

# Pierre Alexandre Haas

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## Academic Appointments

- 2021 – **Max Planck Research Group Leader**  
Max Planck Institutes for the Physics of Complex Systems and of Molecular Cell Biology and Genetics  
Center for Systems Biology, Dresden
- 2020 – 2021 **Hooke Research Fellow**  
Mathematical Institute, University of Oxford  
Senior Demy of Magdalen College
- 2017 – 2020 **Neville Research Fellow in Applied Mathematics**  
Department of Applied Mathematics & Theoretical Physics and Magdalene College, University of Cambridge
- 2016 – 2017 **EPSRC Doctoral Prize Fellow**  
Department of Applied Mathematics & Theoretical Physics, University of Cambridge  
(Supervisor: Prof. Raymond E. Goldstein FRS)

## Education

- 2013 – 2017 **PhD in Applied Mathematics** (Supervisor: Prof. Raymond E. Goldstein FRS)  
Department of Applied Mathematics & Theoretical Physics, University of Cambridge
- 2009 – 2013 **BA & MMath in Mathematics** (Gonville & Caius College, University of Cambridge)  
2012 – 2013 *Mathematical Tripos*, Part III Distinction, *Mayhew Prize*  
2009 – 2012 *Mathematical Tripos*, Parts IA, IB, II
- 2002 – 2009 **Secondary education** (Lycée de Garçons d'Esch-sur-Alzette, Esch-sur-Alzette, Luxembourg)  
*Diplôme de fin d'études secondaires* in 2009

## Awards and Research Fellowships

### Selected Awards

- 2017 **Award for Outstanding Doctoral Thesis Research in Biological Physics, American Physical Society**  
awarded for “*outstanding theoretical work on the description of embryonic inversion in the alga Volvox, incorporating novel generalizations of elasticity theory and applied mathematics*” by the Division of Biological Physics of the American Physical Society (and jointly awarded to Dr David Jacobson); the winners share \$1500 prize money and are given travel reimbursement to present an invited talk at an APS March Meeting
- 2013 **Mayhew Prize**  
awarded to the “*candidate for Part III of the Mathematical Tripos who has in the judgement of the Examiners shown the greatest distinction in the subjects of Applied Mathematics*” ([en.wikipedia.org/wiki/Mayhew\\_Prize](http://en.wikipedia.org/wiki/Mayhew_Prize))

### Research Fellowships

- 2019 **Hooke Research Fellowship, University of Oxford**  
two-year fellowship in the Mathematical Institute at the University of Oxford, “*this prestigious Fellowship provides an ideal opportunity for candidates to pursue an independent research programme*”

- 2017 **Nevile Research Fellowship, Magdalene College, University of Cambridge**  
three-year fellowship at Magdalene College in the University of Cambridge; college research fellowships are highly competitive appointments (success rate  $\lesssim 1\%$ ) allowing early-career researchers who have just completed their doctorates to build their own research programme
- 2016 **Doctoral Prize Fellowship, Engineering and Physical Sciences Research Council**  
one-year post-doctoral fellowship; “*the Doctoral Prize helps universities retain and recruit the best PhD students receiving support to increase the impact of their PhD, and to improve retention of the very best students in research careers*”

## Publications

† – joint first authors, # – corresponding author(s)

### Preprints and Submitted Manuscripts

- [1] P. A. Haas<sup>†#</sup> and S. S. M. H. Höhn<sup>†#</sup>, “Cut it out: out-of-plane stresses in cell sheet folding of *Volvox* embryos”, *bioRxiv* (2023, *sub judice*)
- [2] Y. Meng, Sz. Horvát, C. D. Modes<sup>#</sup>, and Pierre A. Haas<sup>#</sup>, “Impossible ecologies: Interaction networks and stability of coexistence in ecological communities”, *arXiv* (2023, *sub judice*)
- [3] A. Inman, J. E. Lutton, E. Spiritosanto, M. Tada, T. Bretschneider, P. A. Haas<sup>#</sup>, and Michael Smutny<sup>#</sup>, “A multi-tiered mechanical mechanism shapes the early neural plate”, *bioRxiv* (2023, *sub judice*)
- [4] J. Delpierre, José I. Valenzuela, M. J. Bovyn, N. Pimpao Martins, L. Belicova, U. Repnik, M. P. Bebelman, S. Seifert, P. A. Haas, L. Y. Kalaidzidis, and M. Zerial<sup>#</sup>, “Hepatoblast iterative apicobasal polarization is regulated by extracellular matrix remodeling”, *bioRxiv* (2024, *sub judice*)

### Peer-Reviewed Papers

- [5] M. P. Bebelman<sup>†</sup>, M. J. Bovyn<sup>†</sup>, C. M. Mayer, R. Naumann, N. P. Martins, A. Honigmann, Y. Kalaidzidis, P. A. Haas<sup>#</sup>, and M. Zerial<sup>#</sup>, “Hepatocyte apical bulkheads provide a mechanical means to oppose bile pressure”, *Journal of Cell Biology* **222**, e202208002 (2023)
- [6] P. A. Haas<sup>#</sup>, M. A. Gutierrez, N. M. Oliveira<sup>#</sup>, and R. E. Goldstein<sup>#</sup>, “Stabilization of Microbial Communities by Responsive Phenotypic Switching”, *Physical Review Research* **4**, 033224 (2022)
- [7] P. A. Haas<sup>#</sup>, R. E. Goldstein<sup>#</sup>, D. Cholakova<sup>#</sup>, N. Denkov<sup>#</sup>, and S. K. Smoukov<sup>#</sup>, “Comment on *Faceting and Flattening of Emulsion Droplets: A Mechanical Model*”, *Physical Review Letters* **126**, 259801 (2021)
- [8] P. A. Haas<sup>#</sup> and R. E. Goldstein<sup>#</sup>, “Turing’s diffusive threshold in random reaction-diffusion systems”, *Physical Review Letters* **126**, 238101 (2021)  
recommended with a *Journal Club for Condensed Matter Physics Commentary*
- [9] P. A. Haas<sup>#</sup> and R. E. Goldstein<sup>#</sup>, “Morphoelasticity of Large Bending Deformations of Cell Sheets during Development”, *Physical Review E* **103**, 022411 (2021)  
highlighted as an *Editors’ Suggestion*
- [10] P. A. Haas<sup>#</sup>, N. M. Oliveira<sup>#</sup>, and R. E. Goldstein<sup>#</sup>, “Subpopulations and Stability in Microbial Communities”, *Physical Review Research: Rapid Communications* **2**, 022036(R) (2020)
- [11] P. A. Haas<sup>#</sup>, D. Cholakova, N. Denkov, R. E. Goldstein, and S. K. Smoukov<sup>#</sup>, “Shape-Shifting Polyhedral Droplets”, *Physical Review Research* **1**, 023017 (2019)
- [12] P. A. Haas<sup>#</sup> and R. E. Goldstein<sup>#</sup>, “Nonlinear and Nonlocal Elasticity in Coarse-Grained Differential-Tension Models of Epithelia”, *Physical Review E* **99**, 022411 (2019)
- [13] P. A. Haas<sup>#</sup> and R. E. Goldstein<sup>#</sup>, “Embryonic Inversion in *Volvox carteri*: The Flipping and Peeling of Elastic Lips”, *Physical Review E* **98**, 052415 (2018)  
highlighted as an *Editors’ Suggestion*
- [14] P. A. Haas<sup>†</sup>, S. S. M. H. Höhn<sup>†</sup>, A. R. Honerkamp-Smith, J. B. Kirkegaard, and R. E. Goldstein<sup>#</sup>, “The noisy basis of morphogenesis: mechanics and mechanisms of cell sheet folding inferred from developmental variability”, *PLoS Biology* **16**, e2005536 (2018)

- [15] P. A. Haas, R. E. Goldstein<sup>#</sup>, S. K. Smoukov<sup>#</sup>, D. Cholakova, and N. Denkov, “Theory of Shape-Shifting Droplets”, *Physical Review Letters* **118**, 088001 (2017)
- [16] P. A. Haas and R. E. Goldstein<sup>#</sup>, “Elasticity and Glocality: Initiation of Embryonic Inversion in *Volvox*”, *Journal of the Royal Society Interface* **12**, 20150671 (2015)
- [17] S. Höhn, A. R. Honerkamp-Smith, P. A. Haas, P. Khuc Trong, and R. E. Goldstein<sup>#</sup>, “Dynamics of a *Volvox* Embryo Turning Itself Inside Out”, *Physical Review Letters* **114**, 178101 (2015)  
selected for a **Viewpoint in Physics**: A. Boudaoud, “How to Turn an Embryo Inside Out”, *Physics* **8**, 39 (2015)
- [18] J. W. J. Anderson<sup>#</sup>, P. A. Haas, L.-A. Mathieson, V. Volynkin, R. Lyngsø, P. Tataru, and J. Hein, “Oxford: Kinetic Folding of RNA using Stochastic Context-Free Grammars and Evolutionary Information”, *Bioinformatics* **29**, 704 (2013)

### Other Publications (commentaries, peer-reviewed review papers)

- [19] M. J. Bovyn<sup>#</sup> and P. A. Haas<sup>#</sup>, “Shaping epithelial lumina under pressure”, *Biochemical Society Transactions* **52**, 331 (2024)
- [20] M. Ben Amar<sup>#</sup>, P. Ciarletta<sup>#</sup>, P. A. Haas<sup>#</sup>, “Morphogenesis in space offers challenges and opportunities for soft matter and biophysics”, *Communications Physics* **6**, 150 (2023)
- [21] P. A. Haas, “Morphogenesis: Mathematical Models with Frills”, *eLife* **8**, e48520 (2019)  
*Insight* article highlighting S. A. Montandon, A. Fofonjka, and M. C. Milinkovitch, “Elastic instability during branchial ectoderm development causes folding of the *Chlamydosaurus* erectile frill”, *eLife* **8**, e44455 (2019)

### Selected invited talks and seminars

- 2024 Living Matter Seminar, University of Luxembourg
- 2024 iMOL Winter School, University of Frankfurt
- 2023 Soft & Living Matter Seminar, Rudolf Peierls Centre for Theoretical Physics, University of Oxford
- 2023 Society for Mathematical Biology Annual Meeting (Columbus, OH, USA),  
mini-symposium on “Mathematical models of community - A journey through the scales”
- 2023 Theory at EMBL seminar, European Molecular Biology Laboratory, Heidelberg
- 2022 European Colloid & Interface Society Conference,  
keynote talk on “Colloids at Interfaces, Membranes and Biointerfaces, Emulsions and Foams”
- 2022 Theory group seminar, Institut Curie
- 2021 Virtual spring meeting of the German Physical Society  
mini-symposium on “Cell Adhesion and Migration, Multicellular Systems”
- 2021 Theory of Living Matter virtual seminar (with S. Höhn)
- 2020 Colloquium, Department of Physics and Materials Science, University of Luxembourg
- 2018 APS March Meeting (Los Angeles, CA, USA),

### Additional Information

#### Fellowships of Learned Societies

- Institut Grand-Ducal, Section des Sciences (Luxembourg)  
elected *membre correspondant* in 2024

#### Supervision of Junior Researchers

- Interns: Maria Gutierrez (2019), Marcin Pruszczyk (2021), Federico Stefanelli (2022),  
Marija Krstic (2022), Yuan He (2023), Valens Tribet (2024)
- PhD students: Maryam Setoudeh (2021–), Shiheng Zhao (2023–), Chandraniva Guha Ray (2023–)
- Postdocs: Matt Bovyn (2021–), Yu Meng (2022–), Rahul Gopalan Ramachandran (2022–),  
Malcolm Hillebrand (2023–)

## Peer review

- IOP Trusted Reviewer, Institute of Physics (2023)
- Reviewer for Nat. Commun., eLife, Trends Cell Biol., EMBO Rep., J. Phys. Complexity, ...

## Service to the Community

- Contributor to the SciSpaceE White Papers (2021) of the European Space Agency Roadmap on Soft Matter and Biophysics, Section 2.7, with Martine Ben Amar and Pasquale Ciarletta [associated review paper: M. Ben Amar<sup>#</sup>, P. Ciarletta<sup>#</sup>, P. A. Haas<sup>#</sup>, Commun. Phys. **6**, 150 (2023)]

## Conference organisation

- 2023 Biological Physics Circle Meeting, Dresden (with Steffen Rulands, Frank Jülicher)  
[annual meeting of junior researchers from the main biophysics research nodes in Europe]

## Selected institutional responsibilities

- 2021 – 2023 Scientific Committee, MPI-PKS  
Evaluation of the applications for postdoctoral research and sabbatical visits to the Visitors Programme at the Max Planck Institute for the Physics of Complex Systems.
- 2023 – PhD Course Committee, MPI-CBG  
Organisation of the annual, Woods-Hole-style course for new doctoral students: one month's team research in a lab or research group that is not that of their supervisor.
- 2023 – “Thursday Seminar” Committee, MPI-CBG  
Organisation of the institute colloquia (or “Thursday seminars”) at the Max Planck Institute of Molecular Cell Biology and Genetics.
- 2023 – ELBE programme committee, Center for Systems Biology Dresden  
Selection committee for the flagship interdisciplinary postdoctoral research fellowships at the Center for Systems Biology Dresden.

## Teaching (see also Outreach below)

- 2023 – **Lectures at TU Dresden**  
“Pattern formation in biology” (Master Programme in “Physics of Life”): lectures on instabilities  
“Advanced Biological Physics” (Master Programme in “Physics of Life”): lectures on (visco)elasticity
- 2020 **Undergraduate Classes, University of Oxford**  
class tutor for small group classes for the Part C Solid Mechanics course
- 2014 – 2020 **Undergraduate Supervisions, University of Cambridge**  
one-on-two tutorials for undergraduates (from Gonville & Caius, Magdalene, Christ's, Trinity, and other colleges) reading for the Mathematical Tripos at Cambridge  
Courses: Part IA: Vectors & Matrices, Differential Equations, Dynamics & Relativity, Vector Calculus  
Part IB: Methods, Part II: Classical Dynamics, Waves

## Outreach

### • Selected lectures to the general public

- 2023 “Les chercheurs luxembourgeois à l'étranger”  
Lecture in the series on “Luxembourg researchers abroad” organised by the Institut Grand-Ducal, Section des Sciences.
- 2023 “Lange Nacht der Wissenschaften”  
Lecture within the programme of the Dresden Long Night of the Sciences, including a demonstration of the Belousov–Zhabotinsky reaction.

• **Mathematical Olympiads**

- 2012 – 2021 European Girls' Mathematical Olympiad  
 This competition aims to encourage diversity in mathematical olympiads.  
*Team Leader* (Luxembourg) in 2012, 2014–2021, member of the *Appeals Committee* (2019)  
 Member of the *Problem Selection Committee* and *Coordinator* in 2013
- 2018 – Benelux Mathematical Olympiad  
*Problem Selection Committee*: member from 2018, chair in 2023;  
*Coordinator* in 2018, *Chief coordinator* in 2023
- 2024 Olympiade Francophone de Mathématiques  
*Coordinator*
- 2012 – Problem proposals selected for international mathematical olympiads:
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| International Mathematical Olympiad, Shortlist | 2020/G1, 2021/G1                       |
| European Girls' Mathematical Olympiad          | 2012/5, 2012/7, 2015/1, 2024/6         |
| Benelux Mathematical Olympiad                  | 2018/1, 2019/1, 2022/3, 2023/3, 2024/3 |
| Olympiade Francophone de Mathématiques         | 2021/3                                 |