ORIT PELEG

University of Colorado at Boulder
Department of Computer Science
Department of Ecology and Evolutionary Biology (courtesy)
BioFrontiers Institute
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Research Interests

My research is aimed at understanding how organisms buffer themselves against large environmental fluctuations and accommodate adaptation over a wide range of length and time scales. This includes protein assemblies that remain intact under varying external mechanical and chemical stimuli, beetles that navigate using volatile celestial cues, and honeybee clusters that change their morphology to both withstand mechanical stresses, and to regulate their bulk temperature.

Academic Appointments

University of Colorado at Boulder, USA – 2018–Present
Assistant Professor at the Computer Science Department and the Biofrontiers Institute

Santa Fe Institute, USA – 2019–Present
External Professor

Harvard University, USA – 2014–2017
Postdoctoral Fellow at John A. Paulson School Of Engineering And Applied Sciences
Advisor: Prof. L. Mahadevan

Harvard University, USA – 2012–2013
Postdoctoral Fellow at the Department of Chemistry and Chemical Biology
Advisor: Prof. E. Shakhnovich

ETH Zürich and University of Zürich, Switzerland – 2012
Research assistant at the Institute of Neuroinformatics (INI)
Advisor: Prof. R. Hahnloser

Education

PhD in Materials Science, ETH Zürich, Switzerland – 2008–2012
Thesis title: "Simple Models of Competitive Interactions in Biophysical Systems" advised by Prof. Martin Kröger, Prof. Viola Vogel and Prof. Yitzhak Rabin

MSc degree in Physics, Bar-Ilan University, Israel, ***summa cum laude*** – 2006–2007
Thesis title: "Simple Model of Microphase Separation in Polymer Gels; Molecular Dynamics Approach" advised by Prof. Yitzhak Rabin

BSc degree in Physics & Computer Science, Bar-Ilan University, Israel – 2003–2007

Peer Reviewed Journal Publications

1. R. Sarfati, J. Hayes, O. Peleg
Self-organization in natural swarms of Photinus carolinus synchronous fireflies
Science Advances, 7 (28), eabg9259 (2021)

2. D.M. T. Nguyen, M. L. Iuzzolino, A. Mankel, K. Bozek, G. J. Stephens, O. Peleg
Flow-mediated olfactory communication in honey bee swarms
Proc. Natl. Acad. Sci. USA
118 (13) e2011916118 (2021)

3. R. Sarfati, J. Hayes, E. Sarfati, O. Peleg
Spatiotemporal reconstruction of emergent flash synchronization in firefly swarms via stereoscopic 360-degree cameras
J. R. Soc. Interface 17:170 (2020)

4. G.K. Nave, N.T. Mitchell, J.A. Chan Dick, T. Schuessler, J.A. Lagarrigue, O. Peleg
Attraction, dynamics, and phase transitions in fire ant tower-building
Front. Robot. AI 7:25 (2020)

5. S. Bidari, O. Peleg, Z.P. Kilpatrick
Social inhibition maintains adaptivity and consensus of foraging honeybee swarms in dynamic environments
J. R. Soc. Open Sci. 6:12 (2019)

6. L. Khaldy, O. Peleg, C. Tocco, L. Mahadevan, M. Byrne and M. Dacke
The effect of step size on straight-line orientation
J. R. Soc. Interface 16: 20190181 (2019)

7. J. Peters, O. Peleg, L. Mahadevan
Collective ventilation in honeybee nests
J. R. Soc. Interface 16: 20180561 (2019)

8. O. Peleg
Mechanical hive mind Phys. Today 72(4), 66 (2019)

9. O. Peleg*, J. Peters*, M. Salcedo, L. Mahadevan
Collective mechanical adaptation of honeybee swarms
Nat. Phys. 14, 1193–1198 (2018) *Contributed equally to this work

10. O. Peleg, L. Mahadevan
Optimal switching between geocentric and egocentric strategies in navigation
J. R. Soc. Open Sci. 3, 160128 (2016)

11. L.S. Shagolsem, D. Osmanovic, O. Peleg, Y. Rabin
Pair interaction ordering in fluids with random interactions J. Chem. Phys. 142, 051104 (2015)

12. O. Peleg, J.M. Choi, E. Shakhnovich
Evolution of specificity in protein-protein interactions
Biophys. J. 107 (7), 1686-1696 (2014)

13. M.B. Harasim, B. Wunderlich, O. Peleg, M. Kröger, A.R. Bausch
Direct observation of the dynamics of semiflexible polymers in shear flow
Phys. Rev. Lett. 110, 108302 (2013)

14. M. Tagliazucchi*, O. Peleg*, M. Kröger, Y. Rabin, I. Szleifer
Effect of charge, hydrophobicity and sequence of nucleoporins on the translocation of model particles through the nuclear pore complex
Proc. Natl. Acad. Sci. USA 110, 3363–3368 (2013)
*Contributed equally to this work

15. O. Peleg, T. Savin, G. Kolmakov, I. Salib, M. Kröger, A.C. Balazs, V. Vogel
Fibers with integrated mechano-chemical switches: Minimalistic design principles derived from fibronectin
Biophys. J. 103, 1909 (2012)

16. I. Salib, G. Kolmakov, B. Bucior, O. Peleg, T. Savin, M. Kröger, V. Vogel, K. Matyjaszewski, A.C. Balazs
Using mesoscopic models to design strong and tough biomimetic polymer networks
Langmuir 27, 13796–13805 (2011)

17. O. Peleg*, M. Tagliazucchi*, M. Kröger, Y. Rabin, I. Szleifer
Direct observation of the dynamics of semiflexible polymers in shear flow
ACS Nano, 5(6), 4737, (2011) *Contributed equally to this work

18. O. Peleg, R.Y.H. Lim
Converging on the function of intrinsically disordered nucleoporins in the nuclear pore complex
Biol. Chem. 391, 719–730 (2010)

19. M. Kröger, O. Peleg, A. Halperin
From dendrimers to dendronized polymers and forests: Scaling theory and its limitations
Macromolecules 43, 6213–6224 (2010)

20. S. Fransson, O. Peleg, N. Loren, A.-M. Hermansson, M. Kröger
Modelling and confocal microscopy of biopolymer mixtures in confined geometries
Soft Matter 6, 2713–2722 (2010)

21. O. Peleg, M. Kröger, Y. Rabin
Effect of network topology on phase separation in two–dimensional Lennard–Jones networks
Phys. Rev. E 79, 040401(R); also included in the Virtual J. Biol. Phys. 17:8 (2009)

22. O. Peleg, M. Kröger, Y. Rabin
Model of microphase separation in two-dimensional gels
Macromolecules 41, 3267–3275 (2008)

23. M. Kröger, O. Peleg, Y. Ding, Y. Rabin
Formation of double helical and filamentous structures in models of physical and chemical gels
Soft Matter 4, 18–28 (2008)

24. O. Peleg, M. Kröger, I. Hecht, Y. Rabin
Filamentous networks in phase-separating two-dimensional gels
Europhys. Lett. 77, 58007 (2007)

Papers In Preparation / Under Peer Review

O. Shishkov, O. Peleg
Soft, Dense, and Active Invertebrate Aggregations
Submitted (2021)

C. Kempes, O. Peleg
On the Hidden Physics of Social Aggregations
In Prep (2021)

R. Sarfati, O. Peleg
Calibration-free 3D reconstruction of firefly trajectories from 360-degree cameras
Submitted, pre-print on bioRxiv (2021)

J. Peters, O. Peleg, L. Mahadevan
Thermoregulatory morphodynamics of honeybee clusters
Submitted (2021)

C. Nguyen, Y. Ozkan-Aydin, H. Tuazon, D. I. Goldman, S. Bhamla, O. Peleg
Emergent collective locomotion in an active polymer model of entangled worm blobs
Submitted, pre-print on bioRxiv (2021)

Peer Reviewed Conference Proceedings

[CP] Conference Paper **[EA]** Extended Abstract

[CP] D.M. T. Nguyen, G. Gharooni Fard, M. L. Iuzzolino, O. Peleg
Robustness of collective scenting in the presence of physical obstacles. International Symposium on Swarm Behavior and Bio-Inspired Robotics (SWARM2021) (2021)

[CP] G.G. Fard, E. Bradley, O. Peleg
Data-driven modeling of resource distribution in honeybee swarms The 2020 Conference on Artificial Life (ALIFE) (2020); 60.1% acc. rate.

[EA] G.G. Fard, E. Bradley, O. Peleg
Data-driven modeling of resource distribution in honeybee swarms
Collective Intelligence (CI) 2020 (2020)

[EA] G.G. Fard, E. Bradley, O. Peleg
An Integrated Experimental-modeling Approach to Resource Sharing in Honeybee Swarms
Robotic-inspired Biology workshop at the International Conference on Intelligent Robots and Systems (IROS) (2020)

[EA] D.M. T. Nguyen, M. L. Iuzzolino, A. Mankel, K. Bozek, G. J. Stephens, O. Peleg
Flow-mediated olfactory communication in honey bee swarms
Robotic-inspired Biology workshop at the International Conference on Intelligent Robots and Systems (IROS) (2020)

[EA] C. Nguyen, I. Huang, O. Peleg
Firefly-inspired vocabulary generator for communication in multi-agent systems
Robotic-inspired Biology workshop at the International Conference on Intelligent Robots and Systems (IROS) (2020)

Conference and Seminar Talks

[P] Plenary **[I]** Invited **[C]** Contributed
Only listing talks delivered by Dr. Peleg

1. **[I]** Title: TBD. Weizmann Institute of Science, workshop on "From individual to group decision making: experiments and theory" (2022)
2. **[I]** Title: TBD. IUSSI meeting in San Diego, Symposium on Advances in Collective Behavior (2022)
3. **[I]** Title: TBD. Condensed/living matter seminar Physics Department, University of Pennsylvania (2021)
4. **[I]** Title: Collective Ecophysiology and Physics of Honey Bee Swarms. Ernst Strüngmann Institute at Max Planck Society (Frankfurt, Geremany), Systems Neuroscience Conference (ESI SyNC) (2021)
5. **[I]** Title: The physics of firefly communications: Principles and predictions. University College London, Symposium on Intelligent-ish: How Dumb Agents Do Clever Things (2021)
6. **[I]** Title: Collective Ecophysiology and Physics of Honey Bee Swarms. University of Cambridge Theory of Living Matter Seminar (2021)
7. **[I]** Title: The physics of firefly communications: Principles and predictions. World Wide Neuro Online Learning Salon (2021)
8. **[I]** Title: The physics of firefly communications: Principles and predictions. American Physical Society (APS) March Meeting Symposium on *Living timekeepers: Precision measurements, emergent simplicities and physics theory* (2021)
9. **[I]** Title: Collective Ecophysiology and Physics in Bee Swarms . Institute of Integrative Biology (D-USYS) at ETH Zurich (2021)

10. [I] Title: Spatio-temporal reconstruction of emergent flash synchronization in firefly swarms. The Bell Edwards Geographic Data Institute Seminar. School of Geography and Sustainable Development, University of St Andrews in Scotland (2021)

11. [I] Title: On Growth and Form of Dense Insect Aggregations. ICTP-SAIFR Complex Systems Seminar. Institute of Theoretical Physics of São Paulo State University, Brazil (2021)

12. [I] Title: Collective Ecophysiology and Physics of Honeybees. Virtual Systems Neuroecology Seminar Series (2021)

13. [P] Collective Ecophysiology and Physics of Honeybees. ANTS 2020, Twelfth International Conference on Swarm Intelligence (2020)

14. [I] Insect Aggregations. Online Course "Complexity Interactive", Santa Fe Institute (2020)

15. [I] Mechanical Hive Mind. Centre for the Advanced Study of Collective Behaviour (CASCB) at the University of Konstanz (2020)

16. [I] Flow-Mediated Olfactory Communication in Honey Bee Swarms. Virtual AMS Fall Southeastern Sectional Meeting (2020)

17. [I] On Growth and Form of Dense Insect Aggregations. Theory and Modeling of Living Systems Workshop on (What) can soft matter physics teach us about biological function? Emory University (2020)

18. [I] Mechanical Hive Mind. Virtual Biological Physics/Physical Biology (BPPB) Seminar (2020)

19. [P] Collective Ecophysiology and Physics of Honeybees. The 10th International Conference on Complex Systems (2020)

20. [C] Data-driven Modeling of Resource Distribution in Honeybee Swarms. ALIFE 2020, The 2020 Conference on Artificial Life (2020)

21. [C] Data-driven Modeling of Resource Distribution in Honeybee Swarms. ACM Collective Intelligence 2020 (2020)

22. [I] Collective Aggregation via Directed Pheromone Signaling in Honeybee Swarms. SIAM Conference on the Life Sciences (2020)

23. [C] Collective Aggregation via Directed Pheromone Signaling in Honeybee Swarms. American Physical Society (APS) March Meeting (2020)

24. [I] Collective Ecophysiology and Physics of Honeybees. Nonlinear Science & Mathematical Physics Seminar Series, Georgia Institute of Technology, GA, USA (2020)

25. [I] Collective Ecophysiology and Physics of Honeybees. Physics Colloquium, Emory University, GA, USA (2020)

26. [I] Collective Ecophysiology and Physics of Honeybees. Institute of Cognitive Science Colloquium, University of Colorado Boulder, CO, USA (2020)

27. [I] Collective Ecophysiology and Physics of Honeybees. Ecology and Evolutionary Biology Seminar, Princeton University, NJ, USA (2019)

28. [C] Collective Mechanical Adaptation of Honeybee Swarms. SIAM Conference on Dynamical Systems (2019)

29. [I] Physics of Social Insects. Computations in Science Seminars, University of Chicago, IL, USA (2019)

30. [I] Physics of Social Insects. Center for Nonlinear Studies Colloquia, Los Alamos National Laboratory, NM, USA (2019)

31. [C] Collective Physical Computation in Honeybee Swarms. Workshop on What is Biological Computation?, SFI, USA (2019)

32. [I] Collective Mechanical Adaptation of Honeybee Swarms. American Physical Society (APS) March Meeting (2019)

33. [I] Physics of Social Insects. The Boulder School in Condensed Matter and Materials Physics, CO, USA (2019)

34. [I] Collective Adaptation in Honeybee Swarms. Bio-mechanics workshop on Cell membrane dynamics and micro-circulation in tissue, University of Oslo, Norway (2018)

35. [I] The Physics of Disordered Living Systems: Collective Adaptation in Honeybee Swarms. PIER Graduate Week, University of Hamburg, Germany (2018)

36. [I] Intrinsically Disordered Living Systems. Santa Fe Institute Seminar, NM, USA (2018)

37. [I] Collective Ecophysiology and Physics of Honeybees. Active Matter Workshop, University of Colorado Boulder CO, USA (2018)

38. [I] Collective Ecophysiology and Physics of Honeybees. SIAM Conference on the Life Sciences (2018)

39. [I] Collective Mechanical Adaptation of Honeybee Swarms. Robinson Lab Seminar, University of Illinois, Urbana Champaign, IL, USA (2018)

40. [I] Local Sensing in Disordered Living Systems. Janelia/MSRI Summer Graduate School on Mathematical Analysis of Behavior VA, USA (2018)

41. [C] Collective Mechanical Adaptation of Honeybee Swarms. Dynamics Days, CO, USA (2018)

42. [I] Honeybee Collective Behavior. Summer Program of the Aspen Center for Physics (ACP), CO, USA (2018)

43. [I] Collective Ecophysiology and Physics of Social Insects. QBio Seminar, University of California San Diego, CA, USA (2018)

44. [I] Collective Mechanical Adaptation of Honeybee Swarms. Bioinformatics Supergroup Seminar, University of Colorado Boulder, CO, USA (2018)

45. [C] Collective Mechanical Adaptation of Honeybee Swarms. Distributed, Collective Computation in Biological and Artificial Systems Meeting, Janelia Research Campus, VA, USA (2018)

46. [I] Collective Mechanical Adaptation of Honeybee Swarms. 2nd Week on Complexity Sciences at C3-UNAM, Mexico City, Mexico (2018)

47. [I] Local Sensing in Disordered Living Systems. Biophysics Seminar Series, Princeton University, NJ, USA (2017)

48. [I] Local Sensing in Disordered Living Systems. Mechanical Engineering Special Seminar, MIT, MA, USA (2017)

49. [I] Local Sensing in Disordered Living Systems. Complex Systems Seminar, University of Michigan, MI, USA (2017)

50. [I] Local Sensing in Disordered Living Systems. BioFrontiers Symposium and Computer Science Colloquium, University of Colorado Boulder, CO, USA (2017)

51. [C] Mechanical Adaptation in Adhesive Bee Swarms. American Physical Society (APS) March Meeting, LA, USA (2017)

52. [C] How a Bee Swarm Adapts to Dynamic Mechanical Stress. Society for Integrative and Comparative Biology (SICB) Annual Meeting, LA, USA (2017)

53. [C] Optimal Switching between Geocentric and Egocentric Strategies in Navigation. Insect Navigation Workshop, Janelia Research Campus, VA, USA (2016)

54. [C] Ecophysiology of Honeybee Swarms. 18th Annual Greater Boston Area Statistical Mechanics Meeting, Brandeis University MA, USA (2016)

55. [C] Dynamic Morphology in Honeybee Swarms. Annual Meeting of the International Physics of Living Systems (iPoLS) Network, Harvard University MA, USA (2016)

56. [C] Dynamic Morphology in Honeybee Swarms. Workshop on Active and Smart Matter: A New Frontier for Science and Engineering, Syracuse University, NY, USA (2016)

57. [C] Dynamic Morphology in Honeybee Swarms. Workshop on Social Insects In the North East Regions, Pennsylvania State University, PA, USA (2016)

58. [I] Systems Biophysics of Protein–Protein Interactions. Green Center for Systems Biology, Texas University Southwestern Medical Center TX, USA (2015)

59. [C] Optimal Intermittent Reorientation in Insect Navigation. Gordon Research Conference on Stochastic Physics in Biology, CA, USA (2015)

60. [C] Evolution of Specificity in Protein-Protein Interactions. 16th Annual Greater Boston Area Statistical Mechanics Meeting, Brandeis University, MA, USA (2015)

61. [I] Phase Separation in Randomly Crosslinked Elastic Lennard–Jones Networks. EU STREP meeting, Gothenburg, Sweden (2008)

Teaching Experience

CSCI–5/4314, Dynamic Models in Biology, University of Colorado at Boulder; Spring 2019, 2020 ,2021

CSCI–5423, Bio–inspired Multi–agent Systems, University of Colorado at Boulder; Spring 2018, 2019, 2020 2021

Bio-Math REU Program, The University of North Carolina at Greensboro; Summer 2019

Summer Graduate School on Mathematical Analysis of Behavior, Janelia Research Campus/MSRI; Summer 2018

CSE Capstone Project Course, Harvard University; Spring 2016

Inverse Problems in Science and Engineering, Harvard University; Spring 2016

2014 Brains, Minds and Machines Summer Course, The Marine Biological Laboratory; Summer 2014

Laboratory Course in Simulation Methods, Department of Materials, ETH Zürich; Fall 2009, 2011

Computational Polymer Physics, ETH Zürich; Spring 2008, 2009, 2010

Programming and Simulation Techniques in Materials Science, ETH Zürich; Spring 2008

Computational Physics, Bar–Ilan University; Winter 2007, Numerical Analysis, Bar–Ilan University; Winter 2006

Mentoring Activities

Postdoctoral Researchers

2020–Present Dr. Olga Shishkov, Project: Spatiotemporal Integration and Propagation of Mechanical Signals in Honeybee Swarms: 3D structure reconstruction via x–ray

2019–Present Dr. Raphael Sarfati, Project: Physics and Information Theory of Firefly Communication

2019–Present Dr. Chantal Nguyen, Project: Trade–offs in Rapid Plant Movement

2018–2020 Dr. Gary K. Nave, Project: Self–organized mechanical load bearing in bee and ant swarms

Ph.D Students

2020–Present Owen Martin, Computer Science PhD Program, CU Boulder. Project: Physics and Information Theory of Firefly Communication

2018–Present Dieu My Nguyen, IQ Biology PhD Program, and the Computer Science PhD Program, CU Boulder Project: Adaptive Pheromone Communication Networks in Honeybees

2018–Present Golnar G. Fard, co–advised with Prof. Elizabeth Bradley, Computer Science PhD Program, CU Boulder. Project: Efficiency of Food Distribution via Trophallaxis in Honeybees

Graduate Rotations and Short Term Projects

Fall 2020 Ryan Senne, Rotation IQ Biology PhD Program at CU Boulder

2020-2021 Sanskar Katiyar, Independent Study MS PhD Program at CU Boulder

Fall 2020 Claire Powers, Rotation IQ Biology PhD Program at CU Boulder

Summer 2020 Katherine Gruenewald, Research Assistant, CU Boulder

Spring 2020 Ellen Marie Waddle, Liam Friar, Tristan Caro, Jack Gugel, Team-Science Project, Co-supervised with Prof. Dan Doak, IQ Biology PhD Program at CU Boulder

Spring 2020 Isabella Huang, Independent Study CS MS Program at CU Boulder

Fall 2019 Ellen Marie Waddle, Rotation IQ Biology PhD Program at CU Boulder

Fall 2019 Aaron Mankel, Independent Study MS PhD Program at CU Boulder

Fall 2019	Rajarshi Basak, Independent Study MS PhD Program at CU Boulder
Spring 2019	Chan Lee, Independent Study MS PhD Program at CU Boulder
Fall 2018	Kathleen Murphy, Rotation IQ Biology PhD Program at CU Boulder
Fall 2018	Sierra Jech, Rotation IQ Biology PhD Program at CU Boulder
Fall 2018	Dieu My Nguyen, Independent Study CS PhD Program at CU Boulder
Fall 2018	Timothy Thorn, Rotation IQ Biology PhD Program at CU Boulder
June 2018	Nina Ning, Feng Ling, and Samantha Hill, Janelia/MSRI Summer Graduate School on Mathematical Analysis of Behavior
Spring 2018	Scott Nordstrom, Rotation IQ Biology PhD Program at CU Boulder
Spring 2018	Grant Vogel, Rotation IQ Biology PhD Program at CU Boulder
Fall 2018	Ashwin Sankaralingam, Independent Study MS PhD Program at CU Boulder
Spring 2018	Shayon Gupta, Independent Study MS PhD Program at CU Boulder

Undergraduate Students

2021–2022	Skylar Gale, Discovery Learning Apprenticeship (DLA) program and Undergraduate Research Opportunities Program (UROP) program, CU Boulder
2021 Summer	Alexander Lawson, Mechanical Engineering, CU Boulder
2021 Summer	Claire Madonna, Chemical and Biological Engineering, Summer Program for Undergraduate Research (SPUR), CU Boulder
2021 Summer	Patricia Mendoza-Anselmi, Chemical and Biological Engineering, CU Boulder
2021 Summer	Ashley Atkins, Mechanical Engineering, CU Boulder
2021 Summer	Paul Bontempo, Aerospace Engineering, CU Boulder
2020–2021	Claudia Chen, Discovery Learning Apprenticeship (DLA) program and Undergraduate Research Opportunities Program (UROP) program, CU Boulder
2019–2020	Aubrey Kroger, Discovery Learning Apprenticeship (DLA) program, CU Boulder
2018-2019	Christopher Mulligan, Undergraduate Research Opportunities Program (UROP) program, co-advised with Dr. Ed Chuong, CU Boulder
2019 Summer	Hadley Bell Tallackson, Chemical and Biological Engineering, Summer Program for Undergraduate Research (SPUR), CU Boulder
2019 Summer	Spencer Moore, Matthew Miller, Maya Brody, REU program at UNC Greensboro, USA
2018-2020	Aaron Mankel, Bachelor of Science in Physics Program at CU Boulder
2018-2020	Julie Hayes, PostBachelor Program in Computer Science at CU Boulder
2018-2019	Brianna Boeyink, Discovery Learning Apprenticeship (DLA) Program at CU Boulder
2018-2019	Huy Tran, Bachelor Program in Chemical and Biological Engineering at CU Boulder
2018 Summer	Chloe Bruce, Summer Program for Undergraduate Research at University of Colorado Boulder
2017	Dominic Bosco, Ethan Hobbs, Rebecca Wayne, James Worsham, Harvard Paulson School of Engineering and Applied Sciences TRiCAM research program
2015-2016	Aditya Raguram, Harvard Paulson School of Engineering and Applied Sciences REU program

High-school Students

2020-Present Daisy Zhang, ATHENA By WiSTEM Summer Program

Summer 2019 Jackson Bremen, April Tong, Sloan Woodberry, CU Science Discovery program, CU Boulder

2018-Present Charlotte Gorgemans, Boulder High School

2018-2019 William (Jake) Hofgard, Boulder High School

Graduate Thesis Committees

2021–Present Elias Stallardolivera, PhD Program, Environmental and Evolutionary Biology, CU Boulder

2021–Present Ethan Hobbs, MSc Program, Computer Science, CU Boulder

2021–Present Michael Iuzzolino, PhD Program, Computer Science, CU Boulder

2020–Present Ellen Waddle, PhD Program, IQBio/Environmental and Evolutionary Biology, CU Boulder

2020–Present Lyndsey Wong, PhD Program, IQBio/Applied Math, CU Boulder

2020–Present Justin Trupiano, PhD Program, Emergent Technologies and Media Arts Practices, CU Boulder

2019–2021 Haichao Wu, PhD Program, Chemical Engineering, CU Boulder

2019–2021 Connor Thompson, PhD Program, Chemical Engineering, CU Boulder

2019–Present Katherine Hernandez, PhD Program, Environmental and Evolutionary Biology, CU Boulder

2018–2020 Erin Connor, PhD Program, Civil, Environmental and Architectural Engineering, CU Boulder

2018–2020 Ignacio Tripodi, PhD Program, IQBio/Computer Science, CU Boulder

2018–Present Abhijit Suresh, PhD Program, Computer Science, CU Boulder

Undergraduate Thesis Committees

2020–2021 Skylar Martin, Senior Undergraduate Thesis, Computer Science, CU Boulder

2018 Tyler Schuessler, BS Honors Thesis, Applied Math, CU Boulder

Funding

Research Grants

2021–2022 National Geography Society (NGS), AI for Earth Innovation
100K USD, High-throughput Automatic Monitoring Tools for Firefly Conservation, grant # NGS-84850T-21

2021–2022 Army Research Office (ARO), Mechanical Sciences Division
100K USD, Spatiotemporal Integration and Memory of Mechanical Signals in Sensitive Plants, grant # 78234-EG

2020–2023 National Science Foundation (NSF), Physics of Living Systems Program
449K USD, Collective Olfactory Communication in Honeybee Swarms, grant # 2014212

2020–2022 CU Boulder, Research and Innovation (RIO), Seed Grant
44K USD, Bee-honeycomb Formation under Geometric Frustration (with Co-PI F. L. Jimenez)

2019–2021 Human Frontiers Science Program (HFSP), Young Investigator Grant
1.1M USD, The Dynamics of Information Flow in a Social Network of Mutually Shading Plants (lead PI, with Co PIs Y. Meroz and A. Jordan)

2012-2013 Swiss National Science Foundation (SNSF), Fellowship for Prospective Researcher
44K CHF **(~44K USD),** Evolutionary Design of Intrinsically Disordered Proteins, grant # PBEZP3 140130 4

Smaller Grants

2021 CU Boulder, Autonomous Systems IRT, 15K USD, Autonomous Synchronization in Firefly Swarms

2020–2021 Google Cloud Platform (GCP) research credits program, 5K USD, Dense Object Tracking in a 2D Honeybee Hive, grant number RRDB-ALJJ-4Y0J-NEMR

2018 CU Boulder, Multi-functional Materials IRT, 10K USD, Self-Organized Mechanical Load Bearing in Bee Swarms: 3D Structure Reconstruction via X–ray

2018 CU Boulder, Autonomous Systems IRT, 5K USD, Autonomous Distributed Computation in Honeybee Swarms

2016 Participant Travel Grant Insect Navigation Workshop, Janelia Research Campus

2016 Junior Scientist Travel Grant Active and Smart Matter, Syracuse University

2015 Contributed Lecture Travel Grant Gordon Research Conference on Stochastic Physics in Biology

Honors

2021 Paper on firefly synchronization appear on the cover of Science Advances

2021 Selected as National Geographic Explorer

2021 Methods paper on firefly synchronization appear on the cover of Journal of Royal Society Interface

2019 Appointed as External Professor at Santa-Fe Institute

2019 Elected for Member–at–Large at the Executive Committee of the Division of Biological Physics, American Physical Society

2016 Selected to participate at the Rising Stars in Physics workshop, MIT. This workshop bring the next generation of physics academic leaders together https://physicsrisingstars.mit.edu/

2015 Chosen for a Junior Scientist Lecture at the Gordon Conference on Stochastic Physics in Biology

2014 "Evolution of Specificity in Protein-Protein Interactions" paper appear on the cover of Biophysical Journal and chosen among Biophysical Journal Best of 2014

Service

Journal Peer Review

Nature, eLife, Scientific Reports, Chemical Physics Letters, Polymers, Proceedings of the Royal Society B, Journal of the Royal Society, Interface, Distributed Autonomous Robotic Systems, Physical Biology, Science Advances, Robotics and Autonomous Systems, Animal Behaviour, PLOS

Computational Biology, Swarm Intelligence, Nature Ecology and Evolution, Current Biology, Ecological Psychology

Grant Peer Reviews

2021 National Science Foundation (NSF), Graduate Research Fellowship Program Panel https://www.nsfgrfp.org/

2021 National Science Foundation (NSF), Physics Panel https://www.nsf.gov/mps/phy/about.jsp

2021 RIO Seed Grant, University of Colorado Boulder

2021 Natural Sciences and Engineering Research Council of Canada (NSERC) https://www.nserc-crsng.gc.ca/Professors-Professeurs/index_eng.asp

2020 AB Nexus Seed Grant, University of Colorado Boulder https://www.colorado.edu/researchinnovation/2020/08/06/ab-nexus

2019 American Chemical Society (ACS) Petroleum Research Fund (PRF) www.acs.org/content/acs/en/funding-and-awards/grants

Editorial

2020-2021 Guest Associate Editor, the journal of *Frontiers in Physics*, special topic: "Physics of Social Interactions" https://www.frontiersin.org/research-topics/16040/physics-of-social-interactions

Scientific Meetings Organization

2022 Co-Director, Cajal Course-Quantitative Approaches to Behavior, Lisbon Portugal (with B. de Bivort, G. Berman, Gozalo de Polavieja and G. Stephens)

2022 Co-Organizer, Aspen Winter Conference at Aspen Center of Physics on Physics of Social Interactions, CO USA (with S. Iyer-Biswas and J. Shaevitz)

2021 Member, Program Committee of the joint 15th international symposium on distributed autonomous robotic systems 2021 and the 4th international symposium on swarm behavior and bio-inspired robotics 2021 (DARS/SWARM2021)

2021 Co-organizer and Chair of Physics of Social Interactions Focus Session at APS (American Physical Society) March Meeting 2021, (with G. Stephens)

2020-2023 Co-organizer and co-Founder of *Living Histories* Lecture Series DBIO (division of Biology) APS (American Physical Society), with S. Iyer-Biswas
youtube.com/channel/UCBuZ6okBbRvosC0S67WI2gg
iyerbiswas.com/outreach/livinghistories/

2020 Member, Collective Intelligence 2020 Conference, Program Committee

2020 Co-organizer and Chair of Physics of Social Interactions Focus Session at APS (American Physical Society) March Meeting 2020, (with G. Stephens)

2019 Co-organizer of Physics of Mechanics of growth, morphogenesis and evolution of biological solids Symposium at Society for Engineering Science (SES) 2019 meeting, Washington University

2019 Chair of CP31 Collective Behavior Session at SIAM Conference on Dynamical Systems, Snowbird, UT, USA

2017 Co-chair of Neuromechanics II session at Society for Integrative and Comparative Biology (SICB) Annual Meeting, New Orleans, LA, USA

Panels

2020 Panelist in a panel on Interdisciplinary Research at the Virtual American Mathematical Society South East (AMS SE) Sectional Meeting.

Professional Societies

2020-2023 Secretary and Treasurer (S/T), Executive Committee of the Division of Biological Physics (DBIO), American Physical Society (APS)

2020 Co-organizer of the the Division of Biological Physics (DBIO), American Physical Society (APS), *Monthly Virtual Happy Hour* and *Living Histories* lecture series (with Sri Iyer-Biswas) youtube.com/channel/UCBuZ6okBbRvosC0S67WI2gg

2020 Member–at–Large at the Executive Committee of the Division of Biological Physics (DBIO), American Physical Society (APS)

2020 Member, APS DBIO Thesis Award Committee

2020-2021 Member, APS DBIO Program Committee

University Service

2018, 2021 Gave a research talk for incoming IQ Bio students at the Summer Orientation Event

2019, 2021 Lead an Idea exchange Gathering with IQ Biology students

2019, 2021 Science Short Talk, BioFrontiers Council Meeting

2021 CU Boulder RIO Seed Grant reviewer, University of Colorado Boulder

2020 AB Nexus Seed Grant reviewer, University of Colorado Boulder

2020 Invited to give a public talk about honeybees and dung beetle research at Engineering Exploration Lecture Series, Boulder CO, USA https://www.colorado.edu/ewb/exploration

2019-Present Member, BioFrontiers undergrad curriculum committee, Computational Biology minor program

2019-Present Member, BioFrontiers NSF NRT grant committee

2019-Present Member, BioFrontiers NSF T32 grant committee

2019-Present Member, BioFrontiers NSF grant for Sustained Availability of Biological Infrastructure (SABI) Core Program

2019–Present Member, Computational Biology Minor Advisory Committee (Computer Science and BioFrontiers)

2019-Present Member, advisory committee CMAP (the Center for Media Arts and Performance) in ATLAS

2019 Interviewed and participated in an exhibit called "Wonder Women: The Dynamic, Influential, and Innovative Scientists of CU Boulder," displayed in Gemmill Library, CU Boulder https://www.colorado.edu/libraries/2019/05/07/friends-libraries-fellow-exhibit-display

2019	Participant in Chords and Codons: Music About Science at the BioFrontiers CU Boulder (multidisciplinary multimedia with live and electronic music and visualizations) https://www.colorado.edu/biofrontiers/chords-and-codons
2019	Lecturer at Girls Day of Code — a day of coding, team-building, and talks from women in STEM and business in CU Boulder playfulcomputation.group/blog/student-run-girls-day-of-code
2018	Lecturer at Code Wagon: Girls Computer Coding Camp a program to introduce girls and women to CS in CU Boulder
2018	Interviewed for the Buffs Talk Science (@CU Boulder) podcast on honeybee swarms https://buffstalkscience.com/2018/12/05/episode-17-something-something-temperature-regulation/
2018–Present	Member, BioFrontiers Institute Council (formerly Task Force)
2018-2019	Organized two events for students and faculty associated with Complex Systems at the Computer Science Department (including short research presentations and happy-hour)
2018–2019	Member, Engineering College Materials Science faculty Search
2018	Member, BioFrontiers Institute Search Committee for Scientific Web Developer (BioFrontiers Institute Information Technology)
2017	Organized an online recruiting event for the IQ Biology program

Professional Development

2017	CS New Faculty Teaching Workshop with focus on evidence-based instructional practices, at University of California San Diego
2016	Mini-MBA Course at Harvard Business School (a five-week accelerated business course)

Outreach

2021	Featured as a Comic Strip character at Science News for Students on "How bees play telephone to form a swarm" https://www.sciencenewsforstudents.org/article/bees-play-telephone-swarm-pheromones-comic
2021	Invited to give a public talk about honeybee research to beekeepers at Northern Colorado Beekeeper's Association, Loveland CO, USA
2021	Invited to give a public talk about collective behavior to 1,200 journalists at ScienceWriters2021
2021	Pictures of synchronous fireflies, taken by Peleg, to appear in a children's book called *Fireflies and Glowworms*, in a series called "Lights on! Animals That Glow". Publisher: Rourke Educational Media (fall 2021)
2021	Invited to give a class on honeybee behavior (title: "Shaking the Swarm") to high school students at Legacy High School, in Broomfield CO, USA

2021	Lab members gave a public talk at Great Smokey Mountains National Park Science Colloquium 2021: "What trajectories of the Smokies' synchronous fireflies reveal about their behavior" https://dlia.org/event/science-colloquium-2021/
2020	Mentor at ATHENA By WiSTEM Summer Program for high-school girls https://www.athenabywistem.org/
2020	Invited to give a research and career talk for Woman Physicists at Bar Ilan University, Israel
2019	Invited to give a public talk about Honeybee research at MileHiveBeeClub, Denver CO, USA
2019	Wrote a science article, directed for undergraduate students, for Physics Today on "Mechanical Hive Mind" https://physicstoday.scitation.org/doi/10.1063/PT.3.4191
2019	Wrote a popular science article for The Conversation on "What a bundle of buzzing bees can teach engineers about robotic materials" https://theconversation.com/what-a-bundle-of-buzzing-bees-can-teach-engineers-about-robotic-materials-125194
2019	Gave a public talk about honeybee research at Ignite Boulder event: "Shaking the Swarm", Ignite Boulder 40 at Boulder Theater https://youtu.be/HY0CBmlTmZs
2018-2019	Skype with a Scientist sessions with middle schools students in Israel, Costa Rica and the USA https://www.skypeascientist.com/
2016-2017	Volunteer mentor at the Mentoring Program of Harvard Graduate Women in Science connecting female graduate students in science, math, and engineering with faculty https://projects.iq.harvard.edu/hgwise/mentoring-program
2016	Volunteer Mentor at ProjectCS Girls Competition for middle school girls (mentee, a 6th–grader, made it to the semifinals by building a virtual medical diagnostic program) https://www.projectcsgirls.com/
2015	Volunteer at Girls Who Code (Harvard Club) and Big Sister Boston https://girlswhocode.com/

Selected Press

2021	Coverage of paper on collective synchronization in firefly swarm (Science Advances, 2021) New York Times (tinyurl.com/3vfud734) Science (tinyurl.com/4jye5wk2) CBC (tinyurl.com/anp53zw6) NPR (tinyurl.com/kfrvy6su) EcoWatch (tinyurl.com/4vmtravj) Axios (tinyurl.com/wrzmy2rb) Phys.org (tinyurl.com/d97vs2c4), and SFI News (tinyurl.com/f9b3xhm9)
2021	Interviewed for The Guardian travel story: "'Magical': synchronous fireflies light up US national parks" https://www.theguardian.com/environment/2021/jun/11/fireflies-great-smoky-mountains-national-park

2021 Interviewed for a National Geographic travel story: "See fireflies magically light up this national park" https://www.nationalgeographic.com/travel/article/synchronous-fireflies-light-up-smoky-mountains-national-park

2021 Interviewed for a popular-science podcast, Complexity Podcast by Santa Fe Institute, on "Collective Behavior of Honeybees & Fireflies" https://complexity.simplecast.com/episodes/58

2021 Coverage of paper on collective scenting in honeybee swarm (PNAS, e2011916118, 2021)
Science (tinyurl.com/w7epczh7)
Discover Magazine (tinyurl.com/s8f9xmvj)
Haaretz (tinyurl.com/4pnz2zsx)
ABC News (tinyurl.com/23222v7w)
InsideScience (tinyurl.com/35yfzr5k)
Phys.org (tinyurl.com/3zm2fes3), and
CU Boulder Daily news (tinyurl.com/3dpz5xmn)

2020 Firefly field-work featured on National Geographic
"A rare look at fireflies that blink in unison, in a forest without tourists"
https://www.nationalgeographic.com/animals/2020/06/synchronous-fireflies-rare-look-congaree-national-park/

2020 Coverage of spatiotemporal firefly flash patterns methods paper (J. R. Soc. Interface, 17:170, 2020)
Smithsonian Magazine (tinyurl.com/yx9dqaew)
Haaretz (tinyurl.com/y2y2796t)
Science Daily (tinyurl.com/yyzzm3ph)
Biomedical Picture of the Day (tinyurl.com/y382fwqz)
Science Alert (tinyurl.com/yy5pxtzq)
Phys.org (tinyurl.com/yxgom2jl), and
CU Boulder Daily news (tinyurl.com/y65j3fpv)

2019 Coverage of collective honeybee ventilation (J. R. Soc. Interface 16: 20180561, 2019)
SIAM News (tinyurl.com/yya8mge9)
Science Daily (tinyurl.com/y33gsdao)
Phys.org (tinyurl.com/yxp7kjct)
Harvard Gazette (tinyurl.com/y5bk98o3), and
CU Boulder Science Buffs (tinyurl.com/y49852h3)

2018 Coverage of honeybee swarm shaking paper (Nature Physics, doi s41567-018-0262-1, 2018)
SIAM News (tinyurl.com/yyj5xbpj)
New Scientist (tinyurl.com/y5yahz6n)
Forbes (tinyurl.com/y34rkyoy)
Phys.org (tinyurl.com/y5edmclp)
Harvard Gazette (tinyurl.com/yy2us8rg), and
CU Boulder Daily news (tinyurl.com/yylfnzjf)

2018 Interviewed for a Nature Podcast on "Bee Swarms Under Strain" https://www.nature.com/articles/d41586-018-06768-5 and associated Nature Video production https://youtu.be/jswSJznyvDI