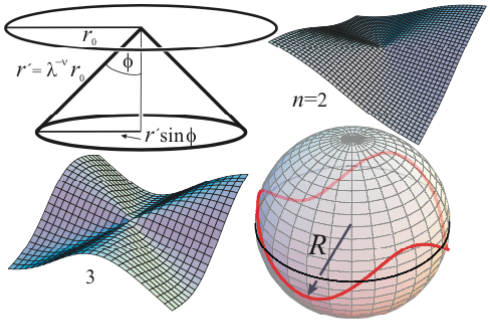

FIG. 1: A flat nematic glass sheet with an azimuthal +1 disclination heats to a cone, or cools to "anticones" (n).

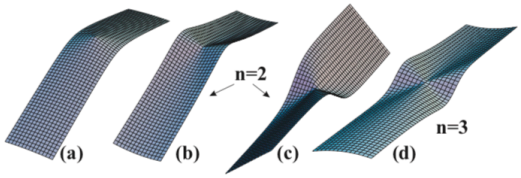

FIG. 5: Disclinations in cantilevers also cause unusual thermal or optical response. (a) a strip cut from a +1 texture conically deforming (with $\phi = 45^o$) bends with a conical cusp. Anti-conical deformations are even richer (here $\alpha = 45^o$), with (b) anti-clastic bending (n = 2, anti-nodes aligned with the cantilever axes) (c) pure twist (nodes aligned) or (d) curvature reversal ($n = 3$).

Professor Kaushik Bhattacharya

The middle and right-most images above are from: Modes CD, Bhattacharya K, Warner M, (2010) Disclination-mediated thermo-optical response in nematic glass sheets. Phys Rev E Stat Nonlin Soft Matter Phys 81(6 Pt 1):060701

See:
https://stage.sriranga.digital/iitm-da/Awardees/2019/Kaushik_Bhattacharya
http://www.mechmat.caltech.edu/
https://gmg.sites.caltech.edu/meet-team/caltech-people/kaushik-bhattacharya
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https://scholar.google.com/citations?user=-yVjvkIAAAAJ&hl=en

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Biography:

Kaushik Bhattacharya is Howell N. Tyson, Sr., Professor of Mechanics and Professor of Materials Science as well as Vice-Provost (Research) at the California Institute of Technology. He received his B. Tech. degree from the Indian Institute of Technology Madras in 1986, his Ph.D. from the University of Minnesota in 1991 and received post-doctoral training at the Courant Institute for Mathematical Sciences during 1991-1993. He joined Caltech in 1993. He has held visiting positions at Cornell University, Heriot-Watt University in Scotland, Max-Planck-Institute at Leipzig, Isaac Newton Institute at the University of Cambridge, Indian Institute of Science at Bangalore, the Jet Propulsion Laboratory and the University of Cambridge. He is internationally recognized for his contributions to understanding the mechanics and physics active materials, including shape-memory alloys, ferroelectrics and nematic elastomers, the mechanics of heterogeneous materials, fracture and failure and multiscale modelling. His 140+ publications and 3+ patents have had a major impact on education, research and industrial practice in engineering sciences – in particular on the disciplines of Mechanical Engineering and Materials Sciences as well as Applied Mathematics. Bhattacharya has received the Warner T. Koiter Medal of the American Society of Mechanical Engineering, Young Investigator Prize from the Society of Engineering Science, the Special Achievements Award in Applied Mechanics from the American Society of Mechanical Engineers and the National Science Foundation Young Investigator Award. He is a fellow of the Society of Industrial and Applied Mathematics. He is a recipient of the Graduate Student Council Teaching and Mentoring Award at Caltech. He has delivered numerous plenary, keynote and named lectures including the Midwest Mechanics Lecturer for 2006-07 (10 universities), Southwest Mechanics Lecturer for 2007-08 (5 universities) and Spanish Mechanics Lecturer in 2013 (5 universities). He served as the fifth editor of the prestigious Journal of the Mechanics and Physics of Solids from 2004 to 2015. Currently, he serves on the editorial board of the Archive for Rational Mechanics and Analysis. He has served on the Board of Directors of the Society of Engineering Science and is the founding Program Director of the SIAM Activity Group on the Mathematical Aspects of Materials Science. Since 2008, he has been the Executive Officer of the Department of Mechanical and Civil Engineering. He has supervised 29 doctoral students, mentored 22 postdoctoral scholars and hosted numerous visiting scholars, many of whom hold leadership positions in academics, industry and national

laboratories. He has served as a consultant for Boston Scientific Corporation, advising them on the design of super-elastic implantable medical devices, assisted AGA Medical Corporation in interviewing and recruiting research engineers and helping them develop an in-house expertise in shape-memory and superelastic technologies, provided training for engineers at Oromco who were involved in developing a new class of orthodontic wires and assisted Medtronic Inc. in developing a core-competence in shape-memory alloys. He is currently working with the Nitinol Development Corporation on the fatigue of these materials.

Selected Publications:

K. Bhattacharya and R.D. James. A theory of thin films of martensitic materials with applications to microactuators. J. Mech. Phys. Solids, 47(3):531–576, 1999.

Bhattacharya, K. , 2004, Microstructure of Martensite—Why It Forms and How It Gives Rise to the Shape-Memory Effect, Oxford University Press, Oxford, UK.

Zhang, W. , and Bhattacharya, K. , 2005, " A Computational Model of Ferroelectric Domains. Part I: Model Formulation and Domain Switching," Acta Mater., 53(1), pp. 185–198.

Zhang, W. , and Bhattacharya, K. , 2005, " A Computational Model of Ferroelectric Domains. Part II: Grain Boundaries and Defect Pinning," Acta Mater., 53(1), pp. 199–209.

Modes CD, Bhattacharya K, Warner M, (2010) Disclination-mediated thermo-optical response in nematic glass sheets. Phys Rev E Stat Nonlin Soft Matter Phys 81(6 Pt 1):060701

Modes D, Bhattacharya K, Warner M (2011) Gaussian curvature from flat elastica sheets. Proc R Soc A 467:1121–1140

Rudykh, S., Bhattacharya, K., deBotton, G., 2012. Snap-through actuation of thick-walled electroactive balloons. Int. J. Nonlinear Mech. 47, 206–209.

S. Rudykh, K. Bhattacharya and G. deBotton, "Multiscale instabilities in soft heterogeneous dielectric elastomers", Proceedings of the Royal Society A, Vol. 470, Article ID 20130618, 2015

Pierluigi Cesana, Paul Plucinsky and Kaushik Bhattacharya, "Effective behavior of nematic elastomer membranes", Archive for Rational Mechanics and Analysis, January 2015

Paul Plucinsky and Kaushik Bhattacharya, "Microstructure-enabled control of wrinkling in nematic elastomer sheets", Journal of the Mechanics and Physics of Solids, Vol. 103, pp 125-150, May 2017

Paul Plucinsky, Benjamin A. Kowalski, Timothy J. White and Kaushik Bhattacharya, "Patterning nonisometric origami in nematic elastomer sheets", Soft Matter, March 2018