Fan Feng

Assistant Professor

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Education

Ph.D. in Solid Mechanics from University of Minnesota, 2018
Advisor: Professor Richard D. James

B.Sc. in Mathematics and Physics from Tsinghua University, 2012

Professional Experience

2023 –   Assistant Professor, Department of Mechanics and Engineering Science,
                 Peking University

2019 –2023   Postdoctoral Scholar, University of Cambridge
                 Advisor: Professor Mark Warner FRS and Professor John Biggins

2018 –2019   Postdoctoral Scholar, University of Minnesota
                 Advisor: Professor Richard D. James

Research Interests

Problems in solid mechanics, applied mathematics and materials science: martensitic phase transformation, origami and kirigami design, liquid crystal elastomers, isometry groups, differential geometry.

Publications

(see also Google Scholar)

1. Y. Ganor, T. Dumitrică, F. Feng, and R. D. James. Zig-zag twins and helical phase transformations. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 374(2066):20150208, 2016.

2. F. Feng, P. Plucinsky, and R. D. James. Phase transformations and compatibility in helical structures. *Journal of the Mechanics and Physics of Solids*, 131:74–95, 2019.

3. F. Feng, P. Plucinsky, and R. D. James. Helical miura origami. *Physical Review E*, 101(3):033002, 2020.

4. F. Feng, X. Dang, R. D. James, and P. Plucinsky. The designs and deformations of rigidly and flat-foldable quadrilateral mesh origami. *Journal of the Mechanics and Physics of Solids*, page 104018, 2020.

5. F. Feng, J. S. Biggins, and M. Warner. Evolving, complex topography from combining centers of gaussian curvature. *Physical Review E*, 102(1):013003, 2020.

6. H. Liu, P. Plucinsky, F. Feng, and R. D. James. Origami and materials science. *Philosophical Transactions of the Royal Society A*, 379(2201):20200113, 2021.

7. D. Duffy, L. Cmok, J. Biggins, A. Krishna, C. D. Modes, M. Abdelrahman, M. Javed, T. Ware, F. Feng, and M. Warner. Shape programming lines of concentrated gaussian curvature. *Journal of Applied Physics*, 129(22):224701, 2021.

8. X. Dang, F. Feng, H. Duan, and J. Wang. Theorem for the design of deployable kirigami tessellations with different topologies. *Physical Review E*, 104(5):055006, 2021.

9. X. Dang, F. Feng, H. Duan, and J. Wang. Theorem on the compatibility of spherical kirigami tessellations. *Physical Review Letters*, 128(3):035501, 2022.

10. X. Dang, F. Feng, P. Plucinsky, R. D. James, H. Duan, and J. Wang. Inverse design of deployable origami structures that approximate a general surface. *International Journal of Solids and Structures*, 234:111224, 2022.

11. L. Lu, X. Dang, F. Feng, P. Lv, and H. Duan. Conical kresling origami and its applications to curvature and energy programming. *Proceedings of the Royal Society A*, 478(2257):20210712, 2022.

12. Q. Chen, F. Feng, P. Lv, and H. Duan. Origami spring-inspired shape morphing for flexible robotics. *Soft Robotics*, 9(4):798–806, 2022.

13. H. Liu, P. Plucinsky, F. Feng, A. Soor, and R. D. James. Origami and the structure of materials. *SIAM News*, 55(1), 2022.

14. F. Feng, D. Duffy, M. Warner, and J. S. Biggins. Interfacial metric mechanics: stitching patterns of shape change in active sheets. *Proceedings of the Royal Society A*, 478(2262):20220230, 2022.

15. M. Barnes, F. Feng, and J. S. Biggins. Surface instability in a nematic elastomer. *Phys. Rev. Lett.*, 131:238101, 2023.

16. F. Feng, K. Dradrach, M. Zmyślony, M. Barnes, and J. S. Biggins. Geometry, mechanics and actuation of intrinsically curved folds. *Soft Matter*, 2024.

17. Y. Zou, F. Feng, K. Liu, P. Lv, and H. Duan. Kinematics and dynamics of non-developable origami. *Proceedings of the Royal Society A*, 480(2282):20230610, 2024.

Invited Presentations

Shape programming and pattern formation in liquid crystal elastomers. *The University of Edinburgh.* 2023/05

Theory-guided design of novel materials and structures. *University of Science and Technology of China.* 2021/04

Forward and inverse problems in origami design. *The Invariants Talk, University of Oxford.* 2020/11

Phase transformations in atomic structures and origami. *Xi' an Jiaotong University, China.* 2019/09

Phase transformations in atomic structures and origami. *2019 International Forum of Excellent Young Talents in Engineering Sciences, Peking University, Beijing.* 2019/03

Compatibility conditions in origami design. *The First International Workshop on Martensitic Microstructures, Minneapolis.* 2018/05

Deformable helical Miura origami inspired by phase transformation. *Solid Seminar, AEM, University of Minnesota, Minneapolis.* 2017/09

Conference Presentations

液晶弹性体中的表面不稳定性. 第二届全国软物质力学大会，杭州. 2023/11

基于液晶弹性体的智能曲线折纸结构设计. 第一届中国智能材料与结构系统大会，苏州. 2023/11

The designs of rigidly deployable quadrilateral origami and kirigami. *MS 22 Mathematical Aspects of Origami Design, SIAM Conference on Mathematical Aspects of Materials Science, virtual conference.* 2021/05

Non-isometric origami. *Edwards Centre January meeting, University of Cambridge.* 2020/01

Helical Miura Origami (Symposium co-organizer, postponed to 2021). *SIAM Conference on Mathematical Aspects of Materials Science (MS20), Bilbao, Spain.* 2020/05

Phase-transforming helical Miura origami: theory and prototype. *The 9th International Congress on Industrial and Applied Mathematics (ICIAM 2019), Valencia, Spain.* 2019/07

The design of angular actuator using shape-memory wires. *MURI kick-off meeting, Caltech, Pasadena.* 2019/01

Several results on phase transformation in helical structures. *Kaushik Bhattacharya Outstanding Achievement Award Symposium, Minneapolis.* 2018/10

Workshop Attendance

CISM Advanced Course on "Pattern Formation in Advanced Materials: Energetics and Evolution", July 22-26, Udine, Italy 2019

Graduate Summer School of the 2014 IAS/Park City Mathematics Institute (PCMI) Summer Session, June 29-July 19, Park City, Utah 2014

Teaching Experience

TA (Cambridge, undergraduate level): M3 Materials Modeling Lab 2023

Instructor (Peking University, lecture series): Origami Design 2019

Instructor (UMN, graduate level, several lectures): Theory of Elasticity 2019

Teaching Assistant (UMN, undergraduate level): Aerospace Propulsion, Aerodynamics, Fluid Mechanics, Statics and Dynamics 2012 –2013

Mentorship Experience

Mentored graduate students Xiangxin Dang, Qianying Chen, Yu Zou, and Zhixuan Wen at Peking University. 2019 –2020

Frank Yu, Wayzata High School   2017 –2018

Project: Design and Prototype of Helical Miura Origami

Honor: Scholar of Distinction in Mathematics, University of Minnesota

Academic Service

Referee for: Journal of the Mechanics and Physics of Solids, Physical Review Letters, Journal of Alloys and Compounds, International Journal of Engineering Science, Scientific Report, Frontiers in Robotics and AI, Journal of Sound and Vibration, Acta Materialia, Proceedings of the Royal Society A, Extreme Mechanics Letters, Communications Materials, International Journal of Solids and Structures, Physical Review Applied.

Organizer or co-organizer for: MS 22 Mathematical Aspects of Origami Design, SIAM Conference on Mathematical Aspects of Materials Science, virtual conference.   2021/05

Awards and Fellowships

SIAM Travel Award for ICIAM 2019, Valencia, Spain   2019

John and Jane Dunning Copper Fellowship, University of Minnesota, USA   2013

Outstanding Student Scholarship, Tsinghua University, China   2009 –2011