George I. Hagstrom

Curriculum Vitae

CUNY SPS
New York, NY, USA 10001
+001 505 615 9816
george.hagstrom@cuny.edu
www.georgehagstrom.com

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*, .
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*, Particpated 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] E. H. Krueger, K. Halder, W. Oh, N. Molla, J. C. Rocha, G. Ferro, G. Falmagne, A. B. Stephenson, L. Wang Erlandsson, E. R. Zajdela, J. Bara, **G. Hagstrom**, N. Wunderling, J. Li, X. Huggins, C. Schill, H. Jaggi, S. Constantino, M. A. Muñoz, and V. V. Vasconcelos. From critical transitions to sustainability transformations: Phenomena, theory and applications across disciplines. *Submitted to* Annual Review of Environment and Resources, 2026.

[2] **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`.

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 co_2. *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/elife-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, Introduction to Visual Storytelling

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 ofmarine 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, Lame 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, R, Matlab, Julia, stan, Fortran

Academic Service

2026-present Organized CUNY SPS Data Science Seminar Speaker

2025-present Served on CUNY SPS Governing Council

2024-present Served on CUNY SPS Faculty Forum

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.

Chartiable Service

2022 Organizer for *Impact: Artists in Support of Refugees from Ukraine* Benefit Auction

2021 Volunteered Booking Vaccines for Underserved Communities at EpicenterNYC