

REV. ROBERT MARSLAND III

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Positions

Visiting Scholar Environmental Science & Policy, University of California, Davis	2023 - 2024
Postdoctoral Scholar Theoretical Biophysics Group, Department of Physics, Boston University	2017 - 2020

Education

Doctoral Candidate in Dogmatic Theology Pontifical University of the Holy Cross, Rome, Italy	2024 - present
Licentiate in Dogmatic Theology Pontifical University of the Holy Cross, Rome, Italy	2024
Baccalaureate in Theology Pontifical University of the Holy Cross, Rome, Italy	2022
Doctor of Philosophy in Physics Massachusetts Institute of Technology, Cambridge, MA	2017
Master of Studies in Philosophy of Physics Oxford University, Oxford, UK Distinction	2012
Bachelor of Arts in Physics; Certificate in Latin Language and Literature Princeton University, Princeton, NJ Summa cum laude, GPA 3.9	2011

Teaching

<i>De Deo Uno et Trino II</i> <i>Studium Generale Praelaturis Operis Dei</i>	2024
<i>Intermediate Mechanics (PY408)</i> <i>Boston University</i>	2018

Seminars

Natural Contemplation in Maximus the Confessor: An introduction to patristic philosophy of nature

Relational Ontology Research Seminar, Pontifical University of the Holy Cross
February 26, 2025

Natural Contemplation in Maximus the Confessor: An introduction to patristic philosophy of nature

Faraday Institute Philosophy of Nature Research Hub Seminar, University of Cambridge
January 14, 2025

Statistical Mechanics of Microbiomes

Complex Systems Colloquium, University of Michigan
September 24, 2019

Designing Diverse Microbial Consortia: Challenges and Opportunities

Indigo Ag, Inc.
July 18, 2019

Towards a Statistical Physics of Ecosystems

Center for the Physics of Biological Function, Princeton University
April 2, 2019

Machine Learning, Statistical Physics and Ecological Dynamics

APS March Meeting, invited session
March 7, 2019

Statistical Mechanics of Microbiomes

Parsons Lab Microbial Systems Seminar Series, MIT
February 20, 2019

Statistical Mechanics of Microbiomes

Working Group on Irreversible Processes in Ecological Evolution, Santa Fe Institute
January 29, 2019

Microbial Communities in Python

Guest lecture for MIT graduate course *Computational Ecology* (1.871)
October 3, 2018

Mean-field theory for ecological steady states

MIT Nonequilibrium Statistical Mechanics Seminar
February 20, 2018

Statistical Mechanics of Microbial Communities

BU Biophysics Seminar
February 5, 2018

Dynamic Self-Assembly in Living Matter

Tel Aviv University Biosoft Seminar
July 31, 2017

The Edge of Thermodynamics: Driven Steady States in Physics and Biology

IGERT Summer Institute, Brandeis University
May 31, 2017

Dynamic Self-Assembly in Living Matter

Lewis-Sigler Theory Symposium, Princeton University
November 30, 2016

Meetings/Seminars Organized

Naturam totam complectari animo: Towards a relational ecology

Spring 2024

Pontifical University of the Holy Cross

Organized an interdisciplinary workshop with six invited speakers (four scientists and two philosophers), providing complementary perspectives on the path forward to a more adequate ontology of the biosphere.

Co-organizers: Dr. Douglas Sponsler, Prof. Fernanda Valdovinos, Fr. Giulio Maspero

BU Theory in Biology Meeting

Spring 2018

Boston University

Organized a two-day workshop on the Boston University campus featuring twelve invited speakers on the topic of “community ecology, evolution and the origin of life.”

Co-organizers: Prof. Kirill Korolev, Prof. Pankaj Mehta, Prof. Daniel Segre

Boston University Biophysics Seminar

2017 - 2018

Boston University

Led a team of three faculty members to coordinate weekly lunch seminars given by local faculty and postdocs for the BU biophysics community.

Co-organizers: Prof. Kirill Korolev, Prof. Maria Kamenetska, Prof. Daniel Segre

Non-Equilibrium Statistical Mechanics Seminar

Fall 2016

Massachusetts Institute of Technology

Organized weekly presentations by graduate students and postdocs on important tools and results in theoretical non-equilibrium statistical mechanics.

Philosophical Presuppositions of Science

Summer 2015

Elmbrook University Center

Planned and led weekly discussions with MIT and Harvard students from a variety of disciplines on the place of scientific knowledge within the broader context of human knowledge. Selected topical readings each week from articles by Richard Feynman, Philip Anderson, and Paul Davies.

Scientific Representation

Spring 2012

Grandpont House, Oxford

Planned and led weekly discussions with Oxford students from a variety of disciplines on readings from *Scientific Representation* by Bas van Fraassen (2008).

Co-organizer: Dr. Nicholas Teh

Journals Refereed

The American Naturalist, Ecology Letters, Current Opinion in Microbiology, Nature Communications, Physical Review Letters, Physical Review X, Physical Review E, Physical Review Research, Physica A, American Journal of Physics, PLOS One, PLOS Computational Biology, Journal of Statistical Mechanics, Entropy, iScience

Publications

F.S. Valdovinos, T. Kaur and R. Marsland III, "The equalizing effect of adaptive foraging increases plant coexistence in plant-pollinator networks." *bioRxiv*:2025.03.26.645069 (2025).

W. Cui, R. Marsland III and P. Mehta, "Les houches lectures on community ecology: from niche theory to statistical mechanics." *arXiv*:2403.05497 (2024).

Z. Feng, R. Marsland III, J. W. Rocks and P. Mehta, "Emergent competition shapes top-down versus bottom-up control in multi-trophic ecosystems." *PLoS Comp. Biol.* **20**(2):e1011675 (2024).

R. Marsland III, "Sacramental penance as existential liberation in Hildegard von Bingen's *Liber Vitae Meritorum*." *Annales Theologici* **37**(1):235 (2023).

F. S. Valdovinos, S. Dritz and R. Marsland III, "Transient dynamics in plant-pollinator networks: fewer but higher quality of pollinator visits determines plant invasion success." *Oikos* **2023**(6):e09634 (2023).

J.C.C. Vila, J. Goldford, S. Estrela, D. Bajic, A. Sanchez-Gorostiaga, A. Damian-Serrano, N. Lu, R. Marsland III, M. Rebolleda-Gomez, P. Mehta and A. Sanchez, "Metabolic similarity and the predictability of microbial community assembly." *bioRxiv*:2023.10.25.564019 (2023).

P. Mehta and R. Marsland III, "Cross-feeding shapes both competition and cooperation in microbial ecosystems." *arXiv*:2110.04965 (2021).

W. Cui, R. Marsland III and P. Mehta, "Diverse communities behave like typical random ecosystems." *Phys. Rev. E* **104**:034416 (2021).

F.S. Valdovinos and R. Marsland III, "Niche theory for mutualism: A graphical approach to plant-pollinator network dynamics." *The American Naturalist*. **197**:393 (2021).

R. Marsland III, O. Howell, A. Mayer and P. Mehta, "Tregs self-organize into a computing ecosystem and implement a sophisticated optimization algorithm for mediating immune response." *PNAS*. **118**:e2011709118 (2021).

R. Marsland III and P. Mehta, "Data-driven modeling reveals a universal dynamic underlying the COVID-19 pandemic under social distancing." *arXiv*:2004.10666 (2020).

W. Cui, R. Marsland III and P. Mehta, "Effect of resource dynamics on species packing in diverse ecosystems." *Phys. Rev. Lett.* **125**:048101 (2020).

O. Howell, W. Cui, R. Marsland III and P. Mehta, "Machine learning as ecology." *J. Phys. A: Math. Theor.* **53**:334001 (2020).

R. Marsland III, W. Cui and P. Mehta, "The Minimum Environmental Perturbation Principle: A New Perspective on Niche Theory." *The American Naturalist*. **196**:291 (2020).

R. Marsland III, W. Cui, J. Goldford and P. Mehta, "The Community Simulator: a Python package for microbial ecology." *PLoS One*. **15**:e0230430 (2020).

R. Marsland III, W. Cui and P. Mehta, "A minimal model for microbial biodiversity can reproduce experimentally observed ecological patterns." *Scientific Reports*. **10**:3308 (2020).

L. Ikonomidou, M.J. Herriges, S.L. Lewandowski, R. Marsland, C. Villacorta, I.S. Caballero, D.B. Frank, R.M. Sanghrajka, K. Dame, M.M. Kańduła, J. Hicks-Berthet, M.L. Lawton, C. Christodoulou, A.J. Fabian, E. Kolaczyk, X. Varelas, E.E. Morrisey, J.M. Shannon, P. Mehta and D.N. Kotton, "The in vivo genetic program of murine primordial lung epithelial progenitors." *Nature Communications*. **11**:1 (2020).

Joshua E. Goldford, Hyman Hartman, Robert Marsland III and Daniel Segrè, "Environmental boundary conditions for the origin of life converge to an organo-sulfur metabolism." *Nature Ecology & Evolution* **3**:1715 (2019).

R. Marsland III, W. Cui and J. Horowitz, "The Thermodynamic Uncertainty Relation in biochemical oscillations." *Journal of the Royal Society: Interface* **16** (2019).

P. Mehta, W. Cui, C.-H. Wang and R. Marsland III, "Constrained optimization as ecological dynamics with applications to random quadratic programming in high dimensions." *Phys. Rev. E* **99**:052111 (2019).

R. Marsland III, W. Cui, J. Goldford, A. Sanchez, K. Korolev and P. Mehta, "Available energy fluxes drive a transition in the diversity, stability and functional structure of microbial communities." *PLoS Comp. Biol.* **15**:e1006793 (2019).

R. Marsland III and J. England, "Active regeneration unites high- and low-temperature features in cooperative self-assembly," *Phys. Rev. E* **98**:022411 (2018).

R. Marsland III and J. England, "Limits of Prediction in Thermodynamic Systems: A Review," *Rep. Prog. Phys.* **81**:016601 (2018).

K. He, R. Marsland III, S. Upadhyayula, E. Song, S. Dang, B. R. Capraro, W. Wang, W. Skillern, R. Gaudin, M. Ma and T. Kirchhausen, "Dynamics of phosphoinositide conversion in clathrin-mediated endocytic traffic," *Nature* **552**:410 (2017).

N. Perunov, R. Marsland III and J. England, "Statistical Physics of Adaptation," *Phys. Rev. X* **6**:021036 (2016).

R. Marsland III and J. England, "Far-from-equilibrium distribution from near-steady-state work fluctuations," *Phys. Rev. E* **92**(5):052120 (2015).

R. Marsland III, H.R. Brown, and G. Valente, "Time and irreversibility in axiomatic thermodynamics," *American Journal of Physics* **83**(7):628-634 (2015).

T. Bhamre, R. Marsland III, I.K. Kominis, B.H. McGuyer, and W. Happer, "Collision Kernels from Velocity-Selective Optical Pumping with Magnetic Depolarization," *Phys. Rev. A* **87**(4):043412 (2013).

R. Marsland III, B. H. McGuyer, B. A. Olsen, and W. Happer, "Spin-velocity correlations of optically pumped atoms," *Phys. Rev. A* **86**(2):023404 (2012).

B. H. McGuyer, R. Marsland III, B. A. Olsen, and W. Happer, "Cusp Kernels for Velocity-Changing Collisions," *Phys. Rev. Lett.* **108**(18):183202 (2012).

N. Kostinski, B. A. Olsen, R. Marsland, B. H. McGuyer, and W. Happer, "Temperature-insensitive laser frequency locking near absorption lines," *Rev. Sci. Instr.* **82**(3):033114 (2011).