

George I. Hagstrom

Curriculum Vitae

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Education

- 2006–2011 **PhD in Physics**, *The University of Texas at Austin*, Thesis Advisor: Philip Morrison
2002–2006 **BS in Physics**, *California Institute of Technology*, Graduated with Honors

Employment

- 2024–present **Doctoral Lecturer, Department of Data Analytics and Information Systems**, CITY UNIVERSITY OF NEW YORK SCHOOL OF PROFESSIONAL STUDIES
2017–2024 **Associate Research Scientist, Department of Ecology and Evolutionary Biology**, PRINCETON UNIVERSITY
2020–2021 **Research Associate, College of Earth, Ocean, and Atmospheric Science**, OREGON STATE UNIVERSITY
2014–2017 **Postdoctoral Research Associate, Department of Ecology and Evolutionary Biology**, PRINCETON UNIVERSITY
2013–2014 **Courant Instructor, Courant Institute for Mathematical Sciences**, NEW YORK UNIVERSITY
2011–2013 **Assistant Research Scientist, Courant Institute for Mathematical Sciences**, NEW YORK UNIVERSITY
2008–2011 **Graduate Research Assistant, Institute for Fusion Studies, Department of Physics**, UNIVERSITY OF TEXAS AT AUSTIN
2008 **GFD Fellow**, WOODS HOLE OCEANOGRAPHIC INSTITUTE
2006–2008 **Graduate Teaching Assistant, Department of Physics**, UNIVERSITY OF TEXAS AT AUSTIN
2005 **Technical Intern, Computer Science Research Institute**, SANDIA NATIONAL LABORATORY
2003–2004 **Summer Undergraduate Research Fellow, Digital Evolution Laboratory, Department of Computer Science**, MICHIGAN STATE UNIVERSITY

Funding

- June 2025–December 2026 **PSC-CUNY Trad-B Award 56-365, \$6,000**, *Modeling Polyphosphate Regulation in Marine Phytoplankton*, .
2026 **PI G.I. Hagstrom** (CUNY)

- September 2022–August 2025 **NSF Award IOS-2137340, \$249,992**, *Collaborative Research: Interactive physiological controls of trait expression, nutrient allocation, and the elemental stoichiometry of *Synechococcus**, .
PIs: S.A. Levin (Princeton) and **G.I. Hagstrom** (Princeton)
- April 2023–March 2024 **DOC/NOAA Award 1005828, \$66,373**, *Dynamical Elemental Stoichiometry in COBALT*, .
PIs: **G.I. Hagstrom** (Princeton), C. Stock (GFDL), J. Luo (GFDL), and S. Levin (Princeton)
- April 2021–March 2022 **DOC/NOAA Award 1005828, \$67,866**, *Dynamical Elemental Stoichiometry in COBALT*, .
PIs: **G.I. Hagstrom** (Princeton), C. Stock (GFDL), J. Luo (GFDL), and S. Levin (Princeton)
- April 2020–March 2021 **DOC/NOAA Award 1005828, \$69,616**, *Dynamical Elemental Stoichiometry in COBALT*, .
PIs: **G.I. Hagstrom** (Princeton), C. Stock (GFDL), J. Luo (GFDL), and S. Levin (Princeton)
- September 2019–August 2022 **NSF Award OCE-1848576, \$899,182**, *Linking the adaptive dynamics of plankton with emergent ocean biogeochemistry*, Participated substantially in conception and writing of proposal.
PIs: A. Martiny, N. Komarova, F. Primeau (UC Irvine) and S. Levin (Princeton)

Publications

Submitted Manuscripts and Preprints

- [1] **Hagstrom, G. I.**, S. A. Levin, and A. C. Martiny. Balance between resource supply and demand determines nutrient limitation of primary productivity in the ocean. *bioRxiv*. URL: [biorxiv.org/content/early/2017/11/23/064543](https://www.biorxiv.org/content/early/2017/11/23/064543).

Refereed Publications

- [1] **Hagstrom, G. I.**, C. A. Stock, J. Y. Luo, and S. A. Levin. Impact of dynamic phytoplankton stoichiometry on global scale patterns of nutrient limitation, nitrogen fixation, and carbon export. *Global Biogeochemical Cycles*, 38(5):e2023GB007991, 2024. URL: www.authorea.com/doi/full/10.22541/essoar.169686244.46744133.
- [2] M. R. Sullivan, F. W. Primeau, **Hagstrom, G. I.**, W. L. Wang, and A. C. Martiny. Integrating trait-based stoichiometry in a biogeochemical inverse model reveals links between phytoplankton physiology and global carbon export. *Global Biogeochemical Cycles*, 38(3):e2023GB007986, 2024.
- [3] **Hagstrom, G. I.** and S. A. Levin. Phase transitions and the theory of early warning indicators for critical transitions. In M Centeno, P Callahan, P Larcey, and T Patterson, editors, *How Worlds Collapse: What History, Systems, and Complexity Can Teach Us About Our Modern World and Fragile Future*, page 358. Routledge Press, 2023. URL: <https://arxiv.org/abs/2110.12287>.
- [4] A. A Larkin, **Hagstrom, G. I.**, M. L. Brock, N. S. Garcia, and A. C. Martiny.

Basin-scale biogeography of prochlorococcus and sar11 ecotype replication. *The ISME Journal*, pages 1–10, 2023.

- [5] A. C. Martiny, **Hagstrom, G. I.**, T. DeVries, R. T. Letscher, G. L. Britten, C. A. Garcia, E. Galbraith, D. Karl, S. A. Levin, M. W. Lomas, et al. Marine phytoplankton resilience may moderate oligotrophic ecosystem responses and biogeochemical feedbacks to climate change. *Limnology and Oceanography*, 67:S378–S389, 2022.
- [6] M. Titus, **Hagstrom, G. I.**, and J. R. Watson. Unsupervised manifold learning of collective behavior. *PLoS Computational Biology*, 17(2):e1007811, 2021.
- [7] D. R. Brumley, F. Carrara, A. M. Hein, **Hagstrom, G. I.**, S. A. Levin, and R. Stocker. Cutting through the noise: Bacterial chemotaxis in marine microenvironments. *Frontiers in Marine Science*, 7:527, 2020.
- [8] C.A. Garcia, **Hagstrom, G.I.**, A.A. Larkin, L.J. Ustick, S.A. Levin, M.W. Lomas, and A.C. Martiny. Linking regional shifts in microbial genome adaptation with surface ocean biogeochemistry. *Phil. Trans. R. Soc. B.*, 375, 2020. doi: 10.1098/rstb.2019.0254.
- [9] S. Railsback, U. Berger, J. Giske, **Hagstrom, G. I.**, B. Harvey, C. Semeniuk, and G. Volker. Bridging levels from individuals to communities and ecosystems: Including adaptive behavior and feedbacks in ecological theory and models. *Bull Ecol Soc Am*, 101:e01648, 2020. doi:10.1002/bes2.1648.
- [10] C. Serra-Pompei, **Hagstrom, G. I.**, A. W. Visser, and K. H. Andersen. Resource limitation determines temperature response of unicellular plankton communities. *Limnology and Oceanography*, 2019. doi:10.1002/lno.11140.
- [11] A. R. Moreno, **Hagstrom, G. I.**, F. W. Primeau, S. A. Levin, and A. C. Martiny. Marine phytoplankton stoichiometry mediates nonlinear interactions between nutrient supply, temperature, and atmospheric co₂. *Biogeosciences*, 15(9):2761–2779, 2018. URL: <https://www.biogeosciences.net/15/2761/2018/>, doi: 10.5194/bg-15-2761-2018.
- [12] **Hagstrom, G. I.** and S. A. Levin. Marine ecosystems as complex adaptive systems: Emergent patterns, critical transitions, and public goods. *Ecosystems*, 20(3):458–476, 2017. URL: <https://link.springer.com/article/10.1007/s10021-017-0114-3>.
- [13] A. M. Hein*, Rosenthal* S. B., G. I. **Hagstrom***, A. Berdahl, C. J. Torney, and I. D. Couzin. The evolution of distributed sensing and collective computation in animal populations. *eLIFE*, 4:e10955, 2015. URL: <https://cdn.elifesciences.org/articles/10955/elifesciences-10955-v3.pdf>.
- [14] **Hagstrom, G. I.** and E. Hameiri. Traveling waves in Hall-magnetohydrodynamics and the ion-acoustic shock structure. *Physics of Plasmas*, 21(2):022109, 2014. URL: <https://aip.scitation.org/doi/abs/10.1063/1.4862035>.

- [15] **Hagstrom, G. I.** and C. R. Doering. Bounds on surface stress driven shear flow. *J. Nonlinear Science*, 24(1):185–199, 2014. URL: <https://link.springer.com/article/10.1007/s00332-013-9183-4>.
- [16] **Hagstrom, G. I.** and P. J. Morrison. Continuum Hamiltonian Hopf Bifurcation II. In O. Kirillov, editor, *Spectral Analysis, Stability and Bifurcations in Nonlinear Physical Systems*. Wiley, 2013. URL: <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118577608.ch13>.
- [17] P. J. Morrison and **Hagstrom, G. I.** Continuum Hamiltonian Hopf Bifurcation I. In O. Kirillov, editor, *Spectral Analysis, Stability and Bifurcations in Nonlinear Physical Systems*. Wiley, 2013. URL: <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118577608.ch12>.
- [18] T. Hagstrom and **Hagstrom, G. I.** Grid stabilization of high-order one-sided differencing II: Second-order wave equations. *J. of Comp. Phys.*, 2012. URL: <https://www.sciencedirect.com/science/article/pii/S0021999112004172>.
- [19] **Hagstrom, G. I.** and P. J. Morrison. Caldeira-Leggett model, Landau damping, and the Vlasov-Poisson system. *Physica D*, 240:1652–1660, 2011. URL: <https://www.sciencedirect.com/science/article/pii/S016727891100039X>.
- [20] **Hagstrom, G. I.** and P. J. Morrison. On Krein-like theorems for noncanonical Hamiltonian systems with continuous spectra: Application to Vlasov-Poisson. *Trans. Theory and Stat. Phys.*, 39:466–501, 2011. URL: <https://www.tandfonline.com/doi/abs/10.1080/00411450.2011.566484>.
- [21] **Hagstrom, G. I.** and C. Doering. Bounds on heat transport in Bénard-Marangoni convection. *Phys. Rev. E*, 81:047301, Apr 2010. URL: <https://journals.aps.org/pre/abstract/10.1103/PhysRevE.81.047301>, doi:10.1103/PhysRevE.81.047301.
- [22] T. Hagstrom and **Hagstrom, G. I.** Grid stabilization of high-order one-sided differencing I: First-order hyperbolic systems. *J. of Comp. Phys.*, 223(1):316–340, 2007. URL: <https://www.sciencedirect.com/science/article/pii/S0021999106004396>.
- [23] **Hagstrom, G. I.**, D. H. Hang, C. Ofria, and E. Torng. Using AVIDA to test the effects of natural selection on phylogenetic reconstruction methods. *Artificial Life*, 10(2):157–166, 2004. URL: <https://www.mitpressjournals.org/doi/abs/10.1162/106454604773563586>.

* Indicates equal authorship contribution

Teaching Experience

- 2026 City University of New York School of Professional Studies, Machine Learning and Big Data
- 2026 City University of New York School of Professional Studies, Capstone Thesis
- 2025 City University of New York School of Professional Studies, Data Acquisition and Management

- 2025 City University of New York School of Professional Studies, Capstone Thesis
- 2025 City University of New York School of Professional Studies, Math Modeling Techniques
- 2025 City University of New York School of Professional Studies, Introduction to Visual Storytelling
- 2024 City University of New York School of Professional Studies, Introduction to Probability and Statistics
- 2024 City University of New York School of Professional Studies, Data Acquisition and Management
- 2024 City University of New York School of Professional Studies, Geographic Information Systems
- 2024 City University of New York School of Professional Studies, Introduction to e-commerce for Information Systems
- 2017 Princeton University, Guest Lecturer for Mathematical Ecology
- 2014 Courant Institute, Primary Instructor for Mathematics for Economics I
- 2013 Courant Institute, Primary Instructor for Calculus I
- 2013 Courant Institute, Primary Instructor for Dynamical Systems and Chaos
- 2006-2007 University of Texas at Austin, Teaching Assistant for Physics 336K, Classical Dynamics I

--- Honors and Awards

- 2013 Fellowship, CNRS/Vlasovia
- 2011 Student Poster Prize, Sherwood Fusion Theory Conference
- 2009 University of Texas Professional Development Grant
- 2008 Fellow, Geophysical Fluid Dynamics Summer Program, Woods Hole Oceanographic Institute
- 2007 Honorable Mention, NSF Graduate Research Fellowship Program

--- Invited Talks

- 2023 Mathematical Biology Seminar, Brandeis University
- 2022 Earth Resilience Sustainability Initiative Workshop
- 2022 AGU Ocean Sciences Meeting (virtual)
- 2021 Seminar, Earth Resilience Sustainability Initiative
- 2020 Seminar, Department of Physics, University of Texas at Austin
- 2020 Seminar, Department of Physics, Princeton University
- 2020 Theoretical Ecology Lab Tea, Princeton University
- 2019 Seminar, Department of Mathematics, Rutgers University New Brunswick
- 2019 Seminar, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology
- 2019 Minisymposium Talk, ESA Annual Meeting 2019, Louisville

- 2019 Seminar, Department of Earth Systems Science, University of California at Irvine
- 2018 PCTS Workshop: Bridging Theory and Experiment in Microbial Communities, Princeton University
- 2018 Biogeochemistry Seminar, Geophysical Fluid Dynamics Laboratory
- 2018 Mathematical Modeling Seminar, Technical University of Denmark, Copenhagen
- 2018 Theoretical Ecology Lab Tea, Princeton University
- 2017 Mathematical Biology Seminar, New Jersey Institute of Technology
- 2017 ASLO Aquatic Sciences Meeting, Honolulu
- 2016 Ocean Life Seminar, DTU Copenhagen
- 2016 Theoretical Ecology Lab Tea, Princeton University
- 2016 BPE Seminar, Lamont-Doherty Earth Observatory, Columbia University
- 2016 Ecological Stoichiometry, Geophysical Fluid Dynamics Laboratory
- 2016 Biogeochemical Cycles Seminar, University of California at Irvine
- 2015 Theoretical Ecology Lab Tea, Princeton University
- 2015 Mathematical Biology Seminar, University of Pennsylvania
- 2015 Fish Baste Seminar, Rutgers University
- 2015 Theoretical Ecology Lab Tea, Prince University
- 2014 Colloquium, Army Research Lab
- 2014 Waves Seminar, New Jersey Institute of Technology
- 2014 Theoretical Ecology Seminar, Princeton University
- 2013 Waves Seminar, New Jersey Institute of Technology
- 2013 GFD Seminar, Woods Hole Oceanographic Institution
- 2013 Magneto-Fluids Seminar, Courant Institute for Mathematical Sciences
- 2011 Analysis Seminar. Courant Institute for Mathematical Sciences
- 2011 GFD Seminar. Woods Hole Oceanographic Institution
- 2011 Working Dynamical Systems Seminar. University of Texas at Austin
- 2011 Magneto-Fluids Seminar. Courant Institute for Mathematical Sciences
- 2011 Graduate Student and Postdoc Seminar. Center for Nonlinear Studies, Los Alamos National Laboratories
- 2010 Working Dynamical Systems Seminar, University of Texas at Austin

Conference Proceedings

- 2023 Impact of Dynamic Phytoplankton Stoichiometry on Global Scale Patterns of Nutrient Limitation, Nitrogen Fixation, and Carbon Export, Poster Session
- 2022 ATOM-COBALT Dynamic Phytoplankton Stoichiometry in an Earth Systems Model, AGU Ocean Sciences Meeting, Oral Session
- 2020 A trait-based approach to describe the elemental stoichiometry of marine phytoplankton and the regulation of the biological pump, AGU Ocean Sciences Meeting, eLightning Session

- 2019 Linking Environment and Phytoplankton Stoichiometry with Traits. Trait-Based Approaches to Ocean Life, Oral Session, Milton Keynes UK
- 2019 Bacterial Strategies for degrading organic matter in the ocean. ESA Annual Meeting, Minisymposium on Agent Based Models, Louisville
- 2019 DOM Decomposition and Bacterial Strategies in the Ocean. Marine Particles and Phycospheres Meeting, Oral and Poster Sessions, Ascona, SZ
- 2019 DOM Decomposition and Bacterial Strategies in the Ocean. Simons Foundation Conference on Theory and Biology, Poster Session. New York City
- 2018 DOM Decomposition and Bacterial Strategies in the Ocean. Mathematics of Planet Earth Conference, Rutgers University.
- 2018 Dissolved Organic Matter and the Evolution of Bacterial Motility in the Ocean. ASLO Meeting, Oral Session
- 2018 Resource Ratios and Nutrient Limitation in the Ocean. AGU Ocean Sciences Meeting, Oral Session
- 2017 Chemotaxis and Motility Enable Bacteria to Colonize Sinking Particles and Exploit Ephemeral Resource Patches. Simons Foundation Theory & Biology Conference Poster Session
- 2017 Marine Ecosystems as Complex Adaptive Systems. ASLO Aquatic Sciences Meeting. Oral Session
- 2016 Ecological Problems in the Human Microbiome. Casarti Seminar. Oral Session
- 2016 The Influence of Resource Ratios on Primary Productivity and Nutrient Limitation in the Ocean. Gordon Research Conference. Poster Session
- 2016 The Influence of Resource Ratios on Primary Productivity and Nutrient Limitation in the Ocean. Gordon Research Seminar. Poster Session
- 2016 The Influence of Resource Ratios on Primary Productivity and Nutrient Limitation in the Ocean. Gordon Research Seminar. Oral Session
- 2016 The Influence of Resource Ratios on Primary Productivity and Nutrient Limitation in the Ocean. Quantitative Laws Summer School II. Oral Session
- 2016 Evolution of Distributed Sensing and Collective Computation in Animal Groups. Challenges in Statistical Physics and Fluids Dynamics, a Conference in Honor of Charlie Doering, Oral Session
- 2016 Non-Redfield Stoichiometry and Biogeochemical Cycles, NSF Dimensions of Biodiversity
- 2016 The Influence of Resource Ratio Theory on Primary Productivity in the Ocean, AGU Ocean Sciences. Beyond Redfield Oral Session
- 2015 Deviations from the Redfield Ratio and the Carbon Cycle, Traits Biannual Meeting
- 2015 Evolution of Distributed Sensing and Collective Computation in Animal Populations, ESA Annual Meeting
- 2014 Stability of Waterbag Equilibria of the Single Wave Model. Sherwood Fusion Theory Conference

- 2013 Stability of Inhomogeneous Equilibria of the Single Wave Model. Vlasovia Oral Session
- 2013 Stability of Inhomogeneous Equilibria of Hamiltonian Continuous Media Field Theories. APS-DPP annual meeting Session PP8.0108
- 2013 Shock Structures in Hall-MHD (with E. Hameiri). Sherwood Fusion Theory Conference
- 2012 On the Continuum Hamiltonian Hopf Bifurcation II. BIRS Conference on Spectral Analysis, Stability and Bifurcation in Modern Nonlinear Physical Systems
- 2012 Shock Waves in Hall-MHD. Sherwood Fusion Theory Conference, Session S1.00029
- 2012 Shock Waves in Hall-MHD. 2012 IPAM Plasma Workshop III: Mathematical and Computer Science Approaches to High Energy Density Physics
- 2012 Shock Waves in Hall-MHD. 2012 APS-DPP meeting Session GP8.00053
- 2011 Landau Damping as a General Description of Dissipation. APS-DPP Meeting. Session GP9.00021
- 2011 Caldeira-Leggett Model, Vlasov-Poisson Equation, and Landau Damping. Sherwood Fusion Theory Conference. 2P32
- 2010 A transformation identifying the Caldeira-Leggett model with the linear Vlasov-Poisson system, APS-DPP Meeting. Session PP9.00103
- 2010 Krein-like theorems for non-canonical Hamiltonian systems with continuous spectra: application to Vlasov-Poisson. Sherwood Fusion Theory Conference. 1P33
- 2009 Bounds on the Nusselt Number for Marangoni Convection, APS-DFD Meeting. Session LR.008
- 2009 A Krein-like Theorem for the Linearized Vlasov-Poisson Equation. APS-DPP Meeting. Session GP8.00153
- 2008 Bifurcations of the Continuous Spectrum in the Vlasov Poisson Equation. APS-DPP Annual Meeting 2008. Session CP6.00055

Workshops

- 2022 Earth Resilience Sustainability Initiative Workshop on Tipping Points
- 2021 OCB Biogeoscapes Planning Meeting
- 2018 PCTS Workshop Bridging Theory and Experiment in Microbial Communities, Princeton University
- 2018 Annual Meeting on the Mathematics of Planet Earth, Rutgers University
- 2016 Gordon Research Conference on Ecology Across Scales, University of New England
- 2016 Gordon Research Seminar on Ecology Across Scales, University of New England
- 2016 Quantitative Laws Summer School II, Lake Como, Italy
- 2015 OCB Traits 2015 Meeting, Waterville Valley New Hampshire

- 2014 Workshop on Mathematical Biology and Nonlinear Analysis. Miami University
- 2014 Princeton-Humboldt Workshop on Reality Mining of Animal-Human Systems. Humboldt University
- 2008–2013 Summer Program in Geophysical Fluid Dynamics. Woods Hole Oceanographic Institution
- 2012 BIRS Conference on Spectral Analysis, Stability and Bifurcation in Modern Nonlinear Physical Systems. BIRS
- 2012 IPAM Plasma Workshop III: Mathematical and Computer Science Approaches to High Energy Density Physics. UCLA
- 2011 Novel Applications of Kinetic Theory and Computation. ICERM
- 2011 Vlasov Models in Kinetic Theory. ICERM
- 2010 ITER school. University of Texas at Austin

Programming Skills

Knowledge of C, C++, MPI, PYTHON, Matlab, Julia, stan, Fortran

Academic Service

- 2026-present Organized CUNY SPS Data Science Seminar Speaker
- 2025-present Served on CUNY SPS Governing Council
 - 2018-2019 Participant in EEB Scholars Weekend
 - 2018-2019 Member of the EEB Climate Committee
 - 2016-2017 Member of PNAS Journal Club
- 2015-present Reviewed grant proposals for NSF
- 2011-present Refereed articles for Physics of Plasmas, Journal of Fluid Mechanics, European Physical Journal D, Frontiers Microbiology, Limnology and Oceanography, Global Biogeochemical Cycles, PNAS
 - 2014 Served on American Physical Society Division of Plasma Physics Education and Outreach Committee
 - 2013 Discussed Research in Plasma Physics with Stanford EPGY summer students.
 - 2010 Served on panel to improve the environment for women and under-represented minorities in the physics department at the University of Texas at Austin.
- 2009-2010 Volunteer mathematics tutor for topology and real analysis.

Charitable Service

- 2022 Organizer for *Impact: Artists in Support of Refugees from Ukraine* Benefit Auction
- 2021 Volunteered Booking Vaccines for Underserved Communities at EpicenterNYC