Daniel Duffy

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Employment

June 2024 – present *University of Michigan (USA), Physics*

- Pioneer Fellow (postdoctoral), Nov 2024 onwards.
- Postdoc, June – Nov 2024.

April 2023 – March 2024 *NTU (Singapore), Physical and Mathematical Sciences*

- Research Associate.

Education

2014 – 2024 *University of Cambridge (UK)*

- PhD, *Concentrated Gauss Curvature in Shape-Programmed Shells*, supervised by Prof. John S. Biggins. Graduated April 2024.
- MPhil in Scientific Computing, Class 1 with Distinction.
- Part III research project, *Relating Proximity to the Jamming Critical Point to Isostatic Regions in Particulate Media* with Prof. Raphael Blumenfeld, 2018.
- UROP research project, *The Sounds of Plucked String Instruments* with Prof. Jim Woodhouse, 2017.
- MSci + BA in Physics/Natural Sciences, Classes 1, 2.1, 1, 1.

Teaching

I have over 300 hours of experience teaching Electromagnetism, Classical Mechanics, Thermodynamics, and Statistical Physics to 2nd-year Physics undergraduates, in small-group supervisions at the University of Cambridge (Downing College). I chose to attend training courses on effective undergraduate supervision, run by the University of Cambridge. I wrote and delivered an entirely new shell mechanics course for graduate students at the University of Michigan. I write an educational Physics/Engineering/Maths blog on my website.

Awards

Downing College 2018 Judy C Petty Scholarship
Downing College 2018 Saint Prize
Downing College 2017 Saint Prize + Saunders Scholarship
Downing College 2015 Unwin Prize + Saunders Scholarship
Peterhouse College 2013 Kelvin 2nd Prize

Publicity/Media

My paper *Lifting, Loading, and Buckling in Conical Shells* was published as Editor's Suggestion in Physical Review Letters, and featured in various science news outlets including Physics Magazine, Science Daily, Bioengineer.org, and Phys.org. My paper *Programming evolution of geometry in shape-morphing sheets via spatiotemporal activation* was selected for the cover of Proceedings of the Royal Society A.

Additional Skills

I am proficient with C++, Python, Mathematica, ParaView, and LaTeX. I have often performed live music, organised concerts, and operated live audio equipment for events.

Talks

1. *Shape programming lines of concentrated Gaussian curvature* – 2021 SIAM Mathematical Aspects of Materials Science conference.
   https://www.youtube.com/watch?v=WK1bgTyfnGU
2. *Gauss curvature in shape-programmed shells* – 2023 Automorph 'Creative Differences' workshop.
3. *Geometry and mechanics of shape-programmable systems* – ICIAM 2023 Tokyo.
4. *Lifting, Loading, and Buckling in Conical Shells* – International Liquid Crystal Elastomer Conference 2023.
5. *Geometry and mechanics of shape-programmed shells* – Geometrically Guided Analysis and Design in Optimization and Control (Workshop, NTU, 2023).
6. *Shape-programmed shells* – **Invited** seminar, University of Birmingham, 2024.
7. *Lifting, Loading, and Buckling in Conical Shells* and *Geometry and mechanics of shape-programmed shells* – Two **invited** talks at Free Boundary Problems conference, 2024.
8. *Geometry and mechanics of shape-programmed shells* – **Invited** seminar, Rutgers University, 2024.
9. Gave a talk and chaired a subsequent large-group discussion on *Shape Morphing* in the 2024 Active Solids program at the Kavli Institute for Theoretical Physics.
10. *Nematic shape-programmed shells* – **Invited** seminar at Syracuse University, 2025.
11. *Programming evolution of geometry in shape-morphing sheets via spatiotemporal activation* – APS Global Physics Summit, 2025.

Publications

1. **Duffy**, Biggins, *Defective nematogenesis: Gauss curvature in programmable shape-responsive sheets with topological defects*, Soft Matter, 2020, https://doi.org/10.1039/D0SM01192D
2. **Duffy**, Cmok, Biggins, Krishna, Modes, Abdelrahman, Javed, Ware, Feng, Warner, *Shape programming lines of concentrated Gaussian curvature*, Journal of Applied Physics, 2021, https://doi.org/10.1063/5.0044158
3. **Duffy**, Javed, Abdelrahman, Ware, Warner, Biggins, *Metric mechanics with nontrivial topology: Actuating irises, cylinders, and evertors*, Phys. Rev. E, 2021, https://doi.org/10.1103/PhysRevE.104.065004
4. Feng, **Duffy**, Warner, Biggins, *Interfacial metric mechanics: stitching patterns of shape change in active sheets*, Proc. R. Soc. A, 2022, https://doi.org/10.1098/rspa.2022.0230
5. Giudici, Clement, **Duffy**, Shankar, Biggins, *Multiple shapes from a single nematic elastomer sheet activated via patterned illumination*, EPL, 2022, https://doi.org/10.1209/0295-5075/ac9e19
6. Hebner, Bowman, **Duffy**, Mostajeran, Griniasty, Cohen, Warner, Bowman, White, *Discontinuous metric programming in liquid crystalline elastomers*, ACS Applied Materials & Interfaces, 2023, https://doi.org/10.1021/acsami.2c21984
7. **Duffy**, McCracken, Hebner, White, Biggins, *Lifting, Loading, and Buckling in Conical Shells*, Physical Review Letters, Editor's Suggestion, 2023, https://doi.org/10.1103/PhysRevLett.131.148202

8. **Duffy**, Griniasty, Biggins, Mostajeran, *Programming evolution of geometry in shape-morphing sheets via spatiotemporal activation*, Proc. R. Soc. A, 2025, selected for cover, https://doi.org/10.1098/rspa.2024.0387