

Anurag Gupta

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| CONTACT INFORMATION | 359 Faculty Building Department of Mechanical Engineering Indian Institute of Technology Kanpur, UP 208016 India | <i>Voice:</i> (+91) 512 259-6161 <i>Fax:</i> (+91) 512 259-7408 <i>E-mail:</i> ag@iitk.ac.in <i>Web:</i> home.iitk.ac.in/~ag |
| EDUCATION | University of California, Berkeley, CA, USA Ph.D., Mechanical Engineering, August 2008 (Advisor: Prof. David Steigmann) M.S., Civil and Environmental Engineering, December 2003 Indian Institute of Technology, Roorkee, UT, India B.Tech., Civil Engineering, May, 2002 | |
| ACADEMIC EXPERIENCE | Indian Institute of Technology, Kanpur, UP India Professor, Mechanical Engineering, December, 2019 - present Associate Professor, Mechanical Engineering, June, 2015 - December, 2019 Assistant Professor, Mechanical Engineering, October, 2008 - June, 2015 Indian Institute of Technology, Delhi, India Associate Professor, Applied Mechanics, December, 2018 - April, 2019 | |
| PEER RECOGNITION | <ul style="list-style-type: none">• Visiting Professor, Univ. Calgary, Canada, July-Aug 2019 (Shastri Indo-Canada Mobility award)• Specialist member, ISRO committee on biological research experiments on PSLV platform• P. K. Kelkar research fellow, IIT Kanpur, May, 2017 - Apr, 2020• Member of the editorial board, Mathematics and Mechanics of Solids (since 2017)• Lawrence scholar, LLNL, Livermore, U.S., 2007-2008 | |
| RESEARCH INTERESTS | Geometry and mechanics of defects and singular interfaces in thin structures (continuous distributions of point defects, dislocations, and disclinations; residual stresses); Topological methods in mechanics; Finite deformation plasticity (strain-gradient theory, interfaces, stability); Interfacial kinetics in solids (grain boundaries, incoherent phase fronts, and junctions); Nonlinear elasticity (biological growth mechanics); Mechanics of Indian musical instruments (percussion and string instruments). | |
| TEACHING INTERESTS | Mechanics of solids; Continuum mechanics; Applied mathematics; Linear elasticity; Nonlinear elasticity; Plasticity; Micromechanics; Thin structures; Fracture mechanics. | |
| PUBLICATIONS | <i>Archival Journals</i> <ol style="list-style-type: none">1. Tushar Joshi, Rajat Arora, Anup Basak, and Anurag Gupta. Equilibrium Shape of Misfitting Precipitates with Anisotropic Elasticity and Anisotropic Interfacial Energy. <i>Modelling and Simulation in Materials Science and Engineering</i>. 28, 075009, 2020.2. Mousumi Mukherjee, Anurag Gupta, and Amit Prashant. A rate-dependent model for sand to predict constitutive response and instability onset. <i>Acta Geotechnica</i>, Available online, 2020.3. Ayan Roychowdhury and Anurag Gupta. Growth and Non-Metricity in Föppl-von Kármán Shells, <i>Journal of Elasticity</i>, 140, 337-348, 2020.4. Animesh Pandey and Anurag Gupta. Topological defects and metric anomalies as sources of incompatibility for piecewise smooth strain fields, <i>Journal of Elasticity</i>, 139, 237-267, 2020. | |

5. 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, 53-68, 2019.
6. Digendranath Swain and Anurag Gupta. Mechanochemical aspects of skin wound healing in microgravity, *Mechanics Research Communications*, 96, 87-93, 2019.
7. Kevin Jose, Anindya Chatterjee, and Anurag Gupta. Acoustics of Idakkā: An Indian snare drum with definite pitch, *Journal of the Acoustical Society of America*, 143, 3184-3194, 2018.
8. Rahul Pisharody and Anurag Gupta. Experimental investigations of tānpurā acoustics, *Acta Acustica united with Acustica*, 104, 542-545, 2018.
9. Digendranath Swain and Anurag Gupta. Biological growth in bodies with incoherent interfaces, *Proceedings of the Royal Society London A*, 474, 20170716, 2018.
10. Ayan Roychowdhury and Anurag Gupta. On structured surfaces with defects: geometry, strain incompatibility, internal stress, and natural shapes, *Journal of Elasticity*, 131, 239-276, 2018.
11. Ayan Roychowdhury and Anurag Gupta. Material inhomogeneity and strain incompatibility in thin elastic shells. *Mathematics and Mechanics of Solids*, 22, 1619-1635, 2017.
12. Sankalp Tewari and Anurag Gupta. Effects of Air Loading on the Acoustics of an Indian Musical Drum, *Journal of the Acoustical Society of America*, 141, 2611-2621, 2017.
13. 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, 126-138, 2017.
14. Ayan Roychowdhury and Anurag Gupta. Non-metric connection and metric anomalies in materially uniform elastic solids, *Journal of Elasticity*, 126, 1-26, 2017.
15. 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, 04016042, 2017.
16. Digendranath Swain and Anurag Gupta. Mechanics of cutaneous wound rupture, *Journal of Biomechanics*, 49, 3722-3730, 2016.
17. Animesh Pandey and Anurag Gupta. Applications of anisotropic slipline theory with non-uniform lattice rotation, *Zeitschrift fuer Angewandte Mathematik und Physik (ZAMP)*, 67:77, 1-9, 2016.
18. Mousumi Mukherjee, Anurag Gupta, and Amit Prashant. Drained instability analysis of sand under biaxial loading using a 3D material model, *Computers and Geotechnics*, 79, 130-145, 2016.
19. Anup Basak and Anurag Gupta. Plasticity in multi-phase solids with incoherent interfaces and junctions. *Continuum Mechanics and Thermodynamics*, 28, 423-442, 2016.
20. Digendranath Swain and Anurag Gupta. Interfacial growth during closure of a cutaneous wound: Stress generation and wrinkle formation. *Soft Matter*, 11, 6499-6508, 2015.
21. Anup Basak and Anurag Gupta. Simultaneous grain boundary motion, grain rotation, and sliding in a tricrystal. *Mechanics of Materials*, 90, 229-242, 2015.
22. Anup Basak and Anurag Gupta. A three-dimensional study of coupled grain boundary motion with junctions. *Proceedings of the Royal Society London A*, 471, 20150127, 2015.
23. Anup Basak and Anurag Gupta. A two-dimensional study of coupled grain boundary motion using the level set method. *Modeling and Simulation in Material Science and Engineering*, 22, 055022, 2014.
24. Anurag Gupta and David Steigmann, Plane strain problem in elastically rigid finite plasticity, *Quarterly Journal of Mechanics and Applied Mathematics*, 67, 287-310, 2014.

25. Anurag Gupta and David Steigmann, Plastic flow in solids with interfaces, *Mathematical Methods in the Applied Sciences*, 35, 1799-1824, 2012.
26. Anurag Gupta and Xanthippi Markenscoff, A new interpretation of configurational forces, *Journal of Elasticity*, 108, 225-228, 2012.
27. David Steigmann and Anurag Gupta, Mechanically equivalent elastic-plastic deformations and the problem of plastic spin, *Theoretical and Applied Mechanics*, 38, 397-417, 2011.
28. Anurag Gupta, David Steigmann and James S. Stolken, Aspects of phenomenological theory of elastic-plastic deformation, *Journal of Elasticity*, 104, 249-266, 2011.
29. Anurag Gupta and Xanthippi Markenscoff, Configurational forces as dissipative mechanisms: A revisit, *Comptes Rendus Mecanique*, 336, 126-131, 2008.
30. Anurag Gupta and Xanthippi Markenscoff, An anisotropic elastic formulation for configurational forces in stress space, *International Journal of Fracture*, 147, 157-161, 2007.
31. Anurag Gupta, David Steigmann and James Stölken, On evolution of plasticity and incompatibility, *Mathematics and Mechanics of Solids*, 12, 583-610, 2007.
32. Xanthippi Markenscoff and Anurag Gupta, Configurational balance laws for incompatibility in stress space, *Proceedings of the Royal Society London A*, 463, 1379-1392, 2007.
33. Shaofan Li and Anurag Gupta, On dual configurational forces. *Journal of Elasticity*, 84, 13-31, 2006.
34. Shaofan Li, Xiaohu Liu, and Anurag Gupta, Smart element method - I. The Zienkiewicz-Zhu feedback, *International Journal for Numerical Methods in Engineering*, 62, 1264-1294, 2005.
35. Shaofan Li, Anurag Gupta, and Xanthippi Markenscoff, Conservation laws of linear elasticity in stress formulations, *Proceedings of the Royal Society London A.*, 461, 99-116, 2005.
36. Shaofan Li and Anurag Gupta, The Peierls stress of a screw dislocation in a piezoelectric medium, *Applied Physics Letters*, 85, 2211-2213, 2004.
37. Shaofan Li, Anurag Gupta, Xiaohu Liu, and Morteza Mahyari, Variational eigenstrain multi-scale finite element method, *Computer Methods in Applied Mechanics and Engineering*, 193, 1803-1824, 2004.

Books/Book chapters/Book reviews

1. Ayan Roychowdhury and Anurag Gupta, Dislocations, disclinations, and metric anomalies as sources of global strain incompatibility in thin shells. In W. Pietraszkiewicz and W. Witkowski, editors, *Shell Structures: Theory and Applications*, vol. 4, pp. 153-156. CRC Press, 2018.
2. Anurag Gupta. Review of "Plasticity: Mathematical Theory and Numerical Analysis. Second Edition. By W. Han and B. D. Reddy. Springer, New York, 2013.", *SIAM review*, 58(4), 2016, pp. 802-803.
3. Anurag Gupta and David Steigmann, Chapters on 'Kinematics' and 'Balance Laws', in *Continuum Mechanics: Encyclopedia of Life Support Systems (EOLSS)*, Developed under the auspices of the UNESCO, Eolss Publishers, Oxford ,UK, 2012.
4. Anurag Gupta and Xanthippi Markenscoff, An anisotropic elastic formulation for configurational forces in stress space, in *Defect and Material Mechanics*, C. Dascalu, G. A. Maugin, C. Stolz (Editors), pp. 157-161, Springer, 2008.
5. Xanthippi Markenscoff and Anurag Gupta (Eds.), *Collected Works of J. D. Eshelby: Mechanics of defects and Inhomogeneities*, Springer, 2006.

Peer-reviewed conference proceedings

1. Anurag Gupta, Vishal Sharma, and Shakti S. Gupta, Acoustics of bifacial Indian musical drums with composite membrane, in Proceedings of International Symposium on Music Acoustics, Detmold, Germany, pp. 336-343, 2019.
2. Anurag Gupta and Chaitali Dangarikar, Design, construction, and material of an ancient Indian string instrument, in Proceedings of International Symposium on Music Acoustics, Detmold, Germany, pp. 254-261, 2019.
3. Mousumi Mukherjee, Anurag Gupta, and Amit Prashant, Analysis of Various Drained and Undrained Instability Modes in Medium Dense Sand Subjected to Biaxial Loading Conditions, in Geotechnical Frontiers 2017, GSP 280, T. L. Brandon et. al. (Eds.), Selected papers from Geotechnical Frontiers 2017, held in Orlando, Florida, March 12-15, 2017, pp. 451-460, 2017.
4. Mousumi Mukherjee, Anurag Gupta, and Amit Prashant, Effect of loading condition on the localization behavior of sand, 5th International Congress on Computational Mechanics and Simulation, Chennai, India, 10-13 Dec., 2014, pp. 1972-1977, 2014.
5. Mousumi Mukherjee, Anurag Gupta, and Amit Prashant, Effect of confining pressure on strain localization of a sand specimen under plane strain condition, Computer Methods and Recent Advances in Geomechanics - Proceedings of the 14th Int. Conference of International Association for Computer Methods and Recent Advances in Geomechanics, IACMAG, Kyoto, Japan, 22-25th Sept., 2014, pp. 365-370, 2014.

INVITED TALKS

1. Compatibility and incompatibility of piecewise smooth strain fields, Workshop on Non-Classical Advanced Mechanics of Materials, IISc Bangalore, 9th-11th July, 2019.
2. Biomechanics of Wound Healing in Microgravity Environments, INCAM 2019, IISc Bangalore, 3rd July, 2019.
3. Two lectures on acoustics in ancient India, Course on Indian Knowledge Systems, IIT Gandhinagar, 13th/14th March, 2019.
4. Acoustical Perspectives on Indian Musical Instruments, Physics Colloquium, IIT Kanpur, March 2019.
5. Indian musical drums: Objects of artistic splendour and scientific ingenuity, IIT Kanpur, November 2018.
6. Inhomogeneous von Kármán Shells. Indo-German workshop on challenges in solid mechanics, IIT Delhi, March 2018.
7. Emergence of stress and material instabilities during biological growth. Chemical engineering seminar, IISc Bangalore, November 23rd, 2017. (also at IITK, 22nd January, 2018 and at IITGn, 15th March, 2019)
8. Strain gradient plasticity of heterogeneous amorphous solids. French-Indian meeting on plasticity and rheology in amorphous solids, Grenoble, France, June 26-29th, 2017.
9. Geometry and Mechanics of Growth in Topological Surfaces. ESPCI Paris, June 23rd June, 2017 (also at IISc, June 14th, 2017).
10. Four lectures on differential geometry and continuum mechanics. IISc Bangalore, June 12-17th, 2017.
11. Interfacial Growth during Closure of a Cutaneous Wound. OIST, Japan, March 3rd, 2017.
12. Acoustics of Indian Musical Instruments: Historical and Scientific Perspectives. OIST, Japan (Public lecture), March 1st, 2017.
13. New perspectives on coupled grain boundary motion. NMD-ATM2016, IIT Kanpur, November 11-13th, 2016.
14. Vibration and Acoustics of Indian Musical Instruments: Perspectives in Research. IIT Madras, November 10th, 2016.

15. Geometry of defects on a structured surface. OIST workshop on Geometry in Material Science, Japan, October 14-17th, 2016.
16. Dynamic behavior of metals and design of ammunition. ARDE, DRDO, Pune, September 20th, 2016.
17. Strain gradient plasticity in the presence of mobile interfaces, Current Trends in Non-classical Continuum Mechanics, Goa, December 14-15th, 2015.
18. Geometry of defects in thin elastic structures, Indo-UK workshop on Mathematics, mechanics and physics for tomorrow's materials, ICMS Edinburgh, October 26-30th, 2015.
19. Plastic deformation in solids with homophase interfaces, IIT Hyderabad, October 5, 2015.
20. Inhomogeneous elastic shell, ICMM Berkeley, May 2015.
21. Four Lectures on Continuum Mechanics, TEQIP workshop on Mechanics and Applied Mathematics, IIT Kanpur, February 2015.
22. Geometry of defects in solids, ISTAM annual meeting, Bangalore, December 2014.
23. Lectures on Kinematics and Balance laws, TEQIP workshop on Mechanics and Applied Mathematics, IIT Kanpur, July 2014.
24. Dealing with stress, Pravartana 2013, IIT Kanpur, October 2013.
25. Plane strain problem in elastically rigid finite plasticity, David Steigmann Symposium, 50th Annual Technical Meeting of Society of Engineering Science, Providence, RI, July 2013.
26. Geometry of defects in solids, IIT Gandhinagar, February 24, 2012.
27. Evolution of incompatibility during growth, SNP meeting at East Lansing, MI, October 8, 2011. (Also at UCSD, October 10, 2011)
28. On the role of dislocation distribution in the propagation of elastic-plastic Waves, EuroMech conference, Lisbon, 2009. (Also at University of Hannover, Oct. 2009, University of Stuttgart, Oct. 2009, and IISc Bangalore, June 2009)
29. On surface dislocation density: with application to plastic waves, IIT Kanpur, December 2008.
30. Plastic flow in solids with interfaces, Bernard Coleman Symposium, during 44th Annual Technical Meeting of Society of Engineering Science, College Station, TX, October 2007.

PHD THESIS
SUPERVISION

1. Anup Basak (Dec. 2015, currently Assistant Professor at IIT Tirupati)
2. Mousumi Mukherjee (Mar. 2016, jointly with Dr. A. Prashant, currently Assistant Professor at IIT Mandi)
3. Ayan Roychowdhury (June 2017, currently Simons fellow at NCBS, Bangalore)
4. Digendranath Swain (October 2018, currently at ISRO)
5. Manish Singh (Ongoing)
6. Animesh Pandey (Ongoing)
7. Saptarshi Paul (ongoing)

GRANTS

1. Biomechanical Aspects of Plant and Root Growth in Microgravity Environments. Rs. 14.22 Lakhs. Project sponsored by ISRO. Duration: 2020-22. (PI)
2. On some challenging boundary-value-problems arising in the vibro-acoustical study of Indian musical instruments. Rs. 32 Lakhs. Project sponsored by MHRD (under STARS scheme, operated by IISc). Duration 2020-2023. (PI)
3. Topological Transformation of Elastic Surfaces. Rs. 6.6 Lakhs. Project sponsored by SERB, DST (under the MATRICS scheme). Duration 2020-2023. (PI)
4. Micromechanics of defects in thin elastic structures. Rs. 24 Lakhs. Project sponsored by SERB, DST. Duration 2019-2022. (PI)
5. On vibrations and acoustics in ancient and medieval India: focusing on design and construction of Indian Stringed Instruments. Rs. 3.2 Lakhs. Project sponsored by INSA. Duration: 2016-17. (PI)
6. Ballooning in fuel clads: A study in the constitutive theory and stability of thermoplastic response. Rs. 15.962 Lakhs. Project sponsored by IGCAR. Duration: 2015-18. (PI)
7. Growth and ageing of tissues under microgravity environment. Rs. 11.016 Lakhs. Project sponsored by ISRO. Duration: 2015-18. (PI)
8. A scientific study of Indian musical instruments: history, mathematical modeling and experiments. Rs. 15 Lakhs. Project sponsored by MHRD. Duration: 2014-15. (PI)

PROFESSIONAL SERVICE

Member of editorial board, Mathematics and Mechanics and solids (since 2017).

Reviewer for: Journal of Elasticity, Mathematics and Mechanics of Solids, Proceedings of the Royal Society A (top reviewer award in 2016), Acta Mechanica, Comptes Rendus Mecanique, ZAMP, Sadhana, Resonance, International Journal of Solids and Structures, Continuum Mechanics and Thermodynamics, Cambridge University Press, CRC press, Current Science, The Journal of the Acoustical Society of America, ASME Journal of Computational and Nonlinear Dynamics, Extreme Mechanics Letters, Applied Acoustics.

Guest editor, Special issue on *Geometric approaches to problems in continuum mechanics* in the Journal of Mathematics and Mechanics of Solids, July 2017.