

Professional Experience

- Assistant Professor** 2025 - pres.
Mechanical and Industrial Engineering
University of Illinois at Chicago
- Postdoctoral Scholar** 2021 - 2025.
University of Chicago
Advisor: Vincenzo Vitelli

Education

- Ph.D. in Physics** 2015-2021
Yale University
Advisor: Michael P. Murrell
Thesis: Energetics of biological mechanics and dynamics
- B.A. in Individualized Study** 2010-2014
New York University

Academic Publications

12. **When is nonreciprocity relevant?** Giulia Garcia Lorenzana, David G. Martin, Yael Avni, Daniel S. Seara, Michel Fruchart, Giulio Biroli, and Vincenzo Vitelli. [arXiv:2509.17972](#) (2025)
11. **Information theory for data-driven model reduction in physics and biology.** Matthew S. Schmitt, Maciej Koch-Janusz, Michel Fruchart, Daniel S. Seara, Michael Rust, and Vincenzo Vitelli. [arXiv:2312.06608](#) (2023)
10. **The transition to collective motion in nonreciprocal active matter: coarse graining agent-based models into fluctuating hydrodynamics.** David G. Martin, Daniel S. Seara, Yael Avni, Michel Fruchart, and Vincenzo Vitelli. [arXiv:2307.08251](#) (in press at PRX)
9. **Sociohydrodynamics: data-driven modeling of social behavior.** Daniel S. Seara, Jonathan Colen, Michel Fruchart, Yael Avni, David G. Martin, and Vincenzo Vitelli. [PNAS \(2025\)](#), [arXiv:2312.17627](#).
8. **Nonreciprocal Ising Model.** Yael Avni, Michel Fruchart, David G. Martin, Daniel S. Seara, and Vincenzo Vitelli. [Physical Review Letters \(2025\)](#), [arXiv:2311.05471](#)
7. **Dynamical phase transitions in the non-reciprocal Ising model.** Yael Avni, Michel Fruchart, David G. Martin, Daniel S. Seara, and Vincenzo Vitelli. [Physical Review E \(2025\)](#), [arXiv:2409.07481](#)
6. **Energy partitioning in the cell cortex.** Sheng Chen, Daniel S. Seara, Ani Michaud, Songeun Kim, Willam Bement, and Michael P. Murrell. [Nature Physics \(2024\)](#), [bioRxiv](#)
5. **Non-reciprocal interactions spatially propagate fluctuations in a 2D Ising model.** Daniel S. Seara, Akash Piya, and A. Pasha Tabatabai. [J. Stat. Mech. \(2023\)](#), [arXiv:2210.11229](#)

4. **Irreversibility in dynamical phases and transitions.** Daniel S. Seara, Benjamin B. Machta, Michael P. Murrell. [Nature Communications](#) (2021), [arXiv:1911.10696](#)
3. **Detailed balance broken by catch bond kinetics enables mechanical adaptation in active materials.** A. Pasha Tabatabai*, Daniel S. Seara*, Joseph Tibbs, Ian Linsmeier, and Michael P. Murrell. [Advanced Functional Materials](#) (2020)
2. **Wound healing coordinates actin architectures to regulate mechanical work.** Visar Ajeti, A. Pasha Tabatabai, Andrew J. Fleszar, Michael F. Staddon, Daniel S. Seara, Cristian Suarez, M. Sulaiman Yousafzai, Dapeng Bi, David R. Kovar, Shiladitya Banerjee, and Michael P. Murrell. [Nature Physics](#) (2019)
1. **Entropy production rate is maximized in non-contractile actomyosin.** Daniel S. Seara, Vikrant Yadav, Ian Linsmeier, A. Pasha Tabatabai, Patrick W. Oakes, S. M. Ali Tabei, Shiladitya Banerjee, and Michael P. Murrell. [Nature Communications](#) (2018), [arXiv:1804.04232](#)

Talks

Invited

Levitated Matter Workshop , <i>UChicago, USA</i>	Oct 2025
Physics Department Biophysics Seminar, <i>UIC, USA</i>	Sep 2025
Civil and Environmental Engineering Seminar, <i>UMinnesota, USA</i>	Feb 2025
Condensed Matter Seminar, <i>UMass Amherst, USA</i>	Feb 2025
EconophysiX Seminar, <i>Capital Fund Management, France</i>	Feb 2024
Biological Physics Seminar, <i>MPI PKS, Germany</i>	Jan 2024
Quantitative Life Sciences Seminar, <i>ICTP, Italy</i>	Jan 2021
MRSEC Rising Stars in Soft and Biological Matter Symposium, <i>UChicago, USA</i>	Oct 2020
Gotham-Metro Condensed Matter Conference, <i>NYU, USA</i>	Oct 2019

Contributed

NITMB model reduction workshop, <i>Chicago, USA</i>	Feb 2025
APS March Meeting, <i>Minneapolis, USA</i>	Mar 2024
Journées de Physique Statistique, <i>Paris, France</i>	Jan 2024
STATPHYS28, <i>Tokyo, Japan</i>	Aug 2023
APS March Meeting, <i>online</i>	Mar 2021
CMD2020GEFES , <i>Barcelona, Spain</i>	Aug 2020
APS March Meeting, <i>Denver, USA</i>	Mar 2020
APS March Meeting, <i>Boston, USA</i>	Mar 2019
APS March Meeting, <i>Los Angeles, USA</i>	Mar 2018

Awards

Kadanoff-Rice Postdoctoral Fellowship, University of Chicago	2021
Finalist for Schmidt Science Fellowship	2021
UChicago "Rising Stars in Soft and Biological Matter"	2020
DBIO Travel Grant to 2020 APS March Meeting	2020
NSF GRFP Fellowship	2016
Richard J. Koppenaal Award for Distinguished Interdisciplinary Study	2014
Physics National Honor Society ($\Sigma\Pi\Sigma$)	2013

Service

Professional society membership

American Physical Society (DSNP, DBIO, DSOF)

Organizing

APS Short course on "Physics of Human Social Systems" Mar 2025

APS session on "Physics of Human Social Systems", DSNP Mar 2025

Peer review

Physical Review X, PRX Life, Physical Review E, Physical Review Research, Annual Reviews of Condensed Matter Physics, and Nature Materials.

Teaching

Yale University (Teaching assistant)

Introduction to Biomechanics (*undergraduate and graduate, guest lecturer*) Fall 2017

Statistical Mechanics (*graduate*) Spring 2017

Intro Physics for the Life Sciences I Fall 2016

Intro Physics for the Life Sciences II Spring 2016

Intro Physics for the Life Sciences I Fall 2015

New York University (Teaching Assistant)

Physics III Spring 2015

Classical & Quantum Waves Fall 2014

Popular Science Publications

APS March Meeting self-organizes online, SoftBites Mar 2020

Spell-checking biology, SoftBites Oct 2018

Scaling up biology, SoftBites Aug 2018

Metastasis: a force to be reckoned with, Hartford Courant May 2018

How the leopard got its spots, SoftBites Apr 2018

Dividing liquid droplets as protocells, SoftBites Feb 2018

Editor for >10 articles for [SoftBites](#)

Outreach

2020 Conference for undergraduate women in physics at Yale organizer 2019

Pathways Summer Scholars Instructor 2018

Splash at Yale Instructor 2017

Yale Science Diplomats 2015-2018

Girl's Science Investigation 2015-2020

"Science as a Creative Endeavor", TedXGallatin lecture 2014

Camp New Day 2013-2015

Co-director of summer science camp for Masa-MexEd 2012

References

- **Vincenzo Vitelli** (Post-doc advisor)
Professor of Physics, University of Chicago
`vitelli@uchicago.edu`
- **Michael P. Murrell** (Ph.D. advisor)
Associate Professor of Biomedical Engineering & Physics, Yale University
`michael.murrell@yale.edu`
- **Benjamin B. Machta**
Associate Professor of Physics, Yale University
`benjamin.machta@yale.edu`