# ORIT PELEG

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## Research Interests

My research is aimed at understanding how biological communication signals are generated and interpreted. While the channel may change - whether chemical, sound, or light - the living creatures of our world all encode high-dimensional biological features into low-dimensional communication patterns. I use insect swarms as a model system for identifying how organisms harness the dynamics of communication signals, perform spatiotemporal integration of these signals, and propagate those signals to neighboring organisms. Examples include fireflies who communicate over long distances using light signals, and bees who serve as signal amplifiers to propagate pheromone-based information about the queen's location.

## Academic Appointments

**University of Colorado at Boulder**, USA – 2018–Present
Assistant Professor at the Dept. of Computer Science and at the Biofrontiers Institute
Affiliated Faculty at the Dept. of Physics, Applied Math, and Ecology and Evolutionary Biology

**Santa Fe Institute**, USA – 2019–Present
External Professor

**Harvard University**, USA – 2014–2017
Postdoctoral Fellow at the 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
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 Publications

* Contributed equally to this work; ★Advised student coauthor; ★Advised postdoc coauthor

### Peer-Reviewed Journal Articles

1. ★G. G. Fard, ★D. Zhang, F. López Jiménez, **O. Peleg**
   *Honeycomb crystallography: comb formation under geometric frustrations*
   Proceedings of the National Academy of Sciences, USA 119 (48) e2205043119 (2022)

2. ★R. Sarfati, **O. Peleg**
   *Chimera states among synchronous fireflies*
   Science Advances **8**, eadd6690 (2022)

3. ★O. Shishkov, **O. Peleg**
   *Beyond social insects: Soft, dense, and active invertebrate aggregations*
   Collective Intelligence **1**(2), 1-18 (2022)

4. ★D.M. T. Nguyen, ★G.G. Fard, ★A. Atkins , ★P. Bontempo, ★M. L. Iuzzolino, **O. Peleg**
   *Honey Bees Find the Shortest Path: A Collective Flow-Mediated Approach*
   Artificial Life and Robotics, doi.org/10.1007/s10015-022-00816-0 (2022)

5. ★O. Shishkov, ★C. Chen, ★C.A. Madonna, Kaushik Jayaram, **O. Peleg**
   *Strength-mass scaling law governs mass distribution inside honey bee swarms*
   Scientific Reports **12**, 17388 (2022)

6. ★R. Sarfati, L. Gaudette, J.M. Cicero, **O. Peleg**
   *Statistical analysis reveals the onset of synchrony in sparse swarms of Photinus knulli fireflies*
   Journal of the Royal Society Interface 19:188 (2022)

7. J. Peters, **O. Peleg**, L. Mahadevan
   *Thermoregulatory morphodynamics of honeybee swarm clusters*
   Journal of Experimental Biology 255(5): jeb242234 (2022)

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

9. ★D.M. T. Nguyen, ★M. L. Iuzzolino, ★A. Mankel, K. Bozek, G. J. Stephens, **O. Peleg**
   *Flow-mediated olfactory communication in honey bee swarms*
   Proceedings of the National Academy of Sciences, USA 118 (13) e2011916118 (2021)

10. ★D.M. T. Nguyen, ★G.G. Fard, ★M. L. Iuzzolino, **O. Peleg**
    *Robustness of collective scenting in the presence of physical obstacles*
    Artificial Life and Robotics, doi.org/10.1007/s10015-021-00712-z (2021)

11. ★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*
    Frontiers in Physics 9:540 (2021)

12. ★R. Sarfati, ★J. Hayes, E. Sarfati, **O. Peleg**
*Spatiotemporal reconstruction of emergent flash synchronization in firefly swarms via stereoscopic 360-degree cameras*
Journal of the Royal Society Interface 17:170 (2020)

13. ★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*
Frontiers in Robotics and AI 7:25 (2020)

14. S. Bidari, **O. Peleg**, Z.P. Kilpatrick
*Social inhibition maintains adaptivity and consensus of foraging honeybee swarms in dynamic environments*
Journal of the Royal Society Open Science 6:12 (2019)

15. L. Khaldy, **O. Peleg**, C. Tocco, L. Mahadevan, M. Byrne, M. Dacke
*The effect of step size on straight-line orientation*
Journal of the Royal Society Interface 16: 20190181 (2019)

16. J. Peters, **O. Peleg**, L. Mahadevan
*Collective ventilation in honeybee nests*
Journal of the Royal Society Interface 16: 20180561 (2019)

17. **O. Peleg**
*Mechanical hive mind*
Physics Today 72(4), 66 (2019)

18. **O. Peleg***, J. Peters*, M. Salcedo, L. Mahadevan
*Collective mechanical adaptation of honeybee swarms*
Nature Physics 14, 1193–1198 (2018)

19. **O. Peleg**, L. Mahadevan
*Optimal switching between geocentric and egocentric strategies in navigation*
Journal of the Royal Society Open Science 3, 160128 (2016)

20. L.S. Shagolsem, D. Osmanovic, **O. Peleg**, Y. Rabin
*Pair interaction ordering in fluids with random interactions*
The Journal of Chemical Physics 142, 051104 (2015)

21. **O. Peleg**, J.M. Choi, E. Shakhnovich
*Evolution of specificity in protein-protein interactions*
Biophysical Journal 107 (7), 1686-1696 (2014)

22. M.B. Harasim, B. Wunderlich, **O. Peleg**, M. Kröger, A.R. Bausch
*Direct observation of the dynamics of semiflexible polymers in shear flow*
Physical Review Letters 110, 108302 (2013)

23. 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*
Proceedings of the National Academy of Sciences, USA 110, 3363–3368 (2013)

24. **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*
Biophysical Journal 103, 1909 (2012)

25. 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)

26. **O. Peleg**[*], M. Tagliazucchi[*], M. Kröger, Y. Rabin, I. Szleifer
*Morphology control of hairy nanopores*
American Chemical Society Nano (ACS Nano), 5(6), 4737, (2011)

27. **O. Peleg**, R.Y.H. Lim
*Converging on the function of intrinsically disordered nucleoporins in the nuclear pore complex*
Biological Chemistry 391, 719–730 (2010)

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

29. 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)

30. **O. Peleg**, M. Kröger, Y. Rabin
*Effect of network topology on phase separation in two–dimensional Lennard–Jones networks*
Physical Review E 79, 040401(R); also included in the Virtual Journal of Biological Physics 17:8 (2009)

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

32. 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)

33. **O. Peleg**, M. Kröger, I. Hecht, Y. Rabin
*Filamentous networks in phase-separating two-dimensional gels*
Europhysics Letters 77, 58007 (2007)

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### Peer Reviewed Conference Papers (in Conference Proceedings)

1. ★C. Nguyen, ★I. Huang, **O. Peleg**
*Firefly-inspired vocabulary generator for communication in multi-agent systems*
The 2022 Conference on Artificial Life (ALIFE) (2022); 60.0% acc. rate.;

2. ★D.M. T. Nguyen, ★M. L. Iuzzolino, **O. Peleg**
*Physical Obstacles Constrain Behavioral Parameter Space of Successful Localization in Honey Bee Swarms*
The 2022 Conference on Artificial Life (ALIFE) (2022); 60.0% acc. rate.;

3. ★D.M. T. Nguyen, ★G.G. Fard, ★A. Atkins , ★P. Bontempo, ★M. L. Iuzzolino, **O. Peleg**
*Honey Bees Find the Shortest Path: A Collective Flow-Mediated Approach*
The 27th international symposium on artificial life and robotics (AROB); The 8th international symposium on biocomplexity (ISBC); The 5th international symposium on swarm behavior and bio-inspired robotics (SWARM) AROB-ISBC-SWARM2022 (2022); 92.3% acc. rate.;

4. ★D.M. T. Nguyen, ★G.G. Fard, ★M. L. Iuzzolino, **O. Peleg**
   *Robustness of collective scenting in the presence of physical obstacles*
   The 15th international symposium on distributed autonomous robotic systems (DARS); The 4th international symposium on swarm behavior and bio-inspired robotics (SWARM)
   DARS-SWARM2021 (2021);

5. ★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.;

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## Peer Reviewed Extended Abstracts (not in Conference Proceedings)

1. ★C. Nguyen, ★I. Huang, **O. Peleg**
   *Firefly-inspired vocabulary generator for communication in multi-agent systems*
   The 15th international symposium on distributed autonomous robotic systems (DARS); The 4t international symposium on swarm behavior and bio-inspired robotics (SWARM); (DARS-SWARM2021) (2021)

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

3. ★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)

4. ★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)

5. ★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)

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## Papers In Preparation / Under Peer Review

1. ★R. Sarfati, K. Joshi, ★O. Martin, ★J.C. Hayes, S. Iyer-Biswas, **O. Peleg**
   *Emergent periodicity in the collective synchronous flashing of fireflies*
   In revisions at ***eLife*** (2022)
   Preprint: https://www.biorxiv.org/content/10.1101/2022.03.09.483608v1

2. ★R. Sarfati, **O. Peleg**
   *Calibration-free 3D reconstruction of firefly trajectories from 360-degree cameras*
   In preparation (2022) Preprint: https://www.biorxiv.org/content/10.1101/2021.04.07.438867v1

3. ★C. Nguyen, I. Dromi, A. Kempinski, G.E.C. Gall, **O. Peleg**, Y. Meroz
   *Noise-mediated self-organization in mutually shading sunflowers*
   In preparation (2022) Preprint: https://www.biorxiv.org/content/10.1101/2022.06.11.495747v1

## Conference and Seminar Talks

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

1. **[I]** Title: TBD. Isaac Newton Institute (Cambridge, UK) workshop on "Collective Behaviour" (2023, forthcoming)
2. **[I]** Title: TBD. Physics Colloquium, University of Utah (2023, forthcoming)
3. **[I]** Title: TBD. Department of Chemical and Biological Engineering at Colorado State University (2023, forthcoming)
4. **[I]** Title: TBD. Colorado School of Mines Quantitative Biosciences and Engineering (2023, forthcoming)
5. [P] Title: TBD. Santa Fe Institute Collective Intelligence Symposium & Short Course: Foundations + Radical Ideas (2023, forthcoming)
6. **[I]** Title: TBD. Biophysics Seminar Series. University of California San Diego (2023, forthcoming)
7. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. The 2023 Animal Behavior Society Annual Meeting, Symposium on Ontogeny of Collective Behavior (2023, forthcoming)
8. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. American Physical Society (APS) March Meeting Focus session on "Emergent Behavior in Biological Systems" (2023, forthcoming)
9. **[I]** Title: TBD. Biological Sciences Special Seminar, University of South Carolina (2023, forthcoming)
10. **[I]** Title: Physical Computation in Insect Swarms. American Association for the Advancement of Science (AAAS) Annual Meeting, Session on "Alive or just Active: How are living systems different from synthetic matter?" (2023, forthcoming)
11. **[I]** Title: Flow-mediated olfactory communication in honey bee swarms. HHMI's Janelia Research on "Navigational Algorithms and Neural Circuit Computations Directing Olfactory Search Across Species" (2023, forthcoming)
12. **[I]** Title: TBD. EMBO | EMBL Symposium: Theory and Concepts in biology at the EMBL Advanced Training Centre in Heidelberg (2023, forthcoming)
13. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. Gordon Research Conference Stochastic Physics in Biology: Bridging Experiments and Theories (2023, forthcoming)
14. **[I]** Title: Firefly Communications: Principles and Predictions. Joint Mathematics Meetings, Special Session "Modeling collective behavior in biology" (2023, forthcoming)
15. **[I]** Title: Living Orbs of Light: The Math of Firefly Communication. Dynamics Days, Trinity College (2023, forthcoming)
16. **[I]** Title: Living Orbs of Light: The Physics of Firefly Communication. SIAM Conference on Applications of Dynamical Systems, Minisymposium on "Modeling and data-driven methods for collective behavior and pattern formation" (2023, forthcoming)
17. **[I]** Title: Emergent Spatiotemporal Patterns in Bee Swarms. Physics of Morphing Matter workshop. Princeton Center for Theoretical Science. Princeton University (2022, forthcoming)
18. **[I]** Physical Computation in Insect Swarms. Physics Colloquium, Colorado School of Mines (2022)
19. **[I]** Title: Living Orbs of Light: The Physics of Firefly Communication. Conference on Criticality in Neural Systems 2022: Collective Behavior, Synchronization, & Complexity. National Institutes of Health (2022)
20. **[I]** Title: Physical Computation in Insect Swarms. Center for Theoretical Biophysics Seminar. Rice University (2022)
21. **[I]** Title: Physical Computation in Insect Swarms. the Journal of Biological Physics Webinar Series (2022)

22. **[I]** Physical Computation in Insect Swarms. Computations in Science Seminars, University of Chicago (2022)
23. **[P]** Title: Physical Computation in Insect Swarms. NetSci 2022 satellite "Multiscale & Integrative compleX Networks: EXperiments & Theories" (2022)
24. **[I]** Title: The mechanics of honey bee swarms: aggregation, steady-states, and adaptation. International Union for the Study of Social Insects (IUSSI) Annual Meeting, Symposium on Advances in Collective Behavior (2022)
25. **[I]** Titles : (1)Collective ecophysiology in bee swarms, (2)The physics of firefly communication. 2022 Complex Systems Summer School, Santa Fe Institute (2022)
26. **[I]** Physical Computation in Insect Swarms. Seminar, Santa Fe Institute (2022)
27. **[C]** Title: Three-dimensional tracking: Insights into firefly behavior and conservation. Computations in Science Seminars, The International Firefly Symposium 2022 (IFS2022), Lisbon, Portugal (2022)
28. **[I]** Title: Visual communication in dense firefly swarms. Computer Vision and Pattern Recognition Conference (CVPR) 2022, workshop on "Multi-Agent Behavior Modeling"(2022)
29. **[I]** Title: Physical Computation in Insect Swarms. The University of British Columbia, Math-Biology Seminar Series (2022)
30. **[I]** Title: The Physics of Firefly Communications: Principles and Predictions. Quantitative Ecology/Ethology/Evolution Discussions (QED) Harvard University (2022)
31. **[I]** Title: Physical Computation in Insect Swarms. Department of Engineering Sciences and Applied Mathematics, Northwestern University, Theoretical Physics of Biological Systems Seminar Series (2022)
32. **[I]** Title: The Physics of Firefly Communications: Principles and Predictions. Santa Fe Institute, workshop on "Constructing and Deconstructing Collectives: Signals to Space to Society"(2022)
33. **[I]** Title: Physical Computation in Insect Swarms. Institute for Pure and Applied Mathematics (IPAM) at UCLA, workshop on "Mathematics of Intelligences"(2022)
34. **[I]** Title: Physical Computation in Insect Swarms. Clore Seminar on Soft and Biological Physics, Weizmann Institute of Science, Israel (2021)
35. **[I]** Title: Physical Computation in Insect Swarms. Department Colloquium, Applied Mathematics Department, CU Boulder (2021)
36. **[I]** Title: Physical Computation in Insect Swarms. Condensed Living Matter Seminar, Physics Department, University of Pennsylvania (2021)
37. **[I]** Title: Physical Computation in Insect Swarms. Physics of Behavior Symposium, CUNY/Princeton Initiative for the Theoretical Sciences (2021)
38. **[I]** Title: Physical Computation in Insect Swarms. Department Colloquium, Physics Department, CU Boulder (2021)
39. **[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)
40. **[I]** Title: Physical Computation in Insect Swarms. University College London, Symposium on Smartish: How Dumb Agents Act Clever Together (2021)
41. **[I]** Title: Physical Computation in Insect Swarms. Department Colloquium, Computer Science Department, CU Boulder (2021)
42. **[I]** Title: Collective Ecophysiology and Physics of Honey Bee Swarms. University of Cambridge, Theory of Living Matter Seminar (2021)
43. **[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)

44. **[I]** Title: Collective Ecophysiology and Physics in Bee Swarms . Institute of Integrative Biology (D-USYS) at ETH Zurich (2021)

45. **[I]** Title: Spatio-temporal Reconstruction of Emergent Flash Synchronization in Firefly Wwarms. The Bell Edwards Geographic Data Institute Seminar. School of Geography and Sustainable Development, University of St Andrews in Scotland (2021)

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

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

48. **[P]** Collective Ecophysiology and Physics of Honeybees. IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS) (2020)

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

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

51. **[I]** Flow-Mediated Olfactory Communication in Honey Bee Swarms. Virtual American Mathematical Society (AMS) MS Fall Southeastern Sectional Meeting (2020)

52. **[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)

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

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

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

56. **[C]** Data-driven Modeling of Resource Distribution in Honeybee Swarms. Association for Computing Machinery (ACM )Collective Intelligence 2020 (2020)

57. **[I]** Collective Aggregation via Directed Pheromone Signaling in Honeybee Swarms. Society for Industrial and Applied Mathematics (SIAM) Conference on the Life Sciences (2020)

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

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

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

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

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

63. **[C]** Collective Mechanical Adaptation of Honeybee Swarms. Society for Industrial and Applied Mathematics (SIAM) Conference on Dynamical Systems (2019)

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

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

66. **[C]** Collective Physical Computation in Honeybee Swarms. Workshop on What is Biological Computation?, Santa Fe Institute (SFI), USA (2019)

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

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

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

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

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

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

73. **[I]** Collective Ecophysiology and Physics of Honeybees. Society for Industrial and Applied Mathematics (SIAM) Conference on the Life Sciences (2018)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Teaching Experience

Santa Fe Institute (SFI) International Summer School on intelligence and representation, Isaac Newton Institute in Cambridge UK; Summer 2023

Quantitative Approaches to Behavior, Champalimaud Centre for the Unknown (CAJAL) Portugal; Summer 2022

CSCI–5/4314, Dynamic Models in Biology, University of Colorado at Boulder; Springs 2019-2023

CSCI–5423, Bio–inspired Multi–agent Systems, University of Colorado at Boulder; Springs 2018-2023

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; Springs 2008-2010

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

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|---|---|
| 2020–2022 | 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

August 2022 - Nolan Bonnie, IQ Biology PhD Program (Integrated Data Science Fellow), and the Computer Science PhD Program, CU Boulder Project: TBD

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

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

2018–2022 Dieu My Nguyen, IQ Biology PhD Program, and the Computer Science PhD Program, CU Boulder Project: Adaptive Pheromone Communication Networks in Honeybees

### Graduate Rotations and Short Term Projects

2022 Fall Chethan Kavaraganahalli Prasanna, Computer Science MS Program, CU Boulder

2022 summer-pres. Divya Pragadaraju, Computer Science MS Program, CU Boulder

2022 Summer-pres. Morgan Byers, Computer Science MS Program, CU Boulder

2022 Fall Rachel Billings, Rotation IQ Biology PhD Program at CU Boulder

2022 Fall Nolan Bonnie, Rotation IQ Biology PhD Program at CU Boulder

2021 Fall Ryan Senne, Rotation IQ Biology PhD Program at CU Boulder

2021 Fall Aubry Kroger, Independent Study EE MS Program at CU Boulder

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

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

2020 Summer Katherine Gruenewald, Research Assistant, CU Boulder

2020 Spring 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

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

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

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

2019 Fall Rajarshi Basak, Independent Study CS MS Program at CU Boulder

2019 Spring Chan Lee, Independent Study MS Program at CU Boulder

2018 Fall Kathleen Murphy, Rotation IQ Biology PhD Program at CU Boulder

2018 Fall Sierra Jech, Rotation IQ Biology PhD Program at CU Boulder

2018 Fall Dieu My Nguyen, Independent Study CS PhD Program at CU Boulder

2018 Fall Timothy Thorn, Rotation IQ Biology PhD Program at CU Boulder

2018 Lisa Natale, EBio PhD Program at CU Boulder

2018 Summer Nina Ning, Feng Ling, and Samantha Hill, Janelia/MSRI Summer Graduate School on Mathematical Analysis of Behavior

2018 Spring Scott Nordstrom, Rotation IQ Biology PhD Program at CU Boulder

2018 Spring Grant Vogel, Rotation IQ Biology PhD Program at CU Boulder

2018 Fall Ashwin Sankaralingam, Independent Study MS Program at CU Boulder

2018 Spring Shayon Gupta, Independent Study MS Program at CU Boulder

### Post-Bachelor Students

2021-2022 Erica Maul, Post-Bachelor Research Assistant

2018-2020 Julie Hayes, Post-Bachelor Program in Computer Science at CU Boulder

### Undergraduate Students

2022–2023 Anna Rahn, Discovery Learning Apprenticeship (DLA) program, CU Boulder

2022 Fall Arnav Jain, Computer Science, CU Boulder

22 Fall-23 Spring Pedro Albuquerque Lemos, Independent Study, Physics, CU Boulder

2022 Summer-pres. Carrisa Mayo, Statistics & Data Science and Computer Science, CU Boulder

2021 Summer-pres. Paul Bontempo, Aerospace Engineering, CU Boulder

2022 Summer Maridith Stading, Summer Program for Undergraduate Research (SPUR), CU Boulder

2022 Summer Allison Dickie, Pre-Medicine/Pre-Medical Studies, CU Boulder

2021–2022 Skylar Gale, Discovery Learning Apprenticeship (DLA) program, CU Boulder

2021-2022 Claire Madonna, Chemical and Biological Engineering, Biological Sciences Initiative (BSI) Scholars 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

2021-2022 Patricia Mendoza-Anselmi, Chemical and Biological Engineering, CU Boulder

2021 Summer Ashley Atkins, Mechanical 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

2018-2019 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

2022 Summer Ricky Yang and Olaya Garcia-Grau, the Summer 2022 STEM Research Experience, CU Boulder

2020-2022 Daisy Zhang, ATHENA By WiSTEM Summer Program

2018-2021 Charlotte Gorgemans, Boulder High School

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

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

### Graduate Thesis Committees

2022–Present Nicholas Barendregt, PhD Program, Applied Math, CU Boulder

2022–Present Heiko Kabutz, PhD Program, Mechanical Engineering, CU Boulder

2022–Present Gladiana Spitz, PhD Program, Environmental and Evolutionary Biology, CU Boulder

2022–Present Ameya G. Prabhune , PhD Program, Physics, CU Boulder

2022–Present Elise Tate, PhD Program, IQBio/Computer Science, CU Boulder

2022–Present Tzu-Chi Yen , PhD Program, Computer Science, CU Boulder

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

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

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

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

2021–2022 Michael Iuzzolino, PhD Program, Computer Science, CU Boulder

2020–2022 Lyndsey Wong, PhD Program, IQBio/Applied Math, CU Boulder

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

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

2019–2022 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

2018–2021 Abhijit Suresh, PhD Program, Computer Science, CU Boulder

### External Graduate Thesis Committees

2022 - Present Narcís Font, advised by Prof. Serena Ding, Max Planck Institute of Animal Behavior

### Undergraduate Thesis Committees

2022–2023 Saurabh Totey, Senior Undergraduate Thesis, BS in Computer Science, CU Boulder

2020–2021 Skylar Martin, Senior Undergraduate Thesis, BS in Computer Science, Computational Biology Minor, CU Boulder

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

## Funding

*Successful grants as a PI totaling ~$3,412,000 (my share is ~$2,391,000)*

### Research Grants

2023–2028 National Science Foundation (NSF), Physics of Living Systems Program
**900K USD**, CAREER: Principles of Firefly Rhythmic Synchronization, grant #2239331; PI, Peleg

2022–2025 Research Cooperation for Science Advancement (RCSA), Cottrell Scholar Award
**100K USD**, Physics of Firefly Communication, grant #28219; PI, Peleg

2022–2023 CU Boulder, President's Teaching Scholars Program, Timmerhaus Fund Ambassadors
**50K USD**, Firefly Conservation in Colorado; PI, Peleg

2022–2025 National Science Foundation (NSF), Physics of Living Systems Program
**499K USD** (my portion: **270K USD**), Bee-honeycomb Formation under Geometric Frustration grant #2210628; PI F. L. Jimenez (CU Boulder), co-PI, Peleg

2021–2022 National Geographic Society (NGS), AI for Earth Innovation
**150K USD**, High-throughput Automatic Monitoring Tools for Firefly Conservation, grant # NGS-84850T-21 (including 50K USD cloud computing credit from Microsoft); PI, Peleg

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

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

2020–2022 CU Boulder, Research and Innovation (RIO), Seed Grant
**44K USD** (my portion: **22K USD**), Bee-honeycomb Formation under Geometric Frustration; PI, Peleg, co-PI F. L. Jimenez (CU Boulder)

2019–2022 Human Frontiers Science Program (HFSP), Young Investigator Grant
**1.1M USD** (my portion: **350K USD**), The Dynamics of Information Flow in a Social Network of Mutually Shading Plants, grant #RGY0078/2019; PI, Peleg, co-PIs Y. Meroz (Tel-Aviv University) and A. Jordan (Max Planck Institute)

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; PI, Peleg

### Smaller Grants

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

2021 CU Boulder, Multi-functional Materials IRT, 4.5K USD, Biologically-Inspired Self-Organizing Micro-Robotic Swarms; PI, Peleg, co-PI K. Jayaram (CU Boulder)

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; PI, Peleg

2018 CU Boulder, Multi-functional Materials IRT, 10K USD, Self-Organized Mechanical Load Bearing in Bee Swarms: 3D Structure Reconstruction via X–ray; PI, Peleg, co-PI F. Venery (CU Boulder)

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

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

## Awards and Honors

2023 CAREER Award of the National Science Foundation

2022 Cottrell Scholar Award of the Research Cooperation for Science Advancement

2022 Selected as a Timmerhaus Ambassador by the University of Colorado President's Teaching Scholars Program

2022 *Firefly-inspired vocabulary generator for communication in multi-agent systems* chosen among Best 10 Papers at The 2022 Conference on Artificial Life (ALIFE)

2021 Junior Scientific Award of the Complex Systems Society *"for her contributions to the understanding of collective dynamics"*

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

2021 Selected as Research & Innovation Office Faculty Fellow at CU Boulder

2021 Selected as a National Geographic Explorer

2020 Paper on firefly synchronization chosen to 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 brings 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 chosen to 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, Collective Intelligence, Nature Communications Physics, Physical Review Fluids, PNAS.

### Grants and Fellowships Peer Review

2023 National Science Foundation (NSF), Physics Panel
https://www.nsf.gov/mps/phy/about.jsp

2022 National Science Foundation (NSF), Engineering Panel
https://www.nsf.gov/div/index.jsp?div=CMMI

2022 Research Corporation for Science Advancement (RCSA), External Reviewer
https://rescorp.org/

2022 Center for AI & Data Science at Tel Aviv University "High Impact Research," External Reviewer
https://datascience.tau.ac.il/tad-high-impact-research-grant-awardees-2022

2021 Templeton World Charity Foundation, External Reviewer
https://www.templetonworldcharity.org/

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

2019-2021 Complexity Postdoctoral Fellows, Santa Fe Institute
http://www.santafe.edu/sfifellowship

2021-2022 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

## External Thesis Peer Review

2022 Bar Ilan University, Physics Department, Ph.D. Thesis titled "Computational Study of Systems with Energy and Size Polydispersity" by Itay Azizi (supervised by Prof. Yitzhak Rabin).

## Editorial

2023- Member of the Editorial Board, *PRX Life*

2021 Guest Associate Editor, *PLOS Computational Biology*

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

2024-2025 Co-Organizer of a 12 weeks program on Mathematics of Intelligences at the Institute for Pure & Applied Mathematics (IPAM) at The University of California, Los Angeles (UCLA), (with J. Foster, J. Flack, J. Tenenbaum, M. Kleiman-Weiner, P. Das) (IPAM long program has been accepted)

2023 Co-Organizer and Chair of Physics of Social Interactions Focus Session at APS (American Physical Society) March Meeting 2021, (with G. Stephens)

2022 Member, Program Committee of ANTS 2022 - 13th International Conference on Swarm Intelligence

2022 Member, Collective Intelligence 2022 Conference, Program Committee

2022 Member, Program Committee of the international symposium on distributed autonomous robotic systems 2022 — DARS 2022

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

2022 Co-Organizer and Chair of Physics of Social Interactions Focus Session at APS (American Physical Society) March Meeting 2021, (with G. Stephens)

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

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

2022 Panelist on "When Will We Need a Theory of Intelligence?" at the InterPlanetary Festival at the Santa Fe Institute.

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

## Professional Societies

2022-2023 Member, APS DBIO Fellowship Committee

2022-2023 Member, the Complex Systems Society (CSS) Senior, Junior, and Emerging Researcher Awards Committee

2020, 2022-23 Member–at–Large at the Executive Committee of the Division of Biological Physics (DBIO), American Physical Society (APS)

2022-2023 Chair, APS DBIO Thesis Award Committee

2020-2022 Secretary and Treasurer (S/T), Executive Committee of the Division of Biological Physics (DBIO), American Physical Society (APS)

2020-2021 Member, APS DBIO Thesis Award Committee

2020-2021 Member, APS DBIO Program Committee

### University Service

2022-Present Member, Computer Science Department, Diversity, Equity, and Inclusion (DEI) Committee

2022-2023 Member, Computer Science Department, CS Search Committee for the College-wide Search

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

2019-Present Member, BioFrontiers National Science Foundation Research Traineeship (NSF-NRT) grant committee

2019-Present Member, BioFrontiers National Institutes of Health Institutional Research Training Grant (NIH-T32) grant committee

2019-Present Member, BioFrontiers National Science Foundation Research Traineeship grant for Sustained Availability of Biological Infrastructure (NSF-SABI) Core Program

2022–Present Interim Director, Computational Biology Minor Advisory Committee (Computer Science and BioFrontiers)

2019–2021 Member, Computational Biology Minor Advisory Committee (Computer Science and BioFrontiers)

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

2018–Present Member, BioFrontiers Institute Council (formerly Task Force)

2021-Present Member, BioFrontiers IQ Biology and NSF-NRT Admission Committee

2022 Gave a research lecture to the CS Computing Advisory Board members

2021 Participated at a BioFrontiers event with potential donors

2018, 2021-22 Gave a research talk for incoming IQ Bio students at the Summer Orientation Event

2019, 2021 Led 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 Gave a public talk about honeybees and dung beetle research at Engineering Exploration Lecture Series, Boulder CO, USA https://www.colorado.edu/ewb/exploration

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

| | |
|---|---|
| 2022 | Research & Innovation Office Faculty Fellow Program at CU Boulder (research and creative works leadership program that supports rising CU Boulder faculty) |
| 2022 | Writing Workshop Beyond the Ivory Tower, supported by the John Templeton Foundation and hosted at Northeastern University https://www.beyondtheivorytower.com/ |
| 2022 | Participated in the National Science Foundation (NSF) workshop on Understanding the Rules of Life: Achieving a Sustainable Future |
| 2020, 2022 | "Teaching Circles" CU Boulder, CS Department colleague teaching evaluation program |
| 2018 | Participated in the Computing Community Consortium (CCC) Workshop on Robotic Materials |
| 2017 | CS New Faculty Teaching Workshop with focus on evidence-based instructional practices, at the University of California San Diego |
| 2016 | Mini-MBA (Master of Business) Course at Harvard Business School (a five-week accelerated business course) |

## Outreach

| | |
|---|---|
| 2023 | Public talk at Essig Brunch on our work with bee swarms Essig Museum of Entomology, University of California, Berkeley, USA (forthcoming) |
| 2023 | Public talk at Congaree National Park Lunch and Learn series on our work with synchronous fireflies in Congaree National Park, SC, USA (forthcoming) |
| 2022 | Invited to give a talk at Camp Sandbox — a highly curated weekend gathering that cross-pollinates ideas between boundary-pushing scientists and independent filmmakers, NY, USA |
| 2022 | Panelist on "When Will We Need a Theory of Intelligence?" at the InterPlanetary Festival at the Santa Fe Institute |
| 2022 | Featured in a SciGirls TV episode (PBS) on our work with synchronous fireflies in Congaree National Park, SC, USA (forthcoming) |
| 2022 | Invited to give a public talk about honeybee research to beekeepers at Northern Colorado Beekeeper's Association, Loveland CO, USA |
| 2021 | Wrote a popular science article for Aeon Magazine titled "Living orbs of light" (Solving the mystery of how and why fireflies flash in time can illuminate the physics of complex systems) https://aeon.co/essays/what-secrets-do-the-synchronised-flashes-of-fireflies-unlock |
| 2021 | Invited to give a talk titled "Computing the Swarm: How the dynamics of fireflies, bees, and sheep may lead to robots that work en masse" to journalists at ScienceWriters2021 - a joint annual meeting of the National Association of Science Writers and the Council for the Advancement of Science Writing |
| 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 Two local high school students, Charlotte Gorgemans and April Tong, have been volunteering in the Peleg Lab. The students' work has led them to submit projects to several science fairs to great success: https://www.colorado.edu/cs/2021/07/08/it-takes-hive-community-volunteers-honeybee-research

2021 Interview with 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

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 to undergraduate students, for Physics Today on "Mechanical Hive Mind" https://physicstoday.scitation.org/doi/10.1063/PT.3.4191

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

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/

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/

2016-2017 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 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

2022 Coverage of paper on collective comb construction in honeybee swarms (*PNAS*, 2022)
PNAS In This Issue (tinyurl.com/nmtyhm3z)
PNAS Science Sessions Podcast (tinyurl.com/5djvhap5)
Physics Today (tinyurl.com/2k6jfyme)
Physics World (tinyurl.com/3e7mwr3c)

2022 CU Boulder Highlight of our *Scientific Reports 2022* paper: How many bees can you fit in an X-ray machine? That's not a joke https://www.colorado.edu/today/2022/10/27/how-many-bees-can-you-fit-x-ray-machine-thats-not-joke

2022 Interviewed for a popular-science podcast, Third Pod from the Sun, by the American Geophysical Union https://thirdpodfromthesun.com/2022/12/02/e29-fire-lighting-the-skies-with-fireflies/

2022 Interviewed for a popular-science podcast, Simplifying Complexity, by Sean Brady

2022 Interviewed for a Quanta Magazine feature of the Peleg Lab: "How Do Fireflies Flash in Sync? Studies Suggest a New Answer" https://www.quantamagazine.org/how-do-fireflies-flash-in-sync-studies-suggest-a-new-answer-20220920/

2022 Interviewed for NPR story: "These photos are shedding new light on how fireflies interact with the world" https://www.npr.org/sections/pictureshow/2022/08/12/1114236533/pete-mauney-photographs-fireflies

2022 Interviewed for a popular-science podcast, Many Minds by The Templeton Foundation, on "The brilliant swarm" https://disi.org/the-brilliant-swarm/

2022 Interviewed for a popular-science podcast, TWIML AI (This Week in Machine learning and AI), on "Collective Behavior of Honeybees & Fireflies" https://twimlai.com/podcast/twimlai/understanding-collective-insect-communication-with-ml-w-orig-peleg/

2022 CU Boulder Highlight of the 2022 Cottrell Scholar Award https://www.colorado.edu/asmagazine/2022/03/01/computer-scientist-physicist-wins-cottrell-scholar-award

2022 Featured on the National Park Service story "OSip: Synchronous Fireflies at Congaree National Park" https://www.nps.gov/index.htm https://twitter.com/NatureNPS/status/1503397092483649538

2022 Interviewed for Harper's Magazine story: "Bright Flight: The mysteries of firefly synchrony" https://harpers.org/archive/2022/03/bright-flight-fireflies-collective-behavior-blink/ Accompanying podcast https://soundcloud.com/harpersmagazine/bright-flight-fireflies-complexity

2022 Featured on the Knox News story "How do fireflies synchronize? The secret could unlock semi-autonomous robot technology" https://eu.knoxnews.com/story/news/2022/06/17/great-

smoky-mountains-synchronous-fireflies-2022-hold-secrets/7530268001/ ; Syndicated by Associated Press (AP) https://tinyurl.com/mr2t5t5x

2021 Coverage of paper on collective synchronization in firefly swarms (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 Coverage of paper on collective locomotion of worm blobs (Frontiers in Physics, 2021)
New York Times (https://tinyurl.com/ypsvfvhk)
Mashable (https://tinyurl.com/394wvffu)
NSF What's Hot in Science (https://tinyurl.com/8zc9krw9)
Phys.org (https://tinyurl.com/rn2nnme3), and
SyFy (https://tinyurl.com/4r5dxb2a)

2021 Interviewed for CASW 2021 Newsroom: "'A Q&A with an academic polyglot who draws ideas from nature documentaries" https://casw.org/news/computer-scientist-studies-insect-swarms-to-guide-robot-design/

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 swarms (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 paper (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