ORIT PELEG

University of Colorado at Boulder
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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
2023–Present Associate Professor (with tenure)
2024–2027 Marvin H. Caruthers Endowed Chair
2018–2023 Assistant Professor
Department of Computer Science and at the Biofrontiers Institute
Affiliated Faculty at the Dept. of Physics, Applied Math, and Ecology and Evolutionary Biology

Weizmann Institute of Science, Israel
2024 (October–December) Visiting Faculty Program, Department of Physics of Complex Systems

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
2012–2013 Postdoctoral Fellow at the Department of Chemistry and Chemical Biology

ETH Zürich and University of Zürich, Switzerland
2012 Research assistant at the Institute of Neuroinformatics

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

Publications

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

Journal Articles

1. R. Maya, N. Lerner, B. Karov, N. Tsory, ★R.C. Terrile, **O. Peleg**, T. Beatus
   Flight in the dark: different responses to darkness in flying insects
   Journal of Experimental Biology 229(10): jeb251675 (2026)

2. ★D. Chase, ★D. Zhu, ★M. Kathait, ★H. Robertson,★ J. Shah, ★S. Harrer, G. Nave★, ★N. Bonnie, **O. Peleg** (2026)
   3D Imaging of Honeybee Swarm Assembly and Disassembly
   Integrative and Comparative Biology, Volume 66, 2026, icag141 (2026)

3. C. Brooks, E. Janin, G. Siebert, C. Mathis, **O. Peleg**, S. I. Walker
   A Firefly-inspired Model for Deciphering the Alien
   Accepted for publication at Scientific Reports (2026) Preprint: https://arxiv.org/abs/2511.06139

4. ★G. G. Fard, ★C. K. Prasanna, **O. Peleg,** F. López Jiménez
   Honeybees adapt to a range of comb cell sizes by merging, tilting, and layering their construction
   PLOS Biology **23**(8): e3003253 (2025)

5. ★C. Nguyen, **O. Peleg**
   Where physics meets behavior in animal groups
   PRX Life **3**, 037001 (2025)

6. ★D.L. Chase, **O. Peleg**
   The Physics of Sensing and Decision-Making by Animal Groups
   Annual Review of Biophysics **54**:329-351 (2025)

7. ★G. Gharooni-Fard, M. Byers, V. Deshmukh, E. Bradley, C. Mayo, C. Topaz, **O. Peleg**
   A Computational Topology-based Spatiotemporal Analysis Technique for Honeybee Aggregation
   npj Complexity **1**:3 (2024)

8. ★C. Nguyen, I. Dromi, A. Kempinski, G.E.C. Gall, **O. Peleg**, Y. Meroz
   Noisy Circumnutations Facilitate Self-Organized Shade Avoidance in Sunflowers
   PRX 14, 031027 (2024)

9. ★O. Martin*, ★C. Nguyen*, ★R. Sarfati, M. Chowdhury, M.L. Iuzzolino, D.T. Nguyen, R.M. Layer, **O. Peleg**
   Embracing firefly flash pattern variability with data-driven species classification
   Scientific Reports **14**:3432 (2024)

10. C. A. Riiska*, ★C. Nguyen*, **O. Peleg**, J. M. Reiser
    The Physics of Animal Behavior: Form, Function, and Interactions
    Annual Review of Condensed Matter Physics **15**:325-350 (2024)

11. **O. Peleg**
A new chapter in the physics of firefly swarms
Nature Review Physics doi.org/10.1038/s42254-023-00675-z (2023)

12. E. Loffredo, E. Vesconi, R. Razban, **O. Peleg**, E. Shakhnovich, S. Cocco, R. Monasson
Evolutionary Dynamics of a Lattice Dimer: a Toy Model for Stability vs. Affinity Trade-offs in Proteins
J. Phys. A: Math. Theor. **56** 455002 (2023)

13. ★R. Sarfati*, K. Joshi*, ★O. Martin*, ★J.C. Hayes, S. Iyer-Biswas, **O. Peleg**
Emergent periodicity in the collective synchronous flashing of fireflies
eLife Accepted for publication (2023)

14. H. Tuazon, ★C. Nguyen, E. Kaufman, I. Tiwari, J. Bermudez, D. Chudasama, **O. Peleg**, S. Bhamla
Collecting-Gathering Biophysics of the Blackworm *L. variegatus*
Integrative and Comparative Biology icad080 (2023)

15. ★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)

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

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

18. ★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)

19. ★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)

20. ★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)

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

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

23. ★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)

24. ★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)

25. ★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)

26. ★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)

27. ★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)

28. 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)

29. 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)

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

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

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

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

34. 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)

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

36. 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)

37. 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)

38. **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)

39. 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)

40. **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)

41. **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)

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

43. 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)

44. **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)

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

46. 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)

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

Peer Reviewed Conference Papers (in Conference Proceedings)

1. ★D.M. T. Nguyen, ★G.G. Fard, ★M. L. Iuzzolino, **O. Peleg**
Gone With the Wind: Honey Bee Collective Scenting in the Presence of External Wind
ACM Collective Intelligence Conference (CI2023) (2023); acc. rate. 24%; https://dl.acm.org/doi/10.1145/3582269.3615594

2. ★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.;

3. ★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.;

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
   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.;

5. ★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);

6. ★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.;

Peer Reviewed Extended Abstracts (not in Conference Proceedings)

1. ★G.G. Fard, A. Rahn, R. Terrile, E. Bradley, **O. Peleg**
   Unraveling Communication Mechanisms for Aggregation and Food Exchange among Honeybees
   Collective Intelligence (CI) (2024)

2. ★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)

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

4. ★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)

5. ★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)

6. ★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)

Papers In Preparation / Under Peer Review

1. **O. Peleg**
   Discrete Communication Signals in Nature: Theory, Evolution, and Physiology
   To be published in 2026 at The Proceedings of the 1st Solvey Conference in Biology: The organisation and dynamics of biological computation
2. Owen Martin★, N. Nechyporenko★, K. Jayaram, **O. Peleg** (2026)
   Excitation–inhibition interactions mediate firefly flash synchronization
   Preprint: https://www.biorxiv.org/content/10.64898/2026.01.19.700439v1
3. **O. Peleg,** book manuscript (under contract with ***Harvard University Press***)
   A cross-scale exploration of how living systems make and maintain boundaries, using the physics of collective behavior and communication to connect cells, tissues, and animal swarms.

Others

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

Conference and Seminar Talks

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

1. **[I]** Title: TBD. Gordon Research Conference on the Movement Ecology of Animals, Lucca, Italy (2027, forthcoming)
2. **[I]** Title: TBD. University of Illinois - Mind in Vitro seminar series (2027, forthcoming)
3. **[I]** Title: TBD. 5th Cold Spring Harbor Meeting on Social Insects, Symposium on Biological Rhythms in Social Insects, Cold Spring Harbor Laboratory (2027, forthcoming)
4. **[I]** Title: TBD. University of Pennsylvania, MindCORE Seminar Series (2027, forthcoming)
5. **[I]** Title: TBD. Cold Spring Harbor Laboratory, Quantitative Biology (QB)/NeuroAI seminar (2027, forthcoming)
6. **[I]** Title: TBD. Physics Colloquium at Johns Hopkins (2026, forthcoming)
7. **[I]** Title: Signal relays in insect swarms. Workshop on Collective Motion and Migration, Complexity Science Hub Vienna (2026)
8. **[I]** Where Physics Meets Behavior in Animal Groups. Summer Program on Physics of Collective Function in Active and Living Matter, Aspen Center for Physics (ACP) (2026)
9. **[C]** Title: Synchronization and signal diversity in firefly swarms. International Congress for Neuroethology (ICN 2026) - Symposium on the Neural Substrate of Animal Collective Motion, Vancouver, Canada (2026)
10. **[I]** Title: Reading Firefly Signals in the Wild. Earth Species Project, DeepDive seminar series (2026)

11. **[P]** Title: Reading Firefly Signals in the Wild. CV4Animals Workshop, CVPR 2026, Denver, Colorado (2026)
12. **[I]** Title: Bees as Builders and Building Blocks of Biological Materials. Engineering Mechanics Institute Conference (EMI 2026), Boulder, CO (2026)
13. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. Soft Math Symposium: A symposium on Soft Math in honor of Prof. Mahadevan's 60th birthday, Harvard University, Cambridge, MA (2026)
14. **[I]** Title: Collective Communication in Firefly Swarms. BioInspired Sensing Computing and Control (BISCCITs, https://sites.google.com/uw.edu/bisccits/) (2026)
15. **[I]** Title: Firefly Flash Oscillators. "Oscillator' EMBO/EMBL Symposium (2026)
16. **[I]** Title: Where Physics Meets Behavior in Animal Groups. Physics of Life: Across the Americas. APS Global Summit (2026)
17. **[I]** Title: How a Bee Cluster Computes Stability. Embodied Intelligence Conference (2026)
18. **[I]** Title: Collective Communication in Firefly Swarms. HHMI's Janelia Research Workshop on "Neural Mechanisms Underlying Animal Societies" (2026)
19. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Physical Chemistry/Chemical Physics Seminar at CU Boulder (2026)
20. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Rafael Advanced Defense Systems (2025)
21. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Physical Mathematics Seminar, MIT (2025)
22. **[I]** Title: Governance Among Insects & Plants. MetaGov Seminar series https://metagov.org/seminar (2025)
23. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Physics Colloquium, Technion - Israel Institute of Technology (2025)
24. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Bio Club, Hebrew University of Jerusalem (2025)
25. **[I]** Title: Bees as Builders and Building Blocks of Self-Assembled Structures, Soft Matter Gordon Research Conference (2025)
26. **[I]** Title: Signal Relays in Swarms of Bees and Fireflies. KITP, University of California, Santa Barbara (2025)
27. **[I]** Title: Spherical Bees and Other Echoes of the Small, Schmidt Sciences Interdisciplinary Science Summit, Pasadena Convention Center (2025)
28. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms, Department of Biological Sciences, University of South Carolina (2025)
29. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms, SIAM Conference on Applications of Dynamical Systems (DS25) (2025)
30. **[I]** Title: Discrete Communication Signals in Nature: Theory, Physiology, and Evolution. Workshop on Biological Information and Environmental Uncertainty, Santa Fe Institute (2025)
31. **[I]** Title: Decoding and Directing Communication in Insect Swarms. American Physical Society (APS) March Meeting Focus session on "Controlling Active Matter" (2025)
32. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev (2024)
33. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Clore Seminar on Soft and Biological Physics, Weizmann Institute of Science (2024)
34. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. The Center for Physics and Chemistry of Living Systems, Tel Aviv University (2024)

35. **[I]** Title: Emergent Spatiotemporal Patterns in Firefly and Bee Swarms. Institute for Pure and Applied Mathematics (IPAM), Workshop: Modeling Multi-Scale Collective Intelligences, UCLA (2024)

36. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. Physics Colloquium, University of Florida (2024)

37. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. Seminar at the Rocky Mountain Biological Laboratory (RMBL), CO (2024)

38. **[I]** Title: Discrete Communication Signals in Nature: Theory, Physiology, and Evolution. Solvay Conference on Biology, "The organisation and dynamics of biological computation" Brussels (2024)

39. **[I]** Title: Collective Cognition in Animal Groups. Other Minds Workshop Beyond Center for Fundamental Concepts in Science at Arizona State University (2024)

40. **[I]** Title: Emergent Spatiotemporal Patterns in Bee Swarms. School of Life Sciences at Arizona State University (2023)

41. **[I]** Title: Emergent Spatiotemporal Communication Patterns in Insect Swarms. Isaac Newton Institute (Cambridge, UK) workshop on "Collective Behaviour" (2023)

42. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. Laboratory for Computational Neurodiagnostics, Stony Brooks University (2023).

43. **[I]** Title: Social Insects and Beyond: The Physics of Soft, Dense Invertebrate Aggregations. ACM Collective Intelligence Frontiers Webinar (2023)

44. **[P]** Title: The Dynamics of Collective Intelligence. Santa Fe Institute Collective Intelligence Symposium & Short Course: Foundations + Radical Ideas (2023)

45. **[I]** Title: Communication in Chaos: The Role of Signal Relays in Bee and Firefly Swarms. Conference: From individual to group decision-making experiments and theory, Weizmann Institute of Science, Israel (2023)

46. **[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)

47. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. Biophysics Seminar Series. University of California San Diego (2023)

48. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. American Physical Society (APS) March Meeting Focus session on "Emergent Behavior in Biological Systems" (2023)

49. **[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)

50. **[I]** Title: Emergent Spatiotemporal Patterns in Bee Swarms. Quantitative Biosciences and Engineering Seminar at Colorado School of Mines (2023)

51. **[I]** Title: Physical Computation in Insect Swarms. Physics Colloquium, University of Utah (2023)

52. **[I]** Title: Living Orbs of Light: Principles of Firefly Communication. Ecology, Evolution, and Marine Biology Seminar Series. University of California Santa Barbara (2023)

53. **[I]** Title: Emergent Spatiotemporal Patterns in Insect Swarms. Gordon Research Conference Stochastic Physics in Biology: Bridging Experiments and Theories (2023)

54. **[I]** Title: Firefly Communications: Principles and Predictions. Joint Mathematics Meetings, Special Session "Modeling collective behavior in biology" (2023)

55. **[I]** Title: Living Orbs of Light: The Math of Firefly Communication. Dynamics Days, Trinity College (2023)

56. **[I]** Title: Emergent Spatiotemporal Patterns in Bee Swarms. Physics of Morphing Matter workshop. Princeton Center for Theoretical Science. Princeton University (2022)

57. **[I]** Physical Computation in Insect Swarms. Physics Colloquium, Colorado School of Mines (2022)

58. **[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)

59. **[I]** Title: Physical Computation in Insect Swarms. Center for Theoretical Biophysics Seminar. Rice University (2022)

60. **[I]** Title: Physical Computation in Insect Swarms. the Journal of Biological Physics Webinar Series (2022)

61. **[I]** Physical Computation in Insect Swarms. Computations in Science Seminars, University of Chicago (2022)

62. **[P]** Title: Physical Computation in Insect Swarms. NetSci 2022 satellite "Multiscale & Integrative compleX Networks: EXperiments & Theories" (2022)

63. **[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)

64. **[I]** Titles : (1)Collective ecophysiology in bee swarms, (2)The physics of firefly communication. 2022 Complex Systems Summer School, Santa Fe Institute (2022)

65. **[I]** Physical Computation in Insect Swarms. Seminar, Santa Fe Institute (2022)

66. **[C]** Title: Three-dimensional tracking: Insights into firefly behavior and conservation. Computations in Science Seminars, The International Firefly Symposium 2022 (IFS2022), Lisbon, Portugal (2022)

67. **[I]** Title: Visual communication in dense firefly swarms. Computer Vision and Pattern Recognition Conference (CVPR) 2022, workshop on "Multi-Agent Behavior Modeling"(2022)

68. **[I]** Title: Physical Computation in Insect Swarms. The University of British Columbia, Math-Biology Seminar Series (2022)

69. **[I]** Title: The Physics of Firefly Communications: Principles and Predictions. Quantitative Ecology/Ethology/Evolution Discussions (QED) Harvard University (2022)

70. **[I]** Title: Physical Computation in Insect Swarms. Department of Engineering Sciences and Applied Mathematics, Northwestern University, Theoretical Physics of Biological Systems Seminar Series (2022)

71. **[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)

72. **[I]** Title: Physical Computation in Insect Swarms. Institute for Pure and Applied Mathematics (IPAM) at UCLA, workshop on "Mathematics of Intelligences"(2022)

73. **[I]** Title: Physical Computation in Insect Swarms. Clore Seminar on Soft and Biological Physics, Weizmann Institute of Science, Israel (2021)

74. **[I]** Title: Physical Computation in Insect Swarms. Department Colloquium, Applied Mathematics Department, CU Boulder (2021)

75. **[I]** Title: Physical Computation in Insect Swarms. Condensed Living Matter Seminar, Physics Department, University of Pennsylvania (2021)

76. **[I]** Title: Physical Computation in Insect Swarms. Physics of Behavior Symposium, CUNY/Princeton Initiative for the Theoretical Sciences (2021)

77. **[I]** Title: Physical Computation in Insect Swarms. Department Colloquium, Physics Department, CU Boulder (2021)

78. **[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)

79. **[I]** Title: Physical Computation in Insect Swarms. University College London, Symposium on Smartish: How Dumb Agents Act Clever Together (2021)

80. **[I]** Title: Physical Computation in Insect Swarms. Department Colloquium, Computer Science Department, CU Boulder (2021)

81. **[I]** Title: Collective Ecophysiology and Physics of Honey Bee Swarms. University of Cambridge, Theory of Living Matter Seminar (2021)

82. **[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)

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

84. **[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)

85. **[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)

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

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

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

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

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

91. **[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)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Teaching Experience

University Classes

CSCI–4830/7000, Signals and Codes in Living and Engineered Systems, University of Colorado at Boulder; Spring 2027

CSCI–5423, Bio–inspired Multi–agent Systems, University of Colorado at Boulder; Springs 2018-2023, 2025-27

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

CSE Capstone Project Course, Harvard University; Spring 2016

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

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

Summer Schools

Neurophysics of Active Sensing, Kavli Institute for Theoretical Physics (KITP); Summer 2025

Complex Systems Summer School (CSSS), Santa Fe Institute; Summer 2022, 2024, 2025, 2026

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

Konstanz School of Collective Behavior, Konstanz University, Germany ; Summer 2023

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

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

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

Mentoring Activities

Postdoctoral Researchers

2026–Present Dr. Anju Anand, Project: Signals and codes in living and engineered systems

2026–Present Dr. Samay Hulikal, Project: Sociality in the deep sea, and synchronous communication

2025–Present Dr. Heather Brooks, Project: Visual physiology and the principles of robust collective flashing in fireflies

2025–Present Dr. Sandra Winters, Project: The evolutionary origins of communication and sociality in the deep sea

2023–Present Dr. Danielle Chase, Project: Local information and adaptive responses to environmental perturbations in honeybee swarms

2023–2025 Dr. Nicholas Barendregt, Project: Dynamic encoding and decoding of emergent communication patterns in firefly swarms

2019–2023 Dr. Chantal Nguyen, Project: Trade–offs in collective plant movement and worm locomotion

2019–2023 Dr. Raphael Sarfati, Project: Firefly communication and synchronization

2020–2022 Dr. Olga Shishkov, Project: Spatiotemporal integration and propagation of mechanical signals in honeybee swarms: 3D structure reconstruction via x–ray

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

Ph.D Students

2026–Present Itai Madar, IQ Biology PhD Program, and the Computer Science PhD Program, CU Boulder Project: TBD

2025–Present Pedro Albuquerque Lemos, co–advised with Prof. Zack Kilpatrick, IQ Biology PhD Program, and the Computer Science PhD Program, CU Boulder Project: Spider web geometry shapes vibrational signal detection

2024–Present Richard Terrile, Computer Science PhD Program, CU Boulder Project: Efficiency of food distribution and storage in honeybees

2022–Present Nolan Bonnie, IQ Biology PhD Program (Integrated Data Science Fellow), and the Computer Science PhD Program, CU Boulder Project: Physics of firefly synchronization

2020–2025 Owen Martin, Computer Science PhD Program, CU Boulder. Project: Physics and information theory of firefly communication

2018–2024 Golnar G. Fard, co–advised with Prof. Elizabeth Bradley, Computer Science PhD Program, CU Boulder. Project: Efficiency of food distribution and storage 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

2026 Justin Hein, Rotation IQ Biology PhD Program at CU Boulder

2026 Itai Madar, Rotation IQ Biology PhD Program at CU Boulder

2025 Jonathan Gorman, Independent Study CS MS Program at CU Boulder

2025 Mihir Shrestha, Independent Study CS MS Program at CU Boulder

2025 Ayushi Sabnis, Independent Study CS MS Program at CU Boulder

2025 Arnav Purushotam, Independent Study CS MS Program at CU Boulder

2025 Rajath Vasisth, Independent Study CS MS Program at CU Boulder

2025 Tony Arant, Independent Study CS MS Program at CU Boulder

2025 Atharva Rasane, Independent Study CS MS Program at CU Boulder

2025 Varshitha Sathish, Independent Study CS MS Program at CU Boulder

2025 Archit Shukla, Independent Study CS MS Program at CU Boulder

2025 Jash Shah, Independent Study CS MS Program at CU Boulder

2025 Jenna Stanislaw, Sarah Elizabeth Stockman, Carolina Valderrama Hincapie, Team-Science Project, Co-supervised with Prof. Nolan Kane, IQ Biology PhD Program at CU Boulder

2024-2025 Jonathan Gorman, Independent Study CS MS Program at CU Boulder

2024 Kaustubh Milind Kulkarni, Independent Study CS MS Program at CU Boulder

2023-2024 Richard Terrile, Computer Science MS Program, CU Boulder

2022 Fall-23 Spr Chethan Kavaraganahalli Prasanna, Computer Science MS Program, CU Boulder

2022 Sum-23 Spr Divya Pragadaraju, Computer Science MS Program, CU Boulder

2022-2023 Morgan Byers, Computer Science MS Program, 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 Summer Varun Sharma, PhD Program, Mechanical Engineering, CU Boulder

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 Thesis Students

2025-2026 Ian Soukup, Honors Thesis (main advisor), BS in CS, CU Boulder

2023-2024 Anurag Ranjan, Honors Thesis (main advisor), BS in Physics, CU Boulder

Undergraduate Students

2025-2026 Samuel Buckler, Discovery Learning Apprenticeship (DLA) program, CU Boulder

2025-2026 Jessie Hsu, Discovery Learning Apprenticeship (DLA) program, CU Boulder

2025-2026 Sullivan “Sully" Harrer, Discovery Learning Apprenticeship (DLA) program, CU Boulder

2025 Henry Robertson, Summer Program for Undergraduate Research (SPUR), CU Boulder

2025 Daniel Zhu, Summer Program for Undergraduate Research (SPUR), CU Boulder

2024 Mahi Kathait, CS, Student Assistant, CU Boulder

2024 Andrea Brovolan, Physics, Student Assistant, CU Boulder

2024 Jenn Kaphammer, Undergraduate Research Opportunities Program (UROP) program, CU Boulder

2024 Nina van Hoorn, Distributed Research Experiences for Undergraduates (DREU), Skidmore College

2024 Caitleen Reyes, Distributed Research Experiences for Undergraduates (DREU), Indiana University

2024 Andrew Swanson, Summer Program for Undergraduate Research (SPUR), CU Boulder

2024 Daniel Moran, Summer Program for Undergraduate Research (SPUR), Community College of Aurora

2024 Hana Burroughs, Summer Program for Undergraduate Research (SPUR), CU Boulder

2024 Matthew Harper, Applied Math, CU Boulder

2023-2024 Javon Hickmon, Distributed Research Experiences for Undergraduates (DREU), University of Washington

2023-2024 Bowman Russell, Summer Program for Undergraduate Research (SPUR), CU Boulder

2023-2024 Anna Rose Simone, Summer Program for Undergraduate Research (SPUR), CU Boulder

2022–2025 Anna Rahn, Discovery Learning Apprenticeship (DLA) program, CU Boulder

2022 Fall Arnav Jain, Computer Science, CU Boulder

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

22 Sum-23 Spr Carrisa Mayo, Statistics & Data Science and Computer Science, CU Boulder

2021 Sum-23 Sum 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

2025 Summer John Kim, CU Science Discovery

2025 Summer Sloane Smith, CU Science Discovery

2024 Summer Avery Zheng, CU Science Discovery

2024 Summer Audrey Luong, CU Science Discovery

2023 Summer Mihira Chandrakar, Boulder High School

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

2026–Present Lincoln Doney, PhD Program, Physics, CU Boulder

2026–Present Violet Ross, PhD Program, Computer Science, CU Boulder

2026–Present Lena Faber, PhD Program, IQBio/Environmental and Evolutionary Biology, CU Boulder

2026–Present Ella Henry, PhD Program, IQBio/Environmental and Evolutionary Biology, CU Boulder

2026–Present Will Magrogan, PhD Program, Applied Math, CU Boulder

2026–Present Youhan Sohn, PhD Program, Mechanical Engineering, CU Boulder

2026–Present Matthew Smith, PhD Program, Physics, CU Boulder

2025–Present Derek Goulet, PhD Program, Civil, Environmnetal, & Architectural Engineering, CU Boulder

2025–Present Vivian Li, PhD Program, IQBio/Environmental and Evolutionary Biology, CU Boulder

2024–Present Morgan Byers, PhD Program, Computer Science, CU Boulder

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

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

2022–2025 Elise Tate, PhD Program, IQBio/Computer Science, CU Boulder

2021–2026 Elias Stallardolivera, PhD Program, Environmental and Evolutionary Biology, CU Boulder

2025 Chethan Kavaraganahalli Prasanna, MSc Program, Computer Science, CU Boulder

2022–2026 Heiko Kabutz, PhD Program, Mechanical Engineering, CU Boulder

2020–2026 Ellen Waddle, PhD Program, IQBio/Environmental and Evolutionary Biology, CU Boulder

2020–2023 Justin Trupiano, PhD Program, Emergent Technologies and Media Arts Practices, CU Boulder

2022–2023 Tzu-Chi Yen , PhD Program, Computer Science, CU Boulder

2019–2023 Katherine Hernandez, PhD Program, Environmental and Evolutionary Biology, CU Boulder

2023 Heather Cihak, PhD Program, Applied Math, CU Boulder

2022–2023 Nicholas Barendregt, PhD Program, Applied Math, 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

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

2023 Ana-Karina Potcoava, Honors Thesis, BS in Biochemistry, CU Boulder

2023 Hailey Perryman, Honors Thesis, BS in EBIO, CU Boulder

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 ~$9,767,000 (my share is ~$5,996,000)

Research Grants

2026–2027 Research Cooperation for Science Advancement (RCSA), Scialog, Neurobiology and Changing Ecosystems
198K USD (my portion: **66K USD**), Detection and prediction of environmental disruption by animal collectives; grant #SA-NCE-2026-042; PI Matthew Lovett-Barron (UCSD), co-PIs: James Crall (University of Wisconsin -Madison), and Peleg

2025–2028 National Science Foundation (NSF), Cyber Physical Systems
1M USD (my portion: **250K USD**), Collaborative Research: CPS: Medium: Honeybee-Inspired Coordination & Control of Distributed Energy Resources for Resilient Electric Grids at the Distribution Level; grant #2433426; PI Wangda Zuo (Pennsylvania State University), co-PIs: Kathryn Hinkelman (University of Vermont), Kyri Baker, and Peleg

2025–2028 National Science Foundation (NSF), Mathematical Biology Program
400K USD (my portion: **245K USD**), eMB: Collective and multiscale dynamics of resource transfer in social insects; grant #2527338; PI Z. Kilpatrick (CU Boulder), co-PI, Peleg

2025–2026 Air Force Research Laboratory (AFRL), Bioprincipic Systems Program
100K USD (my portion: **50K USD**), Principles of Robust Aggregation and Synchronization in Fireflies, grant #FA8651-25-2-0005; PI, Peleg, co-PIs: K. Jayaram, Y. Sondhi (Georgia Tech), and D. Speicer (University of South Carolina)

2024–2029 Schmidt Science Foundation, Polymath Program
2.5M USD; grant #G-24-66778 PI, Peleg

2024–2027 Human Frontiers Science Program (HFSP)
1.5M USD (my portion: **375K USD**), Temporal structures in complex deep-sea versus surface marine life: from molecules to communities, grant #RGP021/2024; PI, K. Tessmar-Raible (University of Vienna), co-PIs Peleg, M. Matabos (IFREMER) and T. Oakley (UCSB)

2023–2027 National Science Foundation (NSF), Physics of Living Systems Program
900K USD, CAREER: Principles of Firefly Rhythmic Synchronization, grant #2239331; PI, Peleg

2023–2025 Sloan Fellowship in Physics
75K USD, Spatiotemporal Dynamics of Collective Communication in Insect Swarms; grant #FG-2023-20488; 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

2022–2026 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)

2019–2023 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

2024 City of Boulder Open Space and Mountain Parks (OSMP), 12K USD, From spatiotemporal characterization to ecological insight: leveraging flash patterns to explore behavioral trends in Colorado *Photuris* fireflies; PI, Owen Martin, co-PI Peleg

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

2025 CU Boulder Provost's Faculty Achievement Award

2025 Scialog Fellow, Research Corporation for Science Advancement

2025 Kavli Frontiers of Science Fellow, National Academy of Sciences

2024 Schmidt Science Polymath, Schmidt Futures

2023 Sloan Fellow in Physics, Sloan Foundation

2022 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

2026-Present Scientist Scout, Hypothesis Fund (invited network of scientists identifying and recommending seed-stage research for funding) https://www.hypothesisfund.org/scouts

2026 National Science Foundation (NSF), Living Systems Panel
https://www.nsf.gov/funding/opportunities/ls-living-systems

2026 Templeton World Charity Foundation, External Reviewer
https://www.templetonworldcharity.org/

2025 Research Corporation for Science Advancement (RCSA), External Reviewer
https://rescorp.org/

2025 National Science Foundation (NSF), LEAPS Program, External Reviewer
https://www.nsf.gov/funding/opportunities/launching-early-career-academic-pathways-mathematical

2025 National Science Foundation (NSF), Physics Panel
https://www.nsf.gov/mps/phy/about.jsp

2025 Schmidt Foundation, Polymath Award
https://www.nsf.gov/mps/phy/about.jsp

2024 National Science Foundation (NSF), Physics Program, External Reviewer
https://www.nsf.gov/mps/phy/about.jsp

2024 Human Frontiers Science Program (HFSP)
https://www.hfsp.org/

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

2022 National Science Foundation (NSF), Engineering Panel

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

2025- Member of the Editorial Board, *Journal of the Royal Society Interface*

2025- Member of the Editorial Board, *npj Complexity*

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

2023- Associate Editor, *Collective Intelligence*

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

2026- Member of the Steering Committee for the ACM Collective Intelligence conference

2025-6 Co-Organizer of the "Oscillator" EMBO/EMBL (European Molecular Biology Organization/ European Molecular Biology Laboratory) Symposium in 2026, (with A. Aulehla, J. Garcia and A. Koseska)

2024-5 Co-Organizer of 'On Light and Life' Focus Session at APS (American Physical Society) March Meeting 2024, (with M. Jalaal)

2024 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)

2023 Member, Program Committee of Collective Intelligence Symposium at SFI

2023 Co-Organizer and Chair of Physics of Social Interactions Focus Session at APS (American Physical Society) March Meeting 2023, (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 2022, (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)

2020-2022 Co-Organizer and co-Founder of Living Histories Lecture Series DBIO (division of Biology) APS (American Physical Society), with S. Iyer-Biswas

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

2026 CU Boulder, New RIO CAREER Commit-to-Submit Writing Program Kickoff Workshop, Panel with previous winners

2023 CU Boulder, New CEAS Faculty Orientation, Panel on "What I Wish I Had Known Sooner"

2023 Panelist, HHMI's Janelia Research on Navigational Algorithms and Neural Circuit Computations Directing Olfactory Search Across Species, Panel on "What are we missing?"

2023 Panelist, Santa Fe Institute's Symposium on Collective Intelligence: Foundations + Radical Ideas, Panel on "Does the Nature of Intelligence Change When There is a Shift from Static Tasks to Performance in Changing Environments?"

2023 Panelist, American Association for the Advancement of Science (AAAS) Annual Meeting, Panel on "Alive or just Active: How are living systems different from synthetic matter?"

2022 Panelist, "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

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

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

2026-2028 Member, selection committee for the Provost's Faculty Achievement Awards, Office of Faculty Affairs

2026- Member, BioDataSci Academic Advisory Committee (AAC), BioFrontiers

2026- Member, B2 Faculty Advisor Board, Representative for CS/CEAS) in ATLAS

2025- Director, Computational Biology Minor Advisory Committee (Computer Science and BioFrontiers)

2025-2026 Member, Computer Science Department, Primary Unit Evaluation (PUEC) Committee

2023, 2025- Member, Computer Science Department, Voting Faculty Evaluation Committee

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

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

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

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

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

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

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

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

2022-2024 Member, Computer Science Department, Diversity, Equity, and Inclusion (DEI) Committee

2019-2023 Member, Advisory Committee for CMAP (the Center for Media Arts and Performance) in ATLAS

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

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

2021 Participated at a BioFrontiers event with potential donors

2018, 2021-23 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

Hosting Visiting Researchers

2025-Summer Prof. Tsevi Beatus, School of Computer Science and Engineering, The Hebrew University of Jerusalem

2025-6 Prof. Ithai Rabinowitch, Department of Medical Neurobiology, The Hebrew University of Jerusalem

Professional Development

2026 Invited to participate in the 2026 Polymaths Convening, organized by Schmidt Sciences

2026 Participated in the 2026 Neurobiology and Changing Ecosystems Scialog Workshop https://rescorp.org/scialog/nce-fellows-and-facilitators

2026 Participated in AFRL University Day at Eglin Air Force Base as part of the Bio-Intelligent Swarming Effort.

2025 Participated in the 2025 Neurobiology and Changing Ecosystems Scialog Workshop https://rescorp.org/scialog/nce-fellows-and-facilitators

2025 Participated in the 2025 Polymaths Convening, organized by Schmidt Sciences

2025 Participated in the Berggruen Institute Multispecies Constitution Project, final meeting https://berggruen.org/projects/the-multispecies-constitution-project

2025 Participated in the 2025 U.S. Kavli Frontiers of Science symposium https://www.nasonline.org/symposia/2025-u-s-kavli-frontiers-of-science/

2023 Participated in the 2023 Cottrell Scholar Conference, organized by the Research Corporation for Science Advancement

2023 Participated in Berggruen Institute Multispecies Constitution Project meeting https://berggruen.org/projects/the-multispecies-constitution-project

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

2022 Participated in the 2022 Cottrell Scholar Conference, organized by the Research Corporation for Science Advancement

2020, 22, 25 "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

Public Talks

2026 Invited speaker, Invited speaker, *How Fireflies Fall Into Sync.* WEdnesday SALON (public lecture series), Complexity Science Hub, Vienna.

2026 Invited speaker, *Understanding and Protecting Fireflies*, public webinar for the People and Pollinators Action Network on firefly biology, communication, and conservation.

2025 Public talk at Mountain Research Station, on firefly research and conservation in Colorado.

2025 Gave a talk at RMBL's Boulder Science Salon, sharing my path to the Rocky Mountain Biological Laboratory and outlining future directions for the lab's research.

2024 Gave a public talk titled "Insect Intellect: The Secret Language of Nature's Tiny Communicators" at Saturday Physics at CU Boulder
https://www.colorado.edu/physics/events/outreach/saturday-physics-series

2024 Gave a public talk on firefly research at Firefly Music, a public interactive art exhibition combining music and fireflies at Fountain Creek Nature Center, CO.
https://www.lynnxe.com/fireflies

2023 Public talk titled "Fireflies' Fantasia: Illuminating the Mysteries of Living Lights in Colorado and Beyond" at the Little Creatures Insect Exhibit at Boulder Public Library https://www.coolboulder.org/littlecreatures

2023 Gave a TEDx talk on lab's work with synchronous fireflies
https://www.ted.com/talks/orit_peleg_how_fireflies_communicate

2023 Public talk at Congaree National Park Lunch and Learn series on our work with synchronous fireflies in Congaree National Park, SC, USA

2023 Public talk at Essig Brunch on our work with bee swarms Essig Museum of Entomology, University of California, Berkeley, USA

2022 Gave 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 Gave a public talk about honeybee research to beekeepers at Northern Colorado Beekeeper's Association, Loveland CO, USA

2021 Gave 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 Invited to give a class on honeybee behavior (title: "Shaking the Swarm") to high school students at Legacy High School, in Broomfield CO, USA

2020 Gave a research and career talk for Woman Physicists at Bar Ilan University, Israel

2019 Gave a public talk about Honeybee research at MileHiveBeeClub, Denver CO, USA

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 Gave a public talk about honeybee research at Ignite Boulder event: "Shaking the Swarm", Ignite Boulder 40 at Boulder Theater https://youtu.be/HY0CBmlTmZs

Art+Science Collaborations

2026 Creative and Research Resident, B2 at the ATLAS Institute, CU Boulder, with Jonathon Keats. *Magic for Fireflies* — adapting stage-magic illusions for fireflies in the field and translating the resulting flash-pattern stimuli into human-scale light works in the Black Box.

2026 Scientific collaborator and speaker for *Light in Rhythm: Fireflies & Music*, a Boulder Philharmonic concert of firefly-inspired works informed by the Peleg Lab's research on firefly communication. Niwot Hall, Niwot, CO, May 2, 2026.

2025-6 Co-curated Desire Lines: Mapping Firefly Light and Place, an art–science exhibition of CU Boulder student firefly poems, long-exposure photography, and historical maps linking nocturnal ecology with place. Exhibited at the Jerry Crail Johnson Earth Sciences & Map Library, CU Boulder. https://libraries.colorado.edu/2025/10/23/new-exhibition-events-illuminate-art-and-science-fireflies

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

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 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

Popular Science Writing/Collaborations

2026 Co-wrote a popular science article for Nautilus Magazine, "*A Natural Solution to the Replication Crisis in Science*" https://nautil.us/a-natural-solution-to-the-replication-crisis-in-science-1284942

2025 Collaborated with Ze Frank and Xerces Society on a fundraising video for firefly conservation: https://youtu.be/czt_io0h-CA?si=xBa7wBlexiEOrRtQ

2025 Co-wrote a popular science article for The Conversation "*Fleeting fireflies illuminate Colorado summer nights – and researchers are watching*" https://theconversation.com/fleeting-fireflies-illuminate-colorado-summer-nights-and-researchers-are-watching-253593

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

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 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

Misc

2024 Held an outreach table at the public viewing of synchronous fireflies in Congaree National Park, with lab members O. Martin, N. Bonnie, and N. Barendregt. Showcased movies, robots, and the work of various labs.

2023 Public panel discussion titled "From Cognitive Bias to Rational Governance: What Humans Can Learn From Honeybees" at the ATLAS, CU Boulder (with Jonathon Keats and Erin Espelie)

2023 Featured in a SciGirls TV episode (PBS) on our work with synchronous fireflies in Congaree National Park, SC, USA (aired May 2023) https://www.pbs.org/video/flashy-fireflies-wh6aeq/

2020 Mentor at ATHENA By WiSTEM Summer Program for high-school girls https://www.athenabywistem.org/

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

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

2026 The Denver Post interview on "Colorado Fireflies" https://www.denverpost.com/2026/06/14/colorado-fireflies-conservation-butterfly-pavilion/

2026 True Facts with Ze Frank feature of (*PLOS Comp Bio 2025*) on: "The Mystery Of How Bees Build" https://www.youtube.com/watch?v=_hw26yREe9w

2026 KUNC NPR News, Colorado Stories interview on: "Why fireflies shine their lights at the same time – and why it might lead to new technologies?" https://www.kunc.org/podcast/inthenoco/2026-05-14/why-fireflies-shine-their-lights-at-the-same-time-and-why-it-might-lead-to-new-technologies

2026 APS News interview on: "How are physicists feeling about AI?" https://www.aps.org/apsnews/2026/04/how-physicists-feeling-ai

2026 CU Boulder Today highlight of our firefly-LED interactions project: "In a South Carolina swamp, researchers uncover secrets of firefly synchrony" https://www.colorado.edu/today/2026/03/12/south-carolina-swamp-researchers-uncover-secrets-firefly-synchrony

2026 BBC Wildlife highlight of our firefly-LED interactions project: "I would wonder if I was just seeing things." Scientists make illuminating discovery in South Carolina swamp https://www.discoverwildlife.com/animal-facts/insects-invertebrates/firefly-synchrony-south-carolina

2026 Nautilus highlight of our firefly-LED interactions project: "The Secret of Fireflies' Synchronous Flashing" https://nautil.us/the-secret-of-fireflies-synchronous-flashing-1279006

2026 Ars Technica highlight of our firefly synchronization research: "The science of how fireflies stay in sync" https://arstechnica.com/science/2026/03/the-science-of-how-fireflies-stay-in-sync

2026 Discover Magazine highlight of our firefly-LED interactions project: "Male Fireflies Flash as One Every May in Congaree National Park, Inspiring Future Robotics" https://www.discovermagazine.com/male-fireflies-flash-as-one-each-may-in-congaree-national-park-inspiring-future-robotics-48839

2025 Coverage of paper on collective comb construction in honeybee swarms (*POLS Biology*, 2025)
New York Times (tinyurl.com/3ajck4k6)
Smithsonian Magazine (tinyurl.com/ynhmy3wr)
The Scientist (tinyurl.com/52mnn36r) Physics.org (tinyurl.com/4tt8c3j2)
CU Boulder Today (tinyurl.com/yrfuau6w) Haaretz (tinyurl.com/3cba5fs5)

2025 Interviewed for a story on *The Mathematical Mysteries of Fireflies* for Nautilus https://nautil.us/the-mathematical-mysteries-of-fireflies-1204513/

2025 Interviewed for a story *Yes, Colorado has fireflies, and scientists are decoding their bioluminescent blinking* for Colorado Public Radio (CPR) www.cpr.org/2025/07/01/cu-firefly-blinking-research

2025 Story titled *Colorado Firefly Field Guide* for Alumni Association CU Boulder https://www.colorado.edu/coloradan/2025/07/07/colorado-firefly-field-guide

2025 Interviewed for a story on nematode stacking behavior for CNN: "These worms build living towers. Scientists aren't sure why" https://www.cnn.com/2025/06/05/science/nematode-stacking-worms-living-towers

2024 Interviewed for a story on synchronous fireflies for NPR https://www.npr.org/2024/05/24/g-s1-935/synchronous-fireflies-congaree-endangered; also featured on All Things Considered https://tinyurl.com/273x653h and on Short Wave https://tinyurl.com/yc3m6yjz

2024 Highlight of Schmidt Polymath award CU Boulder News https://www.colorado.edu/cs/2024/09/10/orit-peleg-selected-2024-schmidt-science-polymath and SFI News https://www.santafe.edu/news-center/news/orit-peleg-named-schmidt-science-polymath

2024 CU Boulder Today highlight of sunflower collective dynamics work: "Why do plants wiggle? New study provides answers" https://www.colorado.edu/today/2024/08/15/why-do-plants-wiggle-new-study-provides-answers

2024 Physics World highlight of sunflower collective dynamics work: "Sunflowers 'dance' together to share sunlight" https://physicsworld.com/a/sunflowers-dance-together-to-share-sunlight/

2024 9News highlight of sunflower collective dynamics work https://www.9news.com/video/tech/science/73-29290272-d50d-41d0-9058-4dbd9e96e218

2024 Interviewed for a story on "The surprising way sunflowers work together to get enough light" for the NewScientist https://www.newscientist.com/article/2444060-the-surprising-way-sunflowers-work-together-to-get-enough-light/

2024 Knowable Magazine highlight of (*Annu. Rev. Condens. Matter Phys.* 2024): Animals use physics? Let us count the ways https://knowablemagazine.org/content/article/physical-world/2024/how-animals-exploit-and-negotiate-physics

2024 CU Boulder Today highlight of Colorado Firefly project https://www.colorado.edu/today/2024/07/12/searching-colorados-little-known-fireflies

2024 Interviewed for a story on "Six Seconds of Dark" for the Bitter Southerner https://bittersoutherner.com/feature/2024/six-seconds-of-dark-firefly-lightening-bug

2024 Interviewed for a story on "Protecting Biodiversity Means Saving the Bogs" for the Natural Resources Defense Council https://www.nrdc.org/stories/protecting-biodiversity-means-saving-bogs-and-peatlands-swamps-marshes-fens

2024 Feature of work in collaboration with photographer Pete Mouney https://imagine5.com/gallery/the-twinkling-flirtation-of-fireflies/

2023 Feature on Collective Behavior (in Hebrew), the Davidson Institute of Science Education at the Weizmann Institute of Science https://connections.cu.edu/spotlights/five-questions-orit-peleg

2023 CU Connections Spotlight "5 Questions with Orit Peleg" http://tinyurl.com/nuaj29tj

2023 CU Boulder Highlight of the 2023 NSF CAREER Award https://www.colorado.edu/cs/2023/02/17/talking-fireflies-orit-peleg-receives-career-award

2023 CU Boulder Highlight of the 2023 Sloan Research Fellowship https://www.colorado.edu/asmagazine/2023/02/22/physicists-win-prestigious-sloan-fellowships

2023 Feature on insect behavior in Haaretz (in Hebrew) http://tinyurl.com/ywsxcb6t

2023 Q&A feature on firefly conservation in The Nature Conservancy http://tinyurl.com/bdzd2xhe

2023 Interviewed for a popular-science podcast (two episodes), Simplifying Complexity, by Sean Brady https://omny.fm/shows/simplifying-complexity/orit-peleg-topic-2?in_playlist=podcast https://omny.fm/shows/simplifying-complexity/orit-peleg-fireflies?in_playlist=podcast

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 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/ ; Syndicated by WIRED (https://www.wired.com/story/a-new-explanation-for-how-fireflies-flash-in-sync/)

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 Interviewed for a story by The Davidson Institute of Science Education (in Hebrew): "Nature's Collectives" https://rb.gy/9b0esj

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 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