

# Daniel Duffy

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## Employment

2023–present *NTU (Singapore)*

- Research Associate (Physical and Mathematical Sciences), ongoing.

## Education

2014–2024 *University of Cambridge (UK)*

- PhD on shape-morphing shells, supervised by Prof. John S. Biggins.
- 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.

2007–2014 *Manchester Grammar School*

- 11 A\* GCSEs, 4 A\* A-levels, Additional Further Maths AS.

## 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 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

## Additional Skills

I am proficient with C++, Python, Mathematica, ParaView, and  $\LaTeX$ . I regularly perform live music, organise concerts, and operate live audio equipment for events.

## Publicity/Media

*Lifting, Loading, and Buckling in Conical Shells* published as ‘Editor’s Suggestion’ in Physical Review Letters, and featured on Phys.org and in Physics magazine.

## Talks

1. *Shape programming lines of concentrated Gaussian curvature* – 2021 SIAM Mathematical Aspects of Materials Science conference.  
Public video: <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).

## 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>