

Endao Han

Center for the Physics of Biological Function
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EMPLOYMENT

2018 – present Center for the Physics of Biological Function and Department of Physics,
Princeton University, USA
Associate Research Scholar / CPBF Fellow
Advisors: Prof. Joshua W. Shaevitz and Prof. Howard A. Stone

EDUCATION

2012 – 2018 Ph.D., Physics, University of Chicago, USA
Advisor: Prof. Heinrich M. Jaeger
Thesis: *Transient dynamics of concentrated particulate suspensions under shear.*

2010 – 2012 MPhys (Hons), Physics, University of Manchester, UK
Advisor: Prof. Thomas Mullin

2007 – 2011 B.S., Physics, Shandong University, China

RESEARCH INTERESTS

Biophysics:

Collective motion of bacteria, mechanics of bacterial colonies and biofilms

Soft matter physics:

Shear thickening and jamming of particulate suspensions, granular materials, hybrid hydrogel

Fluid mechanics:

Rheology of non-Newtonian fluids, low-Reynolds-number swimmers

High-precision measurement techniques:

Traction force microscopy (TFM), high-speed imaging (optical, ultrasound, and x-ray), particle imaging velocimetry (PIV)

AWARDS & HONORS

2019 Springer Thesis Award, Springer
Thesis published as a book by Springer.

2018 - present CPBF Fellow, Center for the Physics of Biological Function, Princeton University

2017	Yodh Prize, University of Chicago <i>Awarded for outstanding research in experimental physics</i>
2013	Sachs Fellowship, University of Chicago
2012	Outstanding Academic Achievement Award (Top 0.5%), University of Manchester
2009	National Undergraduate Electronic Design Contest, 2 nd Prize, China
2008	National Scholarship (Top 0.2%), China

PUBLICATIONS

My [Google Scholar](#) page.

Peer-reviewed articles

1. M. D. Koch, M. E. Black, E. Han, J. W. Shaevitz, and Z. Gitai. *Pseudomonas aeruginosa* distinguishes surfaces by stiffness using retraction of type IV pili. **PNAS**, 119 (20) e2119434119 (2022).
2. M. A. Reyes-Martinez, E. P. Chan, C. L. Soles, E. Han, K. A. Murphy, H. M. Jaeger, D. R. Reid, and J. J. de Pablo. Tuning the mechanical impedance of disordered networks for impact mitigation. **Soft Matter**, 18 (10), 2039-2045 (2022).
3. E. Han, L. Zhu, J. W. Shaevitz, and H. A. Stone. Low-Reynolds-number, biflagellated Quincke swimmers with multiple forms of motion. **PNAS**, 118 (29) e2022000118 (2021).
4. S. Pravin*, B. Chang*, E. Han, L. London, D. I. Goldman, H. M. Jaeger, and S. T. Hsieh. Effect of two parallel intruders on total work during granular penetrations. **Physical Review E**, 104 (2), 024902 (2021).
5. L. K. Roth, E. Han, and H. M. Jaeger. Intrusion into granular media beyond the quasistatic regime. **Physical Review Letters**, 126 (21), 218001 (2021).
6. Y. Fang*, E. Han*, X. Zhang*, Y. Jiang*, Y. Lin, J. Shi, J. Wu, L. Meng, X. Gao, P. J. Griffin, X. Xiao, H. Tsai, H. Zhou, X. Zuo, Q. Zhang, M. Chu, Q. Zhang, Y. Gao, L. K. Roth, R. Bleher, Z. Ma, Z. Jiang, J. Yue, C. Kao, C. Chen, A. Tokmakoff, J. Wang, H. M. Jaeger, and B. Tian. Dynamic and programmable cellular-scale granules enable tissue-like materials. **Matter**, 2, 948-964 (2020).
7. E. Han, N. M. James, and H. M. Jaeger. Stress controlled rheology of dense suspensions using transient flows. **Physical Review Letters**, 123 (24), 248002 (2019).
8. E. Han*, L. Zhao*, N. Van Ha, S. T. Hsieh, D. B. Szyld, and H. M. Jaeger. Dynamic jamming of dense suspensions under tilted impact. **Physical Review Fluids**, 4 (6), 063304 (2019).

9. N. M. James, E. Han, R. A. Lopez de la Cruz, J. Jureller, and H. M. Jaeger. Inter-particle hydrogen bonding can elicit shear jamming in dense suspensions. **Nature Materials**, 17, 965-970 (2018).
 10. E. Han, M. Wyart, I. R. Peters, and H. M. Jaeger. Shear fronts in shear-thickening suspensions. **Physical Review Fluids**, 3 (7), 073301 (2018) (*Editors' Suggestion*).
 11. F. Box, E. Han, C. R. Tipton, and T. Mullin. On the motion of linked spheres in a Stokes flow. **Experiments in Fluids**, 58 (4), 29 (2017).
 12. S. Majumdar, I. R. Peters, E. Han, and H. M. Jaeger. Dynamic shear jamming in dense granular suspensions under extension. **Physical Review E**, 95 (1), 012603 (2017).
 13. E. Han, N. Van Ha, and H. M. Jaeger. Measuring the porosity and compressibility of liquid-suspended porous particles using ultrasound. **Soft Matter**, 13 (19), 3506-3513 (2017).
 14. E. Han, I. R. Peters, and H. M. Jaeger. High-speed ultrasound imaging in dense suspensions reveals impact-activated solidification due to dynamic shear jamming. **Nature Communications**, 7, 12243 (2016).
 15. K. Singh, C. R. Tipton, E. Han, and T. Mullin. Magneto-elastic buckling of an Euler beam. **Proc. R. Soc. A**, 469 (2155), 20130111 (2013).
 16. C. R. Tipton, E. Han, and T. Mullin. Magneto-elastic buckling of a soft cellular solid. **Soft Matter**, 8 (26), 6880-6883 (2012).
- *. Contributed equally

Book

1. E. Han, *Transient Dynamics of Concentrated Particulate Suspensions Under Shear*, Springer, 2020.

PRESENTATIONS

1. Mechanical stress fluctuations in *Myxococcus xanthus* monolayers revealed by traction force microscopy (Invited seminar). UC San Diego, online, May. 2022.
2. Mechanical stress fluctuations in *Myxococcus xanthus* monolayers revealed by traction force microscopy (Invited seminar). The Chinese University of Hong Kong, online, Mar. 2022.
3. Mechanical stress fluctuations in *Myxococcus xanthus* monolayers revealed by traction force microscopy (Contributed talk). APS March Meeting, Chicago, IL, Mar. 2022.
4. Measuring mechanical stress in *Myxococcus xanthus* monolayers with traction force microscopy (Invited seminar). Nanyang Technological University, online, Feb. 2022.

5. Measuring mechanical stress in *Myxococcus xanthus* monolayers with traction force microscopy (Contributed talk). 46.5th Annual International Meeting on the Biology of the Myxobacteria, online, Oct. 2021.
6. From rheology of particulate suspensions to collective motion of bacteria (Invited talk). Shandong University, online, Sept. 2021.
7. Measuring mechanical stress in *Myxococcus xanthus* monolayers with traction force microscopy (Contributed talk). APS March Meeting, online, Mar. 2021.
8. Transient dynamics of concentrated particulate suspensions (Invited seminar). Institute of Physics, Chinese Academy of Science, online, Dec. 2020.
9. Low Reynolds number, bi-flagellated Quincke swimmers with multiple forms of motion (Contributed talk). APS DFD Meeting, online, Nov. 2020.
10. From rheology of particulate suspensions to collective motion of bacteria (Invited talk). Mozi forum, University of Science and Technology of China, online, June 2020.
11. Swimmers at low Reynolds number driven by Quincke rotation (Contributed talk). APS March Meeting, online, Mar. 2020.
12. Measuring mechanical stress in *Myxococcus xanthus* monolayers with traction force microscopy (Contributed talk). 46th Annual International Meeting on the Biology of the Myxobacteria, Houston, TX, June 2019.
13. Dynamics of dense suspensions (Invited talk). Soft Materials Coffee Hour, Princeton University, Princeton, NJ, Apr. 2019.
14. Starch embedded hydrogels: linking macroscopic mechanical properties with microscopic particle configurations (Contributed talk). APS March Meeting, Boston, MA, Mar. 2019.
15. Constitutive relations for shear fronts in shear-thickening suspensions (Contributed talk). APS March Meeting, Los Angeles, CA, Mar. 2018.
16. Shear jamming fronts in dense suspensions (Invited talk). Princeton University, Princeton, NJ, Feb. 2018.
17. Constitutive relations for shear fronts in shear-thickening suspensions (Poster). KITP Conference, Santa Barbara, CA, Jan. 2018.
18. Dense particulate suspensions: a new material for impact protection (Poster). CHiMaD Annual Review Meeting, Evanston, IL, Mar. 2017.
19. Dynamic shear fronts in dense suspensions (Contributed talk). APS March Meeting, New Orleans, LA, Mar. 2017.
20. Studying dynamics of dense suspensions using high-speed ultrasound (Poster). Industrial Associates Meeting, University of Chicago, Chicago, IL, Oct. 2016.

21. Modeling shear jamming in one dimension (Invited talk). James Franck Institute bag-lunch meeting, University of Chicago, Chicago, IL, Sept. 2016.
22. Studying dynamics of dense suspensions using high-speed ultrasound (Poster). Granular Matter Gordon Research Conference, Easton, MA, July 2016.
23. Studying the impact-activated solidification of dense suspensions using high-speed ultrasound (Invited talk). Granular Matter Gordon Research Seminar, Easton, MA, July 2016.
24. Dynamic solidification of dense suspensions due to shear (Contributed talk). Workshop: Rheology of Dense Particulate Suspensions, Washington, DC, June 2016.
25. How high-speed ultrasound sees a whammed cornstarch suspension (Invited talk). James Franck Institute bag-lunch meeting, University of Chicago, Chicago, IL, Jan. 2015.

TEACHING

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| 2022 | Student Mentor, Priscila Buele (undergraduate, CUNY) |
| 2022 | Student Mentor, Aidan Zentner (undergraduate, Princeton University) |
| 2020 | Teaching Assistant, PHY 562, Biophysics, Princeton University |
| 2019 – 2022 | Teaching assistant, Center for the Physics of Biological Function Summer School, Princeton University |
| 2019 | Student Mentor, David Weisberg (undergraduate, Princeton University) |
| 2017 – 2018 | Student Mentor, Liang Zhao (undergraduate, University of Chicago) |
| 2017 | Student Mentor, Joan Jones (high school) |
| 2015 – 2017 | Student Mentor, Nigel Van Ha (high school)
<i>Nigel's work brought him to the Semi-finalist in the 2015 Siemens Competition</i> |
| 2013 | Teaching Assistant, PHYS 121, Mechanics, University of Chicago |
| 2013 | Student Mentor, Victoria Norman (undergraduate, University of Chicago) |
| 2013 | Teaching Assistant, PHYS 133, Waves, Optics, and Heat, University of Chicago |
| 2013 | Teaching Assistant, PHYS 132, Electricity and Magnetism, University of Chicago |
| 2012 | Teaching Assistant, PHYS 131, Mechanics, University of Chicago |

OUTREACH & SERVICE

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| 2021 | Organization committee member, The 46.5th Annual International Meeting on the Biology of the Myxobacteria, online. |
| 2020 – present | Center for the Physics of Biological Function symposium committee member, Princeton University. |
| 2020 – present | Physics Equity, Diversity and Inclusion Initiatives, Princeton University
<i>Organize events and arrange/invite speakers.</i> |

- 2019 Holiday lecture, Princeton University
- 2015 – 2018 Organizer, Material Research Center monthly student IRG meeting, University of Chicago
- 2014 – 2017 “Physics with a Bang!”, University of Chicago
Helped with preparation for the annual open house of the James Franck Institute
- 2014 Discovery Channel Daily Planet.
Interview about the solidification of dense suspensions