Jayson Paulose

Theoretical soft matter and biological physics

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Research Interests

- Geometry, topology, and defects in soft metamaterials and structures
- Mechanics and statistical physics of biological and active matter
- Statistical physics approaches in population genetics and evolution

Education

2007–2013 **S.M. & Ph.D., Applied Physics**, *Harvard School of Engineering and Applied Sciences*, Cambridge, MA, USA
Dissertation: Cooperativity, fluctuations and inhomogeneities in soft matter
Advisor: David R. Nelson
Collaborations: Joanna Aizenberg, Vinothan N. Manoharan, David A. Weitz

2003–2007 **A.B. with high honors, Physics**, *Princeton University*, Princeton, NJ, USA
Certificates in Engineering Physics and Applications of Computing
Undergraduate thesis: Investigation of electronic eigenstates of positionally disordered systems in two dimensions
Advisor: Ravindra N. Bhatt

Academic Appointments

2018–present **Assistant Professor**, *University of Oregon*, Eugene, OR, USA

2016–2018 **Postdoctoral Research Associate**, *University of California*, Berkeley, CA, USA

2013–2016 **Postdoctoral Research Associate**, *Leiden University*, Leiden, The Netherlands

Publications

Preprints

[1] J. Gonzalez Nuñez, J. Paulose, W. Möbius, D. A. Beller. *Connecting the dots: Range expansions across landscapes with quenched noise*. arXiv:2310·11563 (2023)

[2] A. Melkani, J. Paulose. *Space-time symmetry and parametric resonance in dynamic mechanical systems*. arXiv:2310·08734 (2023)

[3] W. Sun, C. Rasmussen, R. Vetter, J. Paulose. *A geometric mapping from rectilinear material orthotropy to isotropy: Insights to plates and shells*. arXiv:2307·15746 (2023)

Journal articles

[1] N. Villiger, J. Paulose. *The influence of explicit local dynamics on range expansions driven by long-range dispersal*. G3 Genes—Genomes—Genetics **13**:jkad066 (2023)

[2] P. Karki, J. Paulose. *Non-singular and singular flat bands in tunable phononic metamaterials*. Physical Review Research **5**:023036 (2023)

[3] A. Melkani, A. Patapoff, J. Paulose. *Delocalization of interacting directed polymers on a periodic substrate: Localization length and critical exponents from non-Hermitian spectra*. Physical Review E **107**:014501 (2023)

[4] A. Eghdami, J. Paulose, D. Fusco. *Branching structure of genealogies in spatially growing populations*

and its implications for population genetics inference. Journal of Physics: Condensed Matter **34**:294008 (2022)

[5] N. Kruss, J. Paulose. *Nondispersive One-Way Signal Amplification in Sonic Metamaterials*. Physical Review Applied **17**:024020 (2022)

[6] W. Sun, J. Paulose. *Indentation responses of pressurized ellipsoidal and cylindrical elastic shells: Insights from shallow-shell theory*. Physical Review E **104**:025004 (2021)

[7] P. Karki, J. Paulose. *Stopping and Reversing Sound via Dynamic Dispersion Tuning in a Phononic Metamaterial*. Physical Review Applied **15**:034083 (2021)

[8] J. Paulose, O. Hallatschek. *The impact of long-range dispersal on gene surfing*. Proceedings of the National Academy of Sciences **117**:7584 (2020)

[9] R. P. Pedro, J. Paulose, A. Souslov, M. Dresselhaus, V. Vitelli. *Topological Protection Can Arise from Thermal Fluctuations and Interactions*. Physical Review Letters **122**:118001 (2019)

[10] J. Paulose, J. Hermisson, O. Hallatschek. *Spatial soft sweeps: Patterns of adaptation in populations with long-range dispersal*. PLOS Genetics **15**:e1007936 (2019)

[11] G. Baardink, A. Souslov, J. Paulose, V. Vitelli. *Localizing softness and stress along loops in 3D topological metamaterials*. Proceedings of the National Academy of Sciences **115**:489 (2018)

[12] H. Abbaszadeh*, A. Souslov*, J. Paulose, H. Schomerus, V. Vitelli. *Sonic Landau Levels and Synthetic Gauge Fields in Mechanical Metamaterials*. Physical Review Letters **119**:195502 (2017)

[13] F. Wong, L. D. Renner, G. Özbaykal, J. Paulose, D. B. Weibel, et al. *Mechanical strain sensing implicated in cell shape recovery in Escherichia coli*. Nature Microbiology **2**:17115 (2017)

[14] M. Pelliccia*, P. Andreozzi*, J. Paulose*, M. D'Alicarnasso, V. Cagno, et al. *Additives for vaccine storage to improve thermal stability of adenoviruses from hours to months*. Nature Communications **7**:13520 (2016)

[15] B. C. van Zuiden*, J. Paulose*, W. T. M. Irvine, D. Bartolo, V. Vitelli. *Spatiotemporal order and emergent edge currents in active spinner materials*. Proceedings of the National Academy of Sciences **113**:12919 (2016)

[16] A. S. Meeussen*, J. Paulose*, V. Vitelli. *Geared Topological Metamaterials with Tunable Mechanical Stability*. Physical Review X **6**:041029 (2016)

[17] B. G.-g. Chen, B. Liu, A. A. Evans, J. Paulose, I. Cohen, et al. *Topological Mechanics of Origami and Kirigami*. Physical Review Letters **116**:135501 (2016)

[18] J. Paulose, A. S. Meeussen, V. Vitelli. *Selective buckling via states of self-stress in topological metamaterials*. Proceedings of the National Academy of Sciences **112**:7639 (2015)

[19] J. Paulose, B. G.-g. Chen, V. Vitelli. *Topological modes bound to dislocations in mechanical metamaterials*. Nature Physics **11**:153 (2015)

[20] G. Meng, J. Paulose, D. R. Nelson, V. N. Manoharan. *Elastic Instability of a Crystal Growing on a Curved Surface*. Science **343**:634 (2014)

[21] J. Paulose, D. R. Nelson. *Buckling pathways in spherical shells with soft spots*. Soft Matter **9**:8227 (2013)

[22] A. Amir, J. Paulose, D. R. Nelson. *Theory of interacting dislocations on cylinders*. Physical Review E **87**:042314 (2013)

[23] J. Paulose, G. A. Vliegenthart, G. Gompper, D. R. Nelson. *Fluctuating shells under pressure.* Proceedings of the National Academy of Sciences of the United States of America **109**:19551 (2012)

[24] S. S. Datta*, S.-H. Kim*, J. Paulose*, A. Abbaspourrad, D. R. Nelson, D. A. Weitz. *Delayed Buckling and Guided Folding of Inhomogeneous Capsules.* Physical Review Letters **109**:134302 (2012)

[25] J. Paulose, D. R. Nelson, J. Aizenberg. *Two-parameter sequential adsorption model applied to microfiber clustering.* Soft Matter **6**:2421 (2010)

*Equal contribution

Honors & Awards

2022 National Science Foundation CAREER Award
2020 Outstanding Referee, American Physical Society journals
2017 Martin and Beate Block Award, Aspen Center for Physics
2009 Liviu Librescu Graduate Student Research Fellowship in Engineering, Harvard University
2007 Jeffrey O. Kephart '80 Engineering Physics Award, Princeton University
2007 Allen G. Shenstone Prize in Physics, Princeton University
2007 PRISM Newport Award in Photonics, Princeton University
2006 Kusaka Memorial Prize in Physics, Princeton University
2005 Shapiro Prize for Academic Excellence, Princeton University
2004 Shapiro Prize for Academic Excellence, Princeton University
2004 Manfred Pyka Memorial Physics Prize, Princeton University Physics Department
Elected to Sigma Xi, 2007
Elected to Phi Beta Kappa, 2007

Seminars & Invited talks

Jul 2023 *Complex Mechanical Metamaterials* workshop, University of Michigan
Feb 2023 *Physics Colloquium*, Oregon State University
Sep 2022 *Physics Colloquium*, University of Oregon
Feb 2022 *Soft/Bio Group Meeting*, Harvard University
Oct 2021 *IFS Seminar*, University of Oregon
Nov 2020 *Soft/Bio Group Meeting*, Harvard University
Nov 2020 *META Systems Biology Seminar*, University of Oregon
Sep 2020 *Verily Tech Talk*, Verily Life Sciences, CA
Feb 2020 *Biophysics/Soft Matter Seminar*, Simon Fraser University, Vancouver
Jan 2020 *Physical Chemistry Seminar*, University of Oregon
Jul 2019 *Condensed Matter Seminar*, Indian Institute of Technology Madras
Mar 2019 *Topology Matters: Structure-Property Relationships On Different Length Scales* (invited session), American Physical Society March Meeting, Boston
Nov 2018 *ITS Seminar*, University of Oregon
Mar 2018 *Topological Protection in Messy Matter* workshop, CRASI, Georgia Institute of Technology
Jan 2017 *Topological Metamaterials and Beyond* workshop, Aspen Center for Physics
May 2016 *Topological Matter at H-Zero* workshop, Lorentz Center, Leiden University
Feb 2016 *Physics Seminar*, Northeastern University
Jan 2016 *Physics Colloquium*, University of Oregon
Dec 2015 *Condensed Matter Seminar*, University of Massachusetts Amherst

Mar 2015 *Small Clusters, Polymer Vesicles and Unusual Minima* workshop, ICERM, Brown University
Jan 2015 *James Franck Institute Seminar*, The University of Chicago
Nov 2014 *Widely Applied Mathematics Seminar*, Harvard SEAS
Nov 2014 *MRSEC Seminar*, Brandeis University
Nov 2014 *MRSEC Seminar*, University of Pennsylvania
Apr 2014 *Theoretical Physics Seminar*, Technische Universität Dortmund
Feb 2013 *IFB Seminar*, Eidgenössische Technische Hochschule Zürich
Feb 2013 *Biophysics Seminar*, École Normale Supérieure, Paris
Jan 2013 *Theory Group Seminar*, Instituut-Lorentz, Leiden University
Dec 2012 *Soft Matter Seminar*, Syracuse University
Oct 2012 *Junior Speaker*, *Outcomes in Graduate Education*, The University of Chicago
Jan 2012 *Special Lecture*, SCMS Institute of Bioscience and Biotechnology, Cochin, India
Apr 2011 *Widely Applied Mathematics Seminar*, Harvard SEAS
Apr 2010 *Kavli Meeting*, KIBST, Harvard University
Feb 2010 *Condensed Matter Theory Kids' Seminar*, Harvard University
Dec 2009 *Group Seminar*, Theoretical Soft Matter & Biophysics, Forschungszentrum Jülich
Nov 2009 *Biocomplexity Meeting*, CMOL, Niels Bohr Institute, Copenhagen

Teaching & Mentorship

University of Oregon

PHYS 162 Physics of Solar and Renewable Energies [undergraduate non-major]. Spring 2023
PHYS 612-3 Theoretical and Statistical Mechanics [graduate]. Winter 2023, Winter 2022, Winter 2020
PHYS 611 Theoretical Mechanics [graduate]. Fall 2021, Fall 2019, Fall 2018
PHYS 181 Quantum Mechanics for Everyone [undergraduate non-major]. Spring 2021
PHYS 614 Statistical Mechanics [graduate]. Spring 2021, Spring 2020
PHYS 352 Thermal Physics [undergraduate major]. Winter 2019

Research co-supervision (as postdoctoral researcher)

2018 Masters' thesis of Tom Suter, École Polytechnique Fédérale de Lausanne (with O. Hallatschek)
2015–2016 Masters' thesis of Anne Meeussen, Leiden University (with V. Vitelli)

Teaching assistant (as graduate student, Harvard University)

Fall 2011 Statistical Thermodynamics [graduate]
Spring 2011 Statistical Thermodynamics and Quantitative Biology [advanced undergraduate]
Spring 2010 Advanced Classical Electromagnetism [graduate]
Spring 2009 Statistical Thermodynamics and Quantitative Biology [advanced undergraduate] (received *Harvard University Certificate of Distinction in Teaching* based on student evaluations)
Fall 2008 Introduction to Solid-State Physics [advanced undergraduate]

Professional Activities

- Speaker, *Living Histories* biographical talk series, 20 Sept 2023
- Co-organizer of scientific session *Emergent mechanics of active, robotic and living materials*, Americal Physical Society March Meeting, 2022, 2021
- NSF Panelist 2023, 2021, 2020
- Guest co-editor, *New Journal of Physics Focus Issue: Topological Mechanics* (2016)

- Co-organizer, *Soft and Biological Matter Seminar*, Leiden University (2014–2015)
- Co-organizer, *Condensed Matter Theory Kids' Seminar*, Harvard University (2012–2013)
- Manuscript reviewer for journals including *European Physics Journal E*, *Nanoscale*, *Nature Communications*, *Nature Physics*, *Physical Review E*, *Physical Review Letters*, *Proceedings of the National Academy of Sciences*, *Science Advances*, and *Soft Matter*.

Outreach

- Volunteer, *Eugene Youth Math Festival*, University of Oregon (2023, 2020, 2019)
- Speaker, *Summer Academy to Inspire Learning*, University of Oregon (2023, 2020)
- Speaker, Science Slam, *Oregon Country Fair*, Veneta, OR (2019)
- Speaker, Physics Slam, *Conference for Undergraduate Women in Physics*, University of Oregon (2018)

Conferences, Workshops & Visiting appointments

Mar 2023	*March Meeting*, American Physical Society, Las Vegas
Mar 2022	*March Meeting*, American Physical Society, Chicago
Summer 2021	KITP Program: *The Physics of Elastic Films: from Biological Membranes to Extreme Mechanics*, Kavli Institute of Theoretical Physics (virtual)
March 2021	*March Meeting*, American Physical Society (virtual)
August 2019	*Soft Matter Gordon Research Conference*, New London
Mar 2019	*March Meeting*, American Physical Society, Boston
May 2018	*Topological Protection in Messy Matter* workshop, CRASI, Georgia Institute of Technology
Apr 2018	*Conference on Theory & Biology*, Simons Foundation, New York
Mar 2018	*March Meeting*, American Physical Society, Los Angeles
Jan 2017	*Topological Metamaterials and Beyond* workshop, Aspen Center for Physics
May 2016	*Topological Matter at H-Zero* workshop, Lorentz Center, Leiden University
Nov 2015	*Fall Meeting*, Materials Research Society, Boston
Jun 2015	*Designer Matter* workshop, AMOLF, Amsterdam
Mar 2015	*March Meeting*, American Physical Society, San Antonio
Jan 2015	*Physics@FOM*, Veldhoven
Oct 2014	*Topological Mechanics: from metamaterials to robots* workshop, Lorentz Center, Leiden University
Jun 2014	Visiting scholar, ESPCI Paris
Jan 2014	*Physics@FOM*, Veldhoven
Nov 2012	*Fall Meeting*, Materials Research Society, Boston
Mar 2012	*March Meeting*, American Physical Society, Boston
Jul 2011	*Workshop on Sphere Packing and Amorphous Materials*, Abdus Salam International Centre for Theoretical Physics, Trieste
Mar 2011	*March Meeting*, American Physical Society, Dallas
Aug 2010	*DynaSoft2010: Dynamics in soft condensed matter*, Institut d' Études Scientifiques de Cargèse, Corsica
Mar 2010	*March Meeting*, American Physical Society, Portland
Fall 2009	Visiting scholar, Neils Bohr Institute, Copenhagen
Jul 2009	*Boulder School for Condensed Matter and Materials Physics: Nonequilibrium Statistical Mechanics*, University of Colorado, Boulder
Mar 2008	*March Meeting*, American Physical Society, New Orleans