

Micah Brush | CV

Department of Mathematical and Statistical Sciences

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Education

- 2016 – 2021 **PhD**, *Physics*, The University of California, Berkeley.
Thesis: *Macroecological patterns out of steady state*
Supervisor: John Harte
- 2015 – 2016 **MASt**, *Part III of the Mathematical Tripos*, Trinity College, University of Cambridge.
- 2010 – 2015 **BSc**, *Honours Physics*, Simon Fraser University.
Undergraduate thesis: *Early Universe Interactions of Magnetic Monopoles and Domain Walls*
Supervisor: Levon Pogosian

Publications

- Submitted* **Brush, M.**, Matthews, T.J., Borges, P.A.V., Harte, J., *Land use, macroecology, and the accuracy of the Maximum Entropy Theory of Ecology: A case study of Azorean arthropods*, bioRxiv doi: 10.1101/2021.09.14.460355.
- Harte, J., **Brush, M.**, Newman, E.A., Umemura, K., *An Equation of State for Ecology*.
- 2021 Kitzes, J., **Brush, M.**, Walters, K., *A unified framework for species spatial patterns: Linking the occupancy area curve, Taylor's Law, the neighborhood density function, and two-plot species turnover*, Ecology Letters, **24**(10), 2043–2053.
- Brush, M.**, Harte, J., *Relating the strength of density dependence and the spatial distribution of individuals*, Frontiers in Ecology and Evolution, **9**, 390, bioRxiv doi: 10.1101/827238.
- Franzman, J., **Brush, M.**, Umemura, K., Ray, C., Blonder, B., Harte, J., *Shifting macroecological patterns and static theory failure in a stressed alpine plant community*, Ecosphere, **12**(6) e03548, doi: 10.1002/ecs2.3548, Authorea doi: 10.22541/au.159527004.40155464.
- Harte, J., Umemura, K., **Brush, M.**, *DynaMETE: A Hybrid MaxEnt-plus-Mechanism Theory of Dynamic Macroecology*, Ecology Letters, **24** 935–949, doi: 10.1111/ele.13714, Authorea doi: 10.22541/au.160193464.48676767/v2.
- 2019 **Brush, M.**, Linder, E., Zumalacàrregui, M., *No Slip CMB*, Journal of Cosmology and Astroparticle Physics **01** 029, doi: 10.1088/1475-7516/2019/01/029, arXiv: 1810.12337.
- 2015 **Brush, M.**, Pogosian, L., Vachaspati, T., *Magnetic monopole–domain wall collisions*, Physical Review D **92** 045008, doi: 10.1103/PhysRevD.92.045008, arXiv: 1505.08170.
- Other publications.
- 2021 **Brush, M.**, Liu, J., Yu, Q., *Revamping graduate biophysics education*, Commentary in Physics Today.

Funding and Scholarships

- 2018 – 2020 NSERC Postgraduate Scholarships - Doctoral program (CAD\$42 000)
2017 – 2018 Berkeley Connect Fellowship (USD\$22 000 + tuition/fees)
2015 – 2016 Trinity College Scholarship in Mathematics (£27 000 + tuition/fees)
2015, 2014 NSERC Undergraduate Student Research Award (CAD\$4500)

Teaching and Mentoring Experience

- Spring 2020 **Mentor**, *UC Berkeley*, GSPDP 301 - Mentoring in Higher Education.
Mentored an undergraduate in my research lab as an applied part of a course discussing the role of mentoring in US higher education.
Instructors: Linda von Hoene and Sabrina Soracco
- Fall 2018 **Graduate Student Instructor**, *UC Berkeley*, Astro C13 - Origins: from the Big Bang to the Emergence of Humans.
Instructors: Eliot Quataert and Charles Marshall
- 2017 – 2018 **Berkeley Connect Fellow**, *UC Berkeley*, Physics 98BC, 198BC - Berkeley Connect.
Served as a graduate student mentor for around 40 undergraduate students each semester for an academic year. Met and advised each student individually and facilitated small group discussions.
Instructors: Bernard Sadoulet and Matt Pyle
- Spring 2018, 2017 **Graduate Student Instructor**, *UC Berkeley*, Letters and Science 22 - Sense and Sensibility and Science.
Instructors: Saul Perlmutter, Tania Lombrozo, and John Campbell
- Fall 2016 **Graduate Student Instructor**, *UC Berkeley*, Physics 89 - Introduction to Mathematical Physics.
Instructor: James Analytis
- Spring 2015 **Teaching Assistant**, *Simon Fraser University*, Physics 102 - Physics for the Life Sciences II.
Instructor: Barbara Frisken
- Teaching Assistant**, *Simon Fraser University*, Physics 190 - Introduction to Astronomy.
Instructor: Howard Trottier
- Fall 2013 **Teaching Assistant**, *Simon Fraser University*, Physics 121 - Optics, Electricity, and Magnetism.
Instructor: Michael Chen
- Summer 2012 **Astronomy Interpreter**, *NRC-CNRC: Centre of the Universe*.
Public outreach including telescope tours, planetarium programming, observation nights, and youth summer camps.

Conference Contributions

- 2020 **Brush, M.**, Umemura, K., Harte, J., *Dynamic Maximum Entropy Theory*, Joint Berkeley Initiative for Microbiome Sciences – Theory for Microbiome Research Workshop, Invited talk. Online, hosted by UC Berkeley.

- Brush, M.**, Umemura, K., Harte, J., *DynaMETE: A dynamic extension to the Maximum Entropy Theory of Ecology (METE)*, Ecological Society of America Annual Meeting, Contributed talk. Online.
- Brush, M.**, Suess, K., *Respect is Part of Research: Peer-Led Graduate SVSH Prevention Workshops*, Public Summit of the National Academies' Action Collaborative on Preventing Sexual Harassment in Higher Education, Poster. Online, hosted by the University of Wisconsin.
- Brush*, M.**, Suess*, K., Workshop: How To Start A Peer-Led SVSH Prevention Program, Co-lead organizer and presenter (*Contributed equally), Berkeley, CA, USA.
Organized and led a two day workshop sharing the Respect is Part of Research model of peer-led sexual violence and sexual harassment prevention training with graduate students in physics and astronomy at other institutions.
- 2019 **Brush, M.**, Harte, J., Franzman, J., Umemura, K., *The effects of density dependence on spatial aggregation in the maximum entropy theory of ecology*, Ecological Society of America Annual Meeting, Contributed talk, doi: 10.7490/f1000research.1117483.1. Louisville, KY, USA.
Awarded the Volterra Prize for Best Student Talk in Theoretical Ecology.
- Umemura, K., **Brush, M.**, Harte, J., *A hybrid MaxEnt-plus-Mechanism approach to dynamical theory of macroecology*, Ecological Society of America Annual Meeting, Poster. Louisville, KY, USA.
- 2018 **Brush, M.**, Lukić, Z., *Characterizing WHIM in Simulations*, Intergalactic Interconnections, Contributed talk. Marseille, FR.

Other Presentations

- 2021 **Brush, M.**, *Macroecology, Maximum Entropy, and Disturbance*, Mathematical Biology Seminar, University of Alberta, Invited talk. Edmonton, AB, CA.
- 2020 **Brush*, M.**, Suess*, K., *Respect is Part of Research Facilitator Training*, Harvard University Department of Physics, Co-facilitator (*Contributed equally), Online.
Assisted in leading the facilitator training for the Harvard implementation of Respect is Part of Research.
- 2019 **Brush*, M.**, Suess*, K., *Respect is Part of Research: Peer-Led Training to Improve Departmental Climate*, Graduate Assembly Meeting, Physics Faculty Retreat, and Astronomy Department Lunch Talk, UC Berkeley, Co-presenter (*Contributed equally), Berkeley, CA, USA.
- Brush, M.**, Smith, R., *Strategies for Responding to Harassment and Hostile Climates*, Rocky Mountain Biological Laboratory, Co-facilitator, Gothic, CO, USA.
- Brush, M.**, *Theoretical Ecology and Physics*, Physics Graduate Student Seminar, UC Berkeley, Invited talk. Berkeley, CA, USA.
- 2018 **Brush, M.**, *Illuminating Dark Matter*, Grounds for Science, Emeryville, CA, USA.
Public talk for Dark Matter Day.

- 2015 **Brush, M.**, Pogosian, L., *The monopole problem, and the interactions of topological defects*, Part III Seminar Series, University of Cambridge, Contributed talk. Cambridge, UK.
- 2014 **Brush, M.**, Sigurdson, K., *3D cosmological observables in spherical coordinates*, Cosmology Seminar, Simon Fraser University, Invited talk. Burnaby, BC, CA.
- 2012 **Brush, M.**, *Extreme Environments and Astrobiology*, Centre of The Universe Public Talk Series, Saanich, BC, CA.

Awards

- 2019 Volterra Prize for Best Student Talk, ESA Theoretical Ecology Section
- 2015 Gordon M. Shrum Gold Medal, Simon Fraser University
Awarded for high scholastic achievement and involvement in extracurricular activities.
- 2015 Physics Charter Faculty Prize, Simon Fraser University
Awarded to a top graduating student in Physics.
- 2015, 2013 Evelyn and Leigh Palmer Scholarship, Simon Fraser University
- 2014, 2013 John F. Cochran Physics Award, Simon Fraser University
- 2011 – 2015 Simon Fraser University Open Scholarship
- 2011 – 2014 Simon Fraser University Alumni Scholarship

Professional Service

- 2018 – 2021 Respect is Part of Research, Peer-led Sexual Assault and Sexual Harassment Prevention Training, Co-head Coordinator with K. Suess
RPR is a graduate student run group that leads peer-led sexual assault and sexual harassment prevention training for incoming first year graduate students in 8 STEM departments at UC Berkeley.
- 2020 – 2021 UC Berkeley's Coordinated Community Review Team for Sexual and Gender-Based Violence and Misconduct, Invited Representative from Respect is Part of Research
- 2017 – 2020 Campus Committee on Teaching, Graduate Student Representative
- 2019 – 2020 Physics Graduate Admissions Committee, Graduate Student Representative
- 2017 – 2019 Graduate Assembly, Physics Delegate
- 2018 – 2019 Physics Graduate Curriculum Committee, Graduate Student Representative
- 2017 – 2018 Physics Graduate Student Seminar, Co-founder and Organizer with J. Liu
- 2018 Physics Graduate Student Association, President
- 2017 Respect is Part of Research, Facilitator
- 2017 Physics Faculty Search Committee, Graduate Student Representative
- 2017 Graduate Open House Committee, Organizer