-15
 Academics and Research Committee 2012-15
 Curriculum Committee 2012-15
 Commencement Speaker Selection Committee 2014-15

Physics Student Faculty Conference Committee	2013-15
Physics Option Mentor	2013-15
Upperclassmen Counselor	2013-15
Council for Undergraduate Education	2013-15
Information Management Systems and Services Representative	2012-15
Title IX Committee	2014-15
Faculty Board Ad Hoc Honor Code Task Force	2013-14
Undergraduate Honor Code Committee	2013-14
Housing Stewardship Committee	2013-14
Dabney House Treasurer	2013-14
Computer Advisory Committee	2012-14
Dabney House Comptroller	2012-13