Bezia Lemma

Princeton - Chemical & Biological Engineering

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Education

2021 **PhD Physics**, *Harvard, Graduate School of Arts and Science.*
Thesis: Hierarchical phases of filamentary active matter
Advisors: Daniel Needleman & Zvonimir Dogic

2015 **M.Sc. Engineering Physics**, *Universiteit Gent/University de Lorraine.*
Thesis: Helicity conservation in the dynamical evolution of magnetic flux tubes
Advisor: Daniele Del Sarto

2013 **B.S. Physics**, *New York University, College of Arts & Science.*
Advisor: Paul Chaikin

Publications

Structure and dynamics of motor-driven microtubule bundles
Bezia Lemma, Linnea Lemma, Stephanie Ems-McClung, Claire Walczak, Daniel Needleman, Zvonimir Dogic, *Accepted, Soft Matter, doi.org/10.48550/arXiv.2209.06637*, 2024

Spatial patterning of energy metabolism during tissue morphogenesis
Bezia Lemma, Celeste M. Nelson *Current Opinion in Cell Biology, doi:10.1016/j.ceb.2023.102235*, 2023

Dissipation and energy propagation across scales of an active cytoskeletal material
Peter Foster, Jinhye Bae, **Bezia Lemma**, Juanjuan Zheng, William Ireland, Haitao Zhang, Pooja Chandrakar, Rémi Boros, Zvonimir Dogic, Daniel Needleman, Joost Vlassak, *PNAS, doi:10.1073/pnas.2207662120*, 2023

Plasticity in airway smooth muscle differentiation during mouse lung development
Katharine Goodwin, **Bezia Lemma**, Pengfei Zhang, Adam Boukind, Celeste M. Nelson *Developmental Cell, doi:10.1016/j.devcel.2023.02.002*, 2023

Origins of smooth muscle and evolutionary specializations of the pulmonary mesenchyme in the vertebrate lung
Katharine Goodwin, Michael Palmer, **Bezia Lemma**, Celeste M. Nelson *bioRxiv, doi:10.1101/2022.07.13.499952*, 2022

Active microphase separation in mixtures of microtubules and tip-accumulating molecular motors
Bezia Lemma, Noah Mitchell, Radhika Subramanian, Daniel Needleman, Zvonimir Dogic, *PRX, doi.org/10.1103/PhysRevX.12.031006*, 2022

Engineering stability, longevity, and miscibility of microtubule-based active fluids
Pooja Chandrakar, John Berezney, **Bezia Lemma**, Bernard Hishamunda, Angela Berry, Kun-Ta Wu, Radhika Subramanian, Johnson Chung, Daniel Needleman, Jeff Gelles, Zvonimir Dogic, *Soft Matter, doi:10.1039/D1SM01289D*, 2020

Actively crosslinked microtubule networks: mechanics, dynamics and filament sliding
Sebastian Fürthauer, **Bezia Lemma**, Peter Foster, Stephanie Ems-McClung, Claire Walczak, Zvonimir Dogic, Daniel Needleman, Michael Shelley, *Nature Physics, doi:10.1038/s41567-019-0642-1*, 2019

Re-entrant solidification in polymer–colloid mixtures as a consequence of competing entropic and enthalpic attractions
Lang Feng[‡], **Bezia Laderman**[‡], Stefano Sacanna, Paul Chaikin, *Nature Materials, doi:10.1038/nmat4109*, 2014

Awards and Honors

2024 **NESDB** Best Postdoctoral Poster, 2nd place
2023 **NSF** PRFB Fellowship, $240,000
2023 **SDB** Best Postdoctoral Presentation, 2nd place
2017, 2020 **Harvard University** - Certificate of Distinction in Teaching
2017 **Nikon** - Small World In Motion Competition, 4th Place
2017 **Harvard University** - Wallace-Noyes Fellowship
2016 **Harvard University** - An Wang Fellowship, 2016; Purcell Fellowship, 2015
2014 **Universiteit Gent** - Scholarship for Summer Courses at SPbSPU
2013 **European Union** - Erasmus Mundus Two-Year Full Scholarship

Teaching

2023 **Assistant-in-Instruction**, *Princeton*, Physical Basis of Disease.
2020 **Teaching Fellow**, *Harvard*, Science and Cooking: From Haute Cuisine to Soft Matter Science.
2019 **Derek Bok Center Teaching Certificate**, *Harvard*.
2017 **Teaching Fellow**, *Harvard*, Introduction to Fluid Mechanics and Transport Processes.
2011 - 2013 **Course Tutor**, *NYU*, General Physics I & II.

Presentations and Posters

2024 Poster at Society for Developmental Biology Northeast Regional Meeting, Woods Hole, MA
'Coupling mitochondrial energy metabolism to branching morphogenesis in the developing avian lung'

2023 Presentation at American Society for Cellular Biology, Boston, MA
'Patterning of mitochondrial energy metabolism during early avian lung morphogenesis'

2023 Presentation at EMBO Workshop, 'Developmental metabolism', EMBL, Heidelberg, Germany,
'Connections between energy metabolism and morphogenesis in the developing lung'

2023 Presentation at Society for Developmental Biology, Chicago, IL,
'Coupling energy metabolism to morphogenesis in the developing lung'

2019 Poster at Soft Matter Gordon Research Conference, New London, NH
'Structure and Dynamics of Polarity Sorting Filamentary Systems'

2018 Presentation at Brandeis Bioinspired Soft Materials MRSEC Winter School, Bretton Woods, NH
'Structure and Dynamics of Polarity Sorting Filamentary Systems'

2018 Poster at Aspen Winter Conference for Active Matter, Aspen, CO
'Is the motion of microtubule and kinesin-14 bundles related to polarity?'

2015 Poster at SPP-SO Workshop, Florence, Italy
'Flux Rope Collision And Merging In The Inertial MHD Regime'

2013 Presentation at American Physical Society, Baltimore, MD
'Temperature dependent depletion interaction from PEO and other polymers'

2013 Poster at American Astronomical Society Meeting, Long Beach, CA
'Time Series Photometry of Two Southern Hemisphere AM CVn Stars'

Outreach and Service

2023 Special Interest Subgroup organizer, American Society for Cellular Biology
2022 Science Day - Día de la Ciencia
2022 Summer research program for high school students - Princeton Learning Lab
2018-2021 Creator of, and writer for, LabOnTheCheap
2011-2012 Host for 'The Doppler Effect' radio show on WNYU 89.1 FM.

Employment

2022 **Postdoctoral fellow**, *Princeton Department of Chem. & Bio. Engineering*, Princeton, NJ.

2013 **Junior Research Scientist**, *NYU Center for Condensed Matter Physics*, New York, NY.

2010 - 2013 **Senior Webmaster**, *Courant Institute,*, New York, NY.

2008 - 2009 **Active Service**, *United States Air Force*, Colorado Springs, CO, USAFA.

Additional Research Experiences

2012 **DAAD RISE**, *AICES*, RWTH Aachen, Germany, Advisors: Georg May and Aravind Balan.
Implemented numerical shock-capturing schemes for a Discontinuous Galerkin fluid simulation.

2012 **NSF REU**, *CTIO*, La Serena, Chile, Advisor: Tim Abbott.
Acquired photometry of cataclysmic variable star systems and determined their periodicity.

2011 **U.S. DoE Summer Fellowship**, *INFN, LNS*, Sicilia, Italy, Advisor: Cettina Maiolino .
Developed ROOT/GEANT4 code to fit scintillator signals of MEDEA in response to neutrons.

Relevant Courses

- **Undergraduate Level:** Experimental Physics – Astrophysics – Atmosphere & Ocean Fluid Dynamics – Computational Physics – Condensed Matter Physics – Dynamics – Engineering Design – Linear Algebra – Mathematical Physics – Organic Chemistry – Topology
- **Graduate Level:** Data Processing – E&M – Quantum I & II – Applied E& M– Atomic & Molecular Physics – Computational Wave Solutions – Continuum Mechanics – Electron Microscopy – Fusion Tech. – Higher Representations – Magnetohydrodynamics – Nuclear Instrumentation – Plasma Physics – Plasma Turbulence – Quantum Field Theory – Statistical Physics

References

- **Celeste Nelson**, Wilke Family Professor, Bioengineering, Princeton
- **Andrej Košmrlj**, Associate Professor, Mechanical and Aerospace Engineering, Princeton
- **Zvonimir Dogic**, Professor, Physics, UCSB
- **Daniel Needleman**, Gordon McKay Professor, Applied Physics, Molecular and Cellular Biology, Harvard
- **Radhika Subramanian**, Assistant Prof. of Genetics, Mass. General Hospital