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Employment History

- 2024–... ■ **Max Planck Institute for Plant Breeding Research**, Department of Comparative Development and Genetics, Cologne, Germany
- Group Leader, *Mathematics and mechanics of plant morphogenesis* group
 - Starting package: 1 student (currently employed)
- 2023–2024 ■ **Max Planck Institute of Molecular Cell Biology and Genetics, Center for Systems Biology Dresden**, Dresden, Germany
- ELBE Postdoctoral Research Fellow (03/2024–08/2024) – *Independent research position*
 - Postdoctoral Researcher (10/2023–03/2024), under supervision of Prof. Heather Harrington.
- 2019–2023 ■ **Mathematical Institute, University of Oxford**, Oxford, United Kingdom
- Postdoctoral Research Associate (07/2023–10/2023), under supervision of Prof. Heather Harrington
 - Postdoctoral Research Associate (09/2019–07/2023), under supervision of Prof. Alain Goriely

Academic affiliations and memberships

- **Group Leader** at Max Planck Institute for Plant Breeding Research, Department of Comparative Development and Genetics, Cologne, Germany.
- **Visiting Research Fellow** at Mathematical Institute, University of Oxford, Oxford, United Kingdom (non-stipendiary).
- **Former Fulford Junior Research Fellow** at Somerville College, University of Oxford, Oxford, United Kingdom (non-stipendiary).
- Member of the **Computational Morphodynamics Group** (non-stipendiary) – A Cambridge-founded (SLCU) international research consortium focused on computational modelling of morphogenesis.

Education

- 2015 – 2019 ■ **Ph. D., University of Montpellier / Inria / ENS Lyon**
Computer Science (Computational Biology).
Thesis title: *On the role of mechanical feedback in plant morphogenesis* (defended on 28 May 2019).
Advisors: Dr Christophe Godin, Dr Jan Traas
- 2012 – 2015 ■ **M. Eng., Grenoble Institute of Technology**
Computer Science and Applied Mathematics (*Ensimag*).
- 6-month Erasmus exchange at the Polytechnic University of Turin.
 - Six-month research internship at TIMC lab under supervision of Dr Matthieu Chabanas: *Virtual pre-operative planning of acetabular fracture reduction using a patient-specific biomechanical model*.
 - Two-month research internship at Polytechnic University of Turin — Department of Control and Computer Engineering under supervision of Prof. Andrea Bottino: *Development of a software tool for semi-automatically fitting a deformable model of human face to incoming 3D scans*.
- 2010 – 2012 ■ **Classes préparatoires aux grandes écoles, Lycée Vaugelas, Chambéry**
Mathematics and Physics.
Two-year preparation for national competitive entrance exams leading to French *grandes écoles*, specialising in mathematics and physics. Ranked 309th among 6938 candidates at the *concours communs polytechniques*.

Awards and Achievements

- 2024 ■ **Editor's suggestion feature of PRE** for *Active shape control by plants in dynamic environment*.
- 2023 ■ **Cover feature of PNAS** for *Mechanics reveals the role of peristome geometry in prey capture in carnivorous pitcher plants (Nepenthes)*.
- 2022 ■ **Recognition Award** for outstanding performance, Mathematical Institute, University of Oxford.
- 2021 ■ **Best Early Career Researcher talk prize** at the 6th Oxford International Neuron and Brain Mechanics Workshop, awarded by Elsevier.
- **Editor's suggestion feature of PRL** for *Theory for Durotactic Axon Guidance*.

Grants and fellowships

- 2024 ■ **IXXI research grant (co-author of the proposal)** granted to Dr Ibrahim Cheddadi by the *Institut Rhônalpin des Systèmes Complexes*. Joint project: *Field theory of plant morphogenesis* – 5000 €
- 2023 – 2023 ■ **ELBE Postdoctoral Research Fellowship** (stipendiary), Max Planck Institute of Molecular Cell Biology and Genetics, Dresden.
- 2021 – 2023 ■ **Fulford Junior Research Fellowship** (non-stipendiary), Somerville College, University of Oxford.
- 2014 – 2015 ■ **Erasmus+ scholarship**, 8 month academic exchange with *Politecnico di Torino*.

Teaching and supervision

- Certifications ■ **Qualification de droit commun** French lecturer certification (2024).
- Scientific schools ■ **Invited lecturer** — *Geometry, mechanics and the physics of growth* (Nov. 2025) — *International Centre for Theoretical Sciences*, Bengaluru, India, 4.5 hours. Lecture series available on Youtube.
- Supervision ■ **PhD advisor** of Nanda Krishna Prabhakaranpillai Ushakumari (2025–2028, ongoing), Max Planck Institute for Plant Breeding Research.
- **Supervisor of a Master's student** in mathematics, Max Planck Institute for Plant Breeding Research, 3 month internship (2025).
- **Co-supervisor of a Master's student** in mathematics on the mechanics of carnivorous pitcher plants, Mathematical Institute, University of Oxford, 2 month summer project (2022).
- **Group supervisor for *Case Studies in Mathematical Modelling***, Mathematical Institute, University of Oxford, 2×8 hours, 2×5 students (2021 and 2022).
- **PhD assistant supervisor**, assisting Prof. Alain Goriely in the supervision of 4 PhD students: weekly meetings, technical and scientific advising, design of research strategy & scientific writing.
- **Study group co-supervisor** Workshop *Modelling Shape and Size in Biological Development* (Lorentz Centre, Leiden, 2020).
- Oxford tutorials ■ **Tutor for first-year *Dynamics***, Somerville College, University of Oxford, 8 hours, 2 groups of 3 students (2022).
- **Tutor for fourth-year *Solid Mechanics***, Mathematical Institute, University of Oxford, 6 hours, 15 students (2021).
- Marking ■ **Examiner for first-year *Geometry* final exam**, Mathematical Institute, University of Oxford (2022).
- **Examiner for fourth-year *Networks Mini-projects***, Mathematical Institute, University of Oxford (2021)

Academic service

- Outreach ■ Participant in a popular science **Youtube video** *Plants with teeth — the mechanics of insect-eating pitcher plants* (over 5,000 views since 2023)
- **Oxford Maths Festival**, Public demonstrations of mathematical experiments to children (2023).
- **A slice of Science**, School of Archaeology, University of Oxford, Public talk, Oxford (2023)
- **JRF Research Forum**, talk, Somerville College, University of Oxford (2021 and 2022).
- Administration ■ **Seminar organiser**: *Industrial and Applied Mathematics Seminar series* and the *Oxford Brain Modelling Seminar series*, Mathematical Institute, University of Oxford (2022–2023).
- **Panel member** for the recruitment of a postdoctoral researcher, Mathematical Institute, University of Oxford (2021).

Academic service (continued)

- **Panel member** for the International Max Planck Research School PhD Student selection, Max Planck Institute for Plant Breeding Research (2025). – Conducting interviews with applicants from biology, chemistry, or mathematics for admission to the PhD programme.
- **Examiner** for a PhD *Thesis Advisory Committee*, Max Planck Institute for Plant Breeding Research (2025) – Annual meeting to assess the progress of a Computational Biology student, offering technical, scientific, and strategic guidance.

Peer-reviewing ■ **Peer-reviewer** for *PNAS* (2 reviews), *Physical Review Letters* (1 review), *Physical Review E* (2 reviews), *PLoS Computational Biology* (2 reviews), *Brain Multiphysics* (3 reviews), *Studies in Applied Mathematics* (1 review), *Quantitative Plant Biology* (1 review), *Journal of Mathematical Biology* (1 review), and *Journal of the Mechanics and Physics of Solids* (1 review).

Full list of publications

* These authors contributed equally

Preprints

- 1 G. S. Brennan, T. B. Thompson, **H. Oliveri**, V. Vinje, G. Ringstad, P. K. Eide, A. Goriely, and M. E. Rognes, *Heterogeneity in human brain clearance adds resilience against tauopathy*, bioRxiv, Mar. 2025. [DOI: 10.1101/2025.06.03.657596](https://doi.org/10.1101/2025.06.03.657596).
- 2 **H. Oliveri**, T. Lessinnes, D. E. Moulton, and A. Goriely, *Chirality and handedness*, under review (commissioned by *Reviews of Modern Physics*), Apr. 2025.

Peer-reviewed journal articles

- 1 **H. Oliveri**, E. Cozzolino, and A. Goriely, “A multiscale theory for network advection-reaction-diffusion,” *Journal of Mathematical Biology*, vol. 92, no. 65, Apr. 2026. [DOI: 10.1007/s00285-026-02386-2](https://doi.org/10.1007/s00285-026-02386-2).
- 2 **H. Oliveri**, C. Godin, and I. Cheddadi, “Towards an active matter theory of plant morphogenesis,” *Quantitative Plant Biology*, Apr. 2026, Accepted. [DOI: 10.48550/arXiv.2512.05554](https://doi.org/10.48550/arXiv.2512.05554). eprint: arXiv:2512.05554v1.
- 3 A. Ahern, T. B. Thompson, **H. Oliveri**, S. Lorthois, and A. Goriely, “Modelling the coupling between cerebrovascular pathology and amyloid beta spreading in Alzheimer’s disease,” *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, vol. 481, no. 2311, p. 20240548, Apr. 2025. [DOI: 10.1098/rspa.2024.0548](https://doi.org/10.1098/rspa.2024.0548).
- 4 C. Kassianides, A. Goriely, and **H. Oliveri**, “The multiscale mechanics of axon durotaxis,” *Journal of the Mechanics and Physics of Solids*, vol. 200, p. 106134, Apr. 2025, ISSN: 0022-5096. [DOI: 10.1016/j.jmps.2025.106134](https://doi.org/10.1016/j.jmps.2025.106134).
- 5 **H. Oliveri** and I. Cheddadi, “Hydromechanical field theory of plant morphogenesis,” *Journal of the Mechanics and Physics of Solids*, vol. 196, p. 106035, Mar. 2025, ISSN: 0022-5096. [DOI: 10.1016/j.jmps.2025.106035](https://doi.org/10.1016/j.jmps.2025.106035).
- 6 D. E. Moulton and **H. Oliveri**, “The mathematics and mechanics of tug of war,” *Mathematics and Mechanics of Solids*, vol. 29, no. 6, pp. 1254–1270, Jan. 2024. [DOI: 10.1177/10812865231203154](https://doi.org/10.1177/10812865231203154).

- 7 **H. Oliveri** and A. Goriely, "Correction to: Mathematical models of neuronal growth," *Biomechanics and Modeling in Mechanobiology*, no. 21, pp. 89–118, Mar. 2024. [DOI](#): 10.1007/s10237-024-01831-9.
- 8 **H. Oliveri**, D. E. Moulton, H. A. Harrington, and A. Goriely, "Active shape control by plants in dynamic environments," *Phys. Rev. E*, vol. 110, no. 1, p. 014 405, Jul. 2024, **Editor's suggestion**. [DOI](#): 10.1103/PhysRevE.110.014405.
- 9 G. S. Brennan, T. B. Thompson, **H. Oliveri**, M. E. Rognes, and A. Goriely, "The role of clearance in neurodegenerative diseases," *SIAM Journal on Applied Mathematics*, vol. 84, no. 3, S172–S198, Jul. 2023. [DOI](#): 10.1137/22M1487801.
- 10 D. E. Moulton, **H. Oliveri**, A. Goriely, and C. J. Thorogood, "Mechanics reveals the role of peristome geometry in prey capture in carnivorous pitcher plants (*Nepenthes*)," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 120, no. 38, e2306268120, Sep. 2023, **featured on cover and issue's highlights**. [DOI](#): 10.1073/pnas.2306268120.
- 11 P. Putra, **H. Oliveri**, T. Thompson, and A. Goriely, "Front propagation and arrival times in networks with application to neurodegenerative diseases," *SIAM Journal on Applied Mathematics*, vol. 83, no. 1, pp. 194–224, Feb. 2023. [DOI](#): 10.1137/21M1467547.
- 12 **H. Oliveri** and A. Goriely, "Mathematical models of neuronal growth," *Biomechanics and Modeling in Mechanobiology*, vol. 21, pp. 89–118, Jan. 2022, ISSN: 1617-7940. [DOI](#): 10.1007/S10237-021-01539-0.
- 13 **H. Oliveri**, R. de Rooij, E. Kuhl, and A. Goriely, "Rheology of growing axons," *Physical Review Research*, vol. 4, no. 3, p. 033 125, Aug. 2022. [DOI](#): 10.1103/PhysRevResearch.4.033125.
- 14 M. Boudissa, G. Bahl, **H. Oliveri**, M. Chabanas, and J. Tonetti, "Virtual preoperative planning of acetabular fractures using patient-specific biomechanical simulation: A case-control study," *Orthopaedics & Traumatology: Surgery & Research*, vol. 107, no. 6, p. 103 004, 2021. [DOI](#): 10.1016/j.otsr.2021.103004.
- 15 M. Boudissa, B. Noblet, G. Bahl, **H. Oliveri**, M. Herteleer, J. Tonetti, and M. Chabanas, "Planning acetabular fracture reduction using a patient-specific biomechanical model: A prospective and comparative clinical study," *International Journal of Computer Assisted Radiology and Surgery*, vol. 16, pp. 1305–1317, 2021. [DOI](#): 10.1007/s11548-021-02352-x.
- 16 **H. Oliveri**, K. Franze, and A. Goriely, "Theory for Durotactic Axon Guidance," *Physical Review Letters*, vol. 126, no. 11, p. 118 101, Mar. 2021, **Editor's suggestion**. [DOI](#): 10.1103/PhysRevLett.126.118101.
- 17 D. E. Moulton, **H. Oliveri**, and A. Goriely, "Multiscale integration of environmental stimuli in plant tropism produces complex behaviors," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 117, no. 51, pp. 32 226–32 237, Dec. 2020. [DOI](#): 10.1073/pnas.2016025117.
- 18 F. Zhao*, F. Du*, **H. Oliveri***, L. Zhou*, O. Ali*, W. Chen, S. Feng, Q. Wang, S. Lü, M. Long, R. Schneider, A. Sampathkumar, C. Godin, J. Traas, and Y. Jiao, "Microtubule-mediated wall anisotropy contributes to leaf blade flattening," *Current Biology*, vol. 30, no. 20, pp. 3972–3985, Sep. 2020. [DOI](#): 10.1016/j.cub.2020.07.076.
- 19 O. Ali, **H. Oliveri**, J. Traas, and C. Godin, "Simulating turgor-induced stress patterns in multilayered plant tissues," *Bulletin of mathematical biology*, pp. 1–23, 2019. [DOI](#): 10.1007/s11538-019-00622-z.
- 20 M. Boudissa, **H. Oliveri**, M. Chabanas, and J. Tonetti, "Computer-assisted surgery in acetabular fractures: Virtual reduction of acetabular fracture using the first patient-specific biomechanical

model simulator,” *Orthopaedics & Traumatology: Surgery & Research*, vol. 104, no. 3, pp. 359–362, 2018. [DOI: 10.1016/j.otsr.2018.01.007](https://doi.org/10.1016/j.otsr.2018.01.007).

- 21 **H. Oliveri**, J. Traas, C. Godin, and O. Ali, “Regulation of plant cell wall stiffness by mechanical stress: A mesoscale physical model,” *Journal of mathematical biology*, vol. 78, no. 3, pp. 625–653, 2018. [DOI: 10.1007/s00285-018-1286-y](https://doi.org/10.1007/s00285-018-1286-y).

Conference Proceedings

- 1 M. Boudissa, M. Chabanas, G. Bahl, **H. Oliveri**, and J. Tonetti, “Virtual pre-operative planning in acetabular surgery using a patient-specific biomechanical model: A prospective clinical study,” in *CAOS 2020. The 20th Annual Meeting of the International Society for Computer Assisted Orthopaedic Surgery*, 2020. [URL: https://hal.science/hal-03185100](https://hal.science/hal-03185100).
- 2 M. Boudissa, **H. Oliveri**, M. Chabanas, P. Merloz, and J. Tonetti, “Pre-operative planning in acetabular surgery: The first patient-specific biomechanical model,” in *International Society of Computer-Assisted Orthopaedic Surgery, 17th Annual Scientific Meeting, Aachen, June 2017*, vol. 99-B, 2017, pp. 18–18. [DOI: 10.1302/1358-992X.2017.20.018](https://doi.org/10.1302/1358-992X.2017.20.018).
- 3 **H. Oliveri**, M. Boudissa, J. Tonetti, and M. Chabanas, “Planning acetabular fracture reduction using patient-specific multibody simulation of the hip,” in *Medical Imaging 2017: Image-Guided Procedures, Robotic Interventions, and Modeling*, R. J. W. III and B. Fei, Eds., International Society for Optics and Photonics, vol. 10135, SPIE, 2017, 101352P. [DOI: 10.1117/12.2250380](https://doi.org/10.1117/12.2250380).
- 4 M. Boudissa, M. Chabanas, **H. Oliveri**, and J. Tonetti, “Virtual fracture reduction of the acetabulum using a rigid body biomechanical model,” in *SURGETICA*, 2014. [URL: https://hal.science/hal-01233925](https://hal.science/hal-01233925).

Talks and Posters

- 1 “Hydromechanical field theory of plant morphogenesis,” Meeting of the CNRS “groupement de recherche” on Plant Physics and Biomechanics (PhyP), Carry-le-Rouet, 2026.
- 2 “The mathematics and mechanics of plant tropisms,” *International Conference on Arabidopsis Research (Invited)*, Ghent, Jun. 2025.
- 3 “Towards an active matter of plant morphogenesis,” IUSTI (**Invited**), Marseille, Dec. 2025.
- 4 “Active shape control by plants in dynamic environment,” Meeting of the CNRS “groupement de recherche” on Plant Physics and Biomechanics (PhyP), Carry-le-Rouet, 2024.
- 5 “Hydromechanical field theory of plant morphogenesis,” Workshop *Finite Elements for Cell and Tissue Morphogenesis*, Fréjus, Sep. 2024.
- 6 “Hydromechanical field theory of plant morphogenesis,” *8th Plant Computational Biology Workshop (Invited)*, Lyon, Nov. 2024.
- 7 “Robust posture control by plants in dynamic gravity field,” American Physical Society March Meeting, Minneapolis, Mar. 2024. [URL: https://ui.adsabs.harvard.edu/abs/2024APS..MART360080/abstract](https://ui.adsabs.harvard.edu/abs/2024APS..MART360080/abstract).
- 8 “The mathematics and mechanics of plant tropisms,” Max Planck Institute for Plant Breeding Research (**Invited**), Cologne, 2024.
- 9 “Active shape control by plants in dynamic environment,” *Oxford Cancer: Spatial Biology Workshop (Poster)*, Oxford, 2023.
- 10 “The mathematics and mechanics of plant tropisms,” Max Planck Institute for the Physics of Complex Systems (**Invited**), 2023.

- 11 “A field theory for plant tropism,” Workshop *Multiscale Modeling of Plant Growth, Pattern Formation, and Actuation*, Banff International Research Station, Casa Matemática, Oaxaca (**Invited**), 2022.
- 12 “A field theory for plant tropism,” Université Libre de Bruxelles (**Invited**), Bruxelles, 2022.
- 13 “A field theory for plant tropism,” 10th International Plant Biomechanics Conference, Lyon, 2022.
- 14 “A field theory for plant tropism,” Workshop *Mechanics of Life* (**Invited**), Flatiron Institute, New York, 2022.
- 15 “A field theory for plant tropism,” Symposium of the French “groupement de recherche” on Plant Physics (PhyP), Carry-le-Rouet, Mar. 2022.
- 16 “An optic ray theory for nerve durotaxis,” EMMC18, Oxford, 2022.
- 17 “Rheology of growing axons,” Workshop *Bridging the Gap: from Brain Mechanics to Brain Dynamics*, Lorentz Centre, Leiden, 2022.
- 18 “A multiscale mathematical theory for plant tropism,” Department of Mathematical Sciences (**Invited**), University of Durham, Durham, 2021.
- 19 “An optic ray theory for nerve durotaxis,” 5th Soft Tissue Modelling Workshop, Glasgow, 2021.
- 20 “An optic ray theory for nerve durotaxis,” Industrial and Applied Mathematics Seminar Series, Mathematical Institute (**Invited**), University of Oxford, Oxford, 2021.
- 21 “An optic ray theory for nerve durotaxis,” 6th Oxford International Neuron and Brain Mechanics Workshop, Oxford (**Best ECR talk prize awarded by Elsevier**), 2021.
- 22 “Morphogenesis of plant organs: Understanding the emergent behavior of stress-sensing tissues,” 9th International Plant Biomechanics Conference, Montreal, 2018.
- 23 “Stress-based regulation of multicellular plant growth: A finite element modeling approach applied to planar leaf morphogenesis,” 19th International Conference on Systems Biology (Poster), Lyon, 2018.
- 24 “Force-sensing at the cell wall: A multiscale physical model,” Symposium of the French “groupement de recherche” on Plant Physics (PhyP), Marseille, 2017.