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 **Nevile 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

Selected Awards

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 **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

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*"

2015 **Smith–Rayleigh–Knight Prize**
for an essay on "Inversion in *Volvox*", which was awarded a grade 2 (en.wikipedia.org/wiki/Smith's_Prize)

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)

2011 **Janelia Farm Undergraduate Scholarship** (Howard Hughes Medical Institute)
for spending ten weeks as an undergraduate researcher at the Janelia Farm campus in Ashburn, Virginia (USA), in the group of Sean Eddy and Elena Rivas, to work on RNA secondary structure prediction

2007 – 2009 **International Mathematical Olympiad**
Bronze Medals in 2008 and 2009, *Honourable Mention* in 2007 (competing for Luxembourg)

2005 **European Contest for Young Scientists** (Moscow, Russia)
Third Prize for a project on galls (cecidia) on trees and bushes

Publications

Preprints and Submitted Manuscripts

[1] Maarten P. Bebelman, Matthew J. Bovyn, Carlotta M. Mayer, Ronald Naumann, Nuno P. Martins, Alf Honigmann, Yannis Kalaidzidis, Pierre A. Haas, and Marino Zerial, *sub judice* (2022)

Peer-Reviewed Papers

[2] P. A. Haas, M. A. Gutierrez, N. M. Oliveira, and R. E. Goldstein, "Stabilization of Microbial Communities by Responsive Phenotypic Switching", *Physical Review Research* **4**, 033224 (2022)

[3] P. A. Haas, R. E. Goldstein, D. Cholakova, N. Denkov, and S. K. Smoukov, "Comment on *Faceting and Flattening of Emulsion Droplets: A Mechanical Model*", *Physical Review Letters* **126**, 259801 (2021)

[4] P. A. Haas and R. E. Goldstein, "Turing's diffusive threshold in random reaction-diffusion systems", *Physical Review Letters* **126**, 238101 (2021)

[5] P. A. Haas and R. E. Goldstein, "Morphoelasticity of Large Bending Deformations of Cell Sheets during Development", *Physical Review E* **103**, 022411 (2021)
highlighted as an ***Editors' Suggestion***

[6] P. A. Haas, N. M. Oliveira, and R. E. Goldstein, "Subpopulations and Stability in Microbial Communities", *Physical Review Research: Rapid Communications* **2**, 022036(R) (2020)

[7] P. A. Haas, D. Cholakova, N. Denkov, R. E. Goldstein, and S. K. Smoukov, "Shape-Shifting Polyhedral Droplets", *Physical Review Research* **1**, 023017 (2019)

[8] P. A. Haas and R. E. Goldstein, "Nonlinear and Nonlocal Elasticity in Coarse-Grained Differential-Tension Models of Epithelia", *Physical Review E* **99**, 022411 (2019)

[9] P. A. Haas and R. E. Goldstein, "Embryonic Inversion in *Volvox carteri*: The Flipping and Peeling of Elastic Lips", *Physical Review E* **98**, 052415 (2018)
highlighted as an ***Editors' Suggestion***

[10] P. A. Haas[†], S. S. M. H. Höhn[†], A. R. Honerkamp-Smith, J. B. Kirkegaard, and R. E. Goldstein, "The noisy basis of morphogenesis: mechanics and mechanisms of cell sheet folding inferred from developmental variability", *PLoS Biology* **16**, e2005536 (2018) [† equal contributions]

[11] P. A. Haas, R. E. Goldstein, S. K. Smoukov, D. Cholakova, and N. Denkov, "Theory of Shape-Shifting Droplets", *Physical Review Letters* **118**, 088001 (2017)

[12] P. A. Haas and R. E. Goldstein, "Elasticity and Glocality: Initiation of Embryonic Inversion in *Volvox*", *Journal of the Royal Society Interface* **12**, 20150671 (2015)

[13] S. Höhn, A. R. Honerkamp-Smith, P. A. Haas, P. Khuc Trong, and R. E. Goldstein, "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)

[14] J. W. J. Anderson, P. A. Haas, L.-A. Mathieson, V. Volynkin, R. Lyngsø, P. Tataru, and J. Hein, "Oxfold: Kinetic Folding of RNA using Stochastic Context-Free Grammars and Evolutionary Information", *Bioinformatics* **29**, 704 (2013)

Other Publications

[15] 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)

Contributions to Conferences and Invited Seminars

The symbol ∗ marks invited talks and seminars.

2022 "Mathematical Modelling of Microbiomes" (Plön, Germany)
2022 ∗ European Colloid & Interface Society Conference (Chania, Greece)
2022 ∗ Theory Group Seminar, Institut Curie
2021 ∗ Theory of Living Matter Online Seminar
2021 Virtual ICTAM 2020 + 1
2021 EMBO Workshop "Physics of living systems: from molecules to tissues" (virtual)
2021 ∗ Annual Meeting of the Max Planck Research Group Leaders (virtual)
2021 ∗ Thursday Seminar, Max Planck Institute of Molecular Cell Biology and Genetics (Dresden, Germany)
2021 ∗ Virtual DPG Spring Meeting, Mini-Symposium on "Cell Adhesion and Migration, Multicellular Systems"
2021 ∗ North meets South Colloquium, Mathematical Institute, University of Oxford (virtual)
2020 ∗ Industrial and Applied Mathematics Seminar, Mathematical Institute, University of Oxford (virtual)
2020 ~~ICTAM 2020 (Milan, Italy)~~ [meeting postponed to 2021 due to the CoVid-19 outbreak]
2020 ~~DPG Spring Meeting (Dresden, Germany)~~ [meeting cancelled due to the CoVid-19 outbreak]
2020 ∗ Symposium, Centre for Systems Biology Dresden (Dresden, Germany)
2020 ∗ Seminar, Max Planck Institute for Dynamics and Self-Organization (Göttingen, Germany)
2020 ∗ Colloquium, Department of Physics and Materials Science, University of Luxembourg (Luxembourg)
2019 APS March Meeting (Boston, MA, USA)
2019 Edwards Centre for Soft Matter (Cambridge, United Kingdom)
2018 "Self-Organization in Active Matter: from Colloid to Cells" (Erice, Italy)
2018 "Soft Matter at Interfaces" (Schloss Ringberg, Germany)
2018 ∗ APS March Meeting (Los Angeles, CA, USA)
2017 ∗ Isaac Newton Institute programme: "Growth, Form and Self-Organisation" (Cambridge, UK)
2017 Edwards Centre for Soft Matter (Cambridge, United Kingdom)
2017 Symposium of the Department of Pharmaceutical & Chemical Engineering (Giolechitsa, Bulgaria)
2016 APS Division of Fluid Dynamics Meeting (Portland, OR, USA)
2016 British Applied Mathematics Colloquium (Oxford, UK)
2016 "Physics of Development and Disease" (Aspen, CO, USA)
2016 Symposium of the Department of Pharmaceutical & Chemical Engineering (Giolechitsa, Bulgaria)
2015 Special Triangle Seminar "Mathematical and Physical Aspects of Biology" (London, UK)
2015 "Nonequilibrium Collective Dynamics 2015" (Potsdam, Germany)
2015 3rd International *Volvox* Conference (Cambridge, UK)
2015 17th Biennial Oxford–Cambridge Applied Mathematics Meeting (Oxford, UK)

Teaching (see also **Outreach** below)

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: Mathematical Olympiads

Since 2010, I have prepared Luxembourg candidates for mathematical competitions such as the International Mathematical Olympiad by teaching olympiad mathematics. In particular, I have been involved, since its inception in 2012, with the European Girls' Mathematical Olympiad, a competition that aims to increase female participation in mathematical olympiads. More formal roles have included:

2012–2021 **European Girls' Mathematical Olympiad**

Team Leader in 2012 and 2014–2021, member of the *Appeals Committee* in 2019
I have led teams to the United Kingdom, Turkey, Belarus, Romania, Switzerland, Italy, Ukraine.

Problem Selection Committee member and *Coordinator* in 2013

since 2018 **Benelux Mathematical Olympiad**

Problem Selection Committee member from 2018, *Chief Coordinator* in 2018

Several of my problem proposals have been used in international mathematical competitions. These include
EGMO 2012/5, 2012/7, 2015/1, BxMO 2018/1, 2019/1, IMO shortlist 2020/G1, OFM 2021/3, IMO shortlist 2021/G1, BxMO 2022/3

EGMO: European Girls' Mathematical Olympiad, BxMO: Benelux Mathematical Olympiad, IMO: International Mathematical Olympiad, OFM: Olympiade Francophone de Mathématiques