Continuum Mechanics and Thermodynamics Laboratory

Laboratory Coordinator: Dr. Anurag Gupta

Associated Faculty Members (if any): None

List of Major Equipment:

- Four high performance computer servers
- Several workstations

Brief description of the laboratory:

Our group is primarily engaged in theoretical and numerical research work in the following areas:

(i) Geometry and mechanics of defects and singular interfaces in thin structures. These include continuous distributions of point defects, dislocations, and disclinations;

(ii) Topological and differential geometric methods in mechanics;

(iii) Finite deformation plasticity (strain-gradient theory, interfaces, stability);

(iv) Interfacial kinetics in solids (grain boundaries, incoherent phase fronts, and junctions);

(v) Nonlinear elasticity (biological growth mechanics);

(vi) Mechanics of Indian musical instruments (percussion and string instruments).

Laboratory research keywords:

Continuum Mechanics; Solid Mechanics; Elasticity; Thin structures; Mathematical methods in Mechanics.

Major Research and Development Contribution of the Laboratory

The following research papers have appeared in the last seven years:

(2022) Animesh Pandey and Anurag Gupta. Some Consequences of the Distributional Stress Equilibrium Condition, Zeitschrift fuer Angewandte Mathematik und Physik (ZAMP), 73:203, pp. 1-7.

(2022) Animesh Pandey and Anurag Gupta. Singular Points and Singular Curves in von Kármán Elastic Surfaces, Journal of Elasticity, 150, pp. 367–399.

(2022) Manish Singh, Ayan Roychowdhury, and Anurag Gupta. Defects and Metric Anomalies in Föppl-von Kármán Surfaces, Proceedings of the Royal Society A, 478:20210829, pp. 1-23.

(2022) Manish Singh, Animesh Pandey, and Anurag Gupta. Interaction of a defect with the reference curvature of an elastic surface, Soft Matter, 18, 2979-2991.

(2021) Animesh Pandey and Anurag Gupta. Point singularities in incompatible elasticity, Journal of Elasticity, 147, pp. 229–256.

(2021) Animesh Pandey, Manish Singh, and Anurag Gupta. Positive disclination in a thin elastic sheet with boundary, Physical Review E, 104, 065002.

(2021) Animesh Pandey and Anurag Gupta. Conservation laws for defect fields in non-contractible domains, Mechanics Research Communications, 118, 103806.

(2021) Anurag Gupta. Ekatantrī Vīṇā: A Formal Reconstruction Based on Musicological Texts , Kalākalpa, VI (1), pp. 21-30.

(2021) Ankit Biswas, Saptarshi Paul, Vishal Sharma, and Anurag Gupta. Acoustics of Mizhāvu, Journal of the Acoustical Society of India, 48, pp. 127-140.

(2021) Mousumi Mukherjee, Anurag Gupta, and Amit Prashant. A rate-dependent model for sand to predict constitutive response and instability onset, Acta Geotechnica, 16, pp. 93-111.

(2020) Tushar Joshi, Rajat Arora, Anup Basak, and Anurag Gupta. Equilibrium shape of misfitting precipitates with anisotropic elasticity and anisotropic interfacial energy, Modelling and Simulation in Materials Science and Engineering. 28, 075009.

(2020) Ayan Roychowdhury and Anurag Gupta. Growth and non-metricity in Föppl-von Kármán shells, Journal of Elasticity, 140, pp. 337-348.

(2020) Animesh Pandey and Anurag Gupta. Topological defects and metric anomalies as sources of incompatibility for piecewise smooth strain field, Journal of Elasticity, 139, pp. 237-267.

(2019) Roger Sauer, Reza Ghaffari, and Anurag Gupta. The multiplicative deformation split for shells with application to growth, chemical swelling, thermoelasticity, viscoelasticity, and elastoplasticity, International Journal of Solids and Structures, 174, pp. 53-68.

(2019) Digendranath Swain and Anurag Gupta. Mechanochemical aspects of skin wound healing in microgravity, Mechanics Research Communications, 96, pp. 87-93.

(2018) Kevin Jose, Anindya Chatterjee, and Anurag Gupta. Acoustics of Idakka: An Indian snare drum with definite Pitch, Journal of the Acoustical Society of America, 143(5), pp. 3184-3194.

(2018) Rahul Pisharody and Anurag Gupta. Experimental investigations of tānpurā acoustics, Acta Acustica united with Acustica, 104, pp. 542-545.

(2018) Digendranath Swain and Anurag Gupta. Biological growth in bodies with incoherent interfaces, Proceedings of the Royal Society London A, 474, 20170716.

(2018) Ayan Roychowdhury and Anurag Gupta. On structured surfaces with defects: geometry, strain incompatibility, stress field, and natural shapes. Journal of Elasticity, 131, pp. 239–276.

(2017) Ayan Roychowdhury and Anurag Gupta. Material homogeneity and strain compatibility in thin elastic shells. Mathematics and Mechanics of Solids, 22, pp. 1619-1635.

(2017) Sankalp Tiwari and Anurag Gupta. Effects of air loading on the acoustics of an Indian musical drum. Journal of the Acoustical Society of America, 141, pp. 2611-2621.

(2017) Anup Basak and Anurag Gupta. Influence of a mobile incoherent interface on the strain-

gradient plasticity of a thin slab. International Journal of Solids and Structures, 108, pp. 126-138.

(2017) Ayan Roychowdhury and Anurag Gupta. Non-metric connection and metric anomalies in materially uniform elastic solids. Journal of Elasticity, 126, pp. 1-26.

(2017) Mousumi Mukherjee, Anurag Gupta, and Amit Prashant. Instability analysis of sand under undrained biaxial loading with rigid and flexible boundary. ASCE Journal of Geomechanics, 17(1), 04016042.

(2016) Digendranath Swain and Anurag Gupta. Mechanics of cutaneous wound rupture. Journal of Biomechanics, 49, pp. 3722-3730.

(2016) Animesh Pandey and Anurag Gupta. Applications of anisotropic slipline theory with non-uniform lattice rotation. Zeitschrift fuer Angewandte Mathematik und Physik (ZAMP), 67:77, pp. 1-9.

(2016) Mousumi Mukherjee, Anurag Gupta, and Amit Prashant. Drained instability analysis of sand under biaxial loading using a 3D material model. Computers and Geotechnics, 79, pp. 130-145.

(2016) Anup Basak and Anurag Gupta. Plasticity in multi-phase solids with incoherent interfaces and junctions. Continuum Mechanics and Thermodynamics, 28, pp. 423-442.

(2015) Digendranath Swain and Anurag Gupta. Interfacial growth during closure of a cutaneous wound: Stress generation and wrinkle formation. Soft Matter, 11, pp. 6499-6508.

(2015) Anup Basak and Anurag Gupta. A three-dimensional study of coupled grain boundary motion with junctions. Proceedings of Royal Society London A, 471: 20150127.

(2015) Anup Basak and Anurag Gupta. Simultaneous grain boundary motion, grain rotation, and sliding in a tricrystal. Mechanics of Materials, 90, pp. 229-242.