

David L. Henann

James R. Rice Associate Professor of Solid Mechanics
School of Engineering
Brown University

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Education

- Ph.D. Mechanical Engineering, MIT June 2011
Thesis: Aspects of the mechanics of metallic glasses
- S.M. Mechanical Engineering, MIT June 2008
Thesis: A constitutive theory for the mechanical response of amorphous metals at high temperatures spanning the glass transition temperature: application to microscale thermoplastic forming of $Zr_{41.2}Ti_{13.8}Cu_{12.5}Ni_{10}Be_{22.5}$
- B.S. Mechanical Engineering, State University of New York at Binghamton May 2006
Honors: Summa Cum Laude

Professional Appointments

- James R. Rice Associate Professor of Solid Mechanics July 2020 – Present
Associate Professor of Engineering
Brown University, School of Engineering
- James R. Rice Assistant Professor of Solid Mechanics July 2016 – June 2020
Assistant Professor of Engineering September 2013 – June 2020
Brown University, School of Engineering
- Postdoctoral Associate July 2011 – June 2013
Harvard University, School of Engineering and Applied Sciences
- Postdoctoral Associate July 2011 – June 2013
MIT, Department of Mechanical Engineering

Publications

Refereed Journal Articles

- Zicheng Yan*, Jialiang Tao, Christian Franck, David L Henann. An Equilibrium Constrained Genetic Algorithm (ECGA) calibration framework for isotropic hyperelastic constitutive models with application to an elastomeric foam material. *Computer Methods in Applied Mechanics and Engineering* **457** (2026) 118978.
- Surya Sidhartha Kolluri*, Elizabeth C. Bremer-Sai, Anastasia Tzoumaka*, Christian Franck, and David L. Henann. Determination of high strain-rate, viscoelastic material properties of soft solids using inertial microcavitation in a thin layer. *Extreme Mechanics Letters* **79** (2025) 102378.
- Harkirat Singh* and David L. Henann. Anti-plane segregation and diffusion in dense, bidisperse granular shear flow. *Phys. Rev. Fluids* **9** (2024) 094301.
- Harkirat Singh*, Daren Liu*, and David L. Henann. Continuum modelling of size segregation and flow in dense, bidisperse granular media: accounting for segregation driven by both pressure gradients and shear-strain-rate gradients. *J. Fluid Mech.* **988** (2024) A43.

*Is/was a member of the Henann Group at Brown University

- Daren Liu^{†*}, Harkirat Singh^{†*}, and David L. Henann. Coupled continuum modeling of size-segregation driven by shear-strain-rate gradients and flow in dense, bidisperse granular media. *J. Fluid Mech.* **976** (2023) A16.
- Hadley Witt, Zicheng Yan*, David L. Henann, Christian Franck, and Jonathan Reichner. Mechanosensitive traction force generation is regulated by the neutrophil activation state. *Scientific Reports* **13** (2023) 11098.
- Anastasia Tzoumaka*, Jin Yang, Selda Buyukozturk, Christian Franck, and David L Henann. Modeling high strain-rate microcavitation in soft materials: The role of material behavior in bubble dynamics. *Soft Matter* **19** (2023) 3895–3909.
- Alexander McGhee, Jin Yang, Elizabeth C. Bremer, Zhiqin Xu, Harry C. Cramer, Jonathan B. Estrada, David L. Henann, and Christian Franck. High-speed, full-field deformation measurements near inertial microcavitation bubbles inside viscoelastic hydrogels. *Experimental Mechanics* **63** (2023) 63–78.
- Selda Buyukozturk, Jean-Sebastien Spratt, David L. Henann, Tim Colonius, and Christian Franck. Particle-assisted laser-induced inertial cavitation for high strain-rate soft material characterization. *Experimental Mechanics* **62** (2022) 1037–1050.
- Xiuqi Li*, Jialiang Tao, Alexander K. Landauer, Christian Franck, and David L. Henann. Large-deformation constitutive modeling of viscoelastic foams: Application to a closed-cell foam material. *J. Mech. Phys. Solids* **161** (2022) 104807.
- Pinkesh Malhotra, Tong Jiao, David L. Henann, Rodney J. Clifton, and Pradeep R. Guduru. Dynamic shearing resistance of an energetic material simulant: Sucrose. *J. Mech. Phys. Solids* **159** (2022) 104624.
- Jin Yang, Anastasia Tzoumaka*, Kazuya Murakami, Eric Johnsen, David L. Henann, and Christian Franck. Predicting complex nonspherical instability shapes of inertial cavitation bubbles in viscoelastic soft matter. *Phys. Rev. E* **104** (2021) 045108.
- Pinkesh Malhotra, Tong Jiao, David L. Henann, Rodney J. Clifton, and Pradeep R. Guduru. Dynamic shearing resistance of hydroxyl-terminated polybutadiene (HTPB). *Journal of Applied Physics* **129** (2021) 245901.
- Shihong Li* and David L. Henann. Nonlocal continuum modeling of dense granular flow in a split-bottom cell with a vane-shaped intruder. *Phys. Rev. E* **102** (2020) 022908.
- Michael Jandron* and David L. Henann. Electromechanical instabilities in periodic dielectric elastomer composites. *Int. J. Solids Struct.* **191** (2020) 220–242.
- Lauren Mancia, Eli Vlaisavljevich, Nyousha Yousefi, Mauro Rodriguez, Timothy Ziemlewicz, Fred Lee Jr, David L. Henann, Christian Franck, Zhen Xu, and Eric Johnsen. Modeling tissue-selective cavitation. *Physics in Medicine and Biology* **64** (2019) 225001.
- Alexander K. Landauer[†], Xiuqi Li^{†*}, Christian Franck, and David L. Henann. Experimental characterization and hyperelastic constitutive modeling of open-cell elastomeric foams. *J. Mech. Phys. Solids* **133** (2019) 103701.
- Shihong Li* and David L. Henann. Material stability and instability in nonlocal continuum models for dense granular materials. *J. Fluid Mech.* **871** (2019) 799–830.
- Chad T. Wilson, Timothy L. Hall, Eric Johnsen, Lauren Mancia, Mauro Rodriguez, Jonathan E. Lundt, Tim Colonius, David L. Henann, Christian Franck, Zhen Xu, and Jonathan R. Sukovich. Comparative study of the dynamics of laser and acoustically generated bubbles in viscoelastic media. *Phys. Rev. E* **99** (2019) 043103.

[†]Co-first authors

- Daren Liu* and David L. Henann. Size-dependence of the flow threshold in dense granular materials. *Soft Matter* **14** (2018) 5294–5305.
- Michael Jandron* and David L. Henann. A numerical simulation capability for electroelastic wave propagation in dielectric elastomer composites: Application to tunable soft phononic crystals. *Int. J. Solids Struct.* **150** (2018) 1–21.
- Alexander K. Landauer, Mohak Patel, David L. Henann, and Christian Franck. A q-factor-based digital image correlation algorithm (qDIC) for resolving finite deformations with degenerate speckle patterns. *Experimental Mechanics* **58** (2018) 815–830.
- Jonathan B. Estrada, Carlos Barajas, David L. Henann, Eric Johnsen, and Christian Franck. High strain-rate soft material characterization via inertial cavitation. *J. Mech. Phys. Solids* **112** (2018) 291–317.
- Daren Liu* and David L. Henann. Nonlocal continuum modeling of steady, dense granular heap flows. *J. Fluid Mech.* **831** (2017) 212–227.
- Yuhao Wang* and David L. Henann. Finite-element modeling of soft solids with liquid inclusions. *Extreme Mechanics Letters* **9** (2016) 147–157.
- Shuolun Wang, Martina Decker, David L. Henann, and Shawn A. Chester. Modeling of dielectric viscoelastomers with application to electromechanical instabilities. *J. Mech. Phys. Solids* **95** (2016) 213–229.
- David L. Henann and Ken Kamrin. A finite-element implementation of the nonlocal granular rheology. *Int. J. Numer. Meth. Engng.* **108** (2016) 273–302.
- Ken Kamrin and David L. Henann. Nonlocal modeling of granular flows down inclines. *Soft Matter* **11** (2015) 179–185.
- David L. Henann and Ken Kamrin. Continuum modeling of secondary rheology in dense granular materials. *Phys. Rev. Lett.* **113** (2014) 178001.
- Jennet Toyjanova, Erin Hannen, Eyal Bar-Kochba, Eric M. Darling, David L. Henann, and Christian Franck. 3D viscoelastic traction force microscopy. *Soft Matter* **10** (2014) 8095–8106.
- David L. Henann and Ken Kamrin. Continuum thermomechanics of the nonlocal granular rheology. *Int. J. Plasticity* **60** (2014) 145–162.
- David L. Henann and Katia Bertoldi. Modeling of elasto-capillary phenomena. *Soft Matter* **10** (2014) 709–717.
- David L. Henann, John J. Valenza II, David L. Johnson, and Ken Kamrin. Small-amplitude acoustics in bulk granular media. *Phys. Rev. E* **88** (2013) 281–302.
- David L. Henann, Shawn A. Chester, and Katia Bertoldi. Modeling of dielectric elastomers: Design of actuators and energy harvesting devices. *J. Mech. Phys. Solids* **61** (2013) 2047–2066.
- David L. Henann and Ken Kamrin. A predictive, size-dependent continuum model for dense granular flows. *P. Natl. Acad. Sci. USA* **110** (2013) 6730–6735.
- David L. Henann and Lallit Anand. A large strain isotropic elasticity model based on molecular dynamics simulations of a metallic glass. *J. Elasticity* **104** (2011) 281–302.
- David L. Henann and Lallit Anand. Surface tension-driven shape-recovery of micro/nanometer-scale surface features in a Pt_{57.5}Ni_{5.3}Cu_{14.7}P_{22.5} metallic glass in the supercooled liquid region: A numerical modeling capability. *J. Mech. Phys. Solids* **58** (2010) 1947–1962.

- David L. Henann, Vikas Srivastava, Hayden K. Taylor, Melinda R. Hale, David E. Hardt, and Lalit Anand. Metallic glasses: viable tool materials for the production of surface microstructures in amorphous polymers by micro-hot-embossing. *J. Micromech. Microeng.* **19** (2009) 115030.
- David L. Henann and Lalit Anand. Fracture of metallic glasses at notches: Effects of notch-root radius and the ratio of the elastic shear modulus to the bulk modulus on toughness. *Acta Mater.* **57** (2009) 6057–6074.
- David L. Henann and Lalit Anand. A large deformation theory for rate-dependent elastic-plastic materials with combined isotropic and kinematic hardening. *Int. J. Plasticity* **25** (2009) 1833–1878.
- David Henann and Lalit Anand. A constitutive theory for the mechanical response of amorphous metals at high temperatures spanning the glass transition temperature: Application to microscale thermoplastic forming. *Acta Mater.* **56** (2008) 3290–3305.
- Edwin R. Fuller, David L. Henann, and Li Ma. Theta-like specimens for measuring mechanical properties at the small-scale: effects of non-ideal loading. *Int. J. Mater. Res.* **98** (2007) 729–734.

Preprints

- Zohreh Farmani, Nazanin Ghods, Harkirat Singh*, Jing Wang, Ralf Stannarius, Stefan Radl, David L. Henann, and Joshua A. Dijksman. Pressure sensitivity in non-local flow behaviour of dense hydrogel particle suspensions. arXiv:2308.00140.

Service

To the University

- Engineering Executive Committee, Representative for Solid Mechanics 2025-present
- ABET Group Lead, Mechanical Engineering 2025-present
- Tau Beta Pi, Rhode Island Alpha Chapter Advisor 2023-present
- Mechanical Engineering Concentration Advisor, School of Engineering 2024-2025
- Core Curriculum Committee, School of Engineering 2022-2025
- Library Advisory Board, Brown University 2022-2024
- DEI Advisory Committee, School of Engineering 2023-2024
- Hibbitt/Hope Street Postdoc Search Committee, School of Engineering 2023-2024
- Affirmative Action Representative, Mechanics of Solids 2022-2023
- Honors Program Advisor, School of Engineering 2020-2022
- Graduate Representative for Solid Mechanics,
Committee for Graduate Studies, School of Engineering 2014–2020

To the Profession

- Co-Organizer, Symposium on Mechanics of Granular Media,
SES Technical Meeting 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2022, 2023, 2024, 2025, 2026
- iMechanica Journal Club, Discussion and Theme Leader August 2015, July 2024
- Co-Organizer, Symposium on Mechanics of Granular and Geo-Mechanical Systems,
U.S. National Congress on Theoretical & Applied Mechanics 2022

- Organizer, New England Workshop on the Mechanics of Materials and Structures (NEW.Mech) 2018
- Co-Organizer, Prager Medal Symposium to honor Prof. Lallit Anand,
SES Technical Meeting 2018
- Co-Organizer, Focus Session on Continuum Descriptions of Particulate Media,
APS March Meeting 2013, 2014, 2015, 2016, 2017, 2018
- Co-Organizer, Drucker Medalist Symposium,
ASME International Mechanical Engineering Congress & Exposition 2014
- Organizer, 12th Annual Northeastern Granular Materials Workshop 2014
- Co-Organizer, Symposium Honoring Professor Lallit Anand on the Occasion of
his 65th Birthday, U.S. National Congress on Theoretical & Applied Mechanics 2014
- Co-Organizer, Symposium on Amorphous Solids: Modeling, Computation, and Experiment,
ASME International Mechanical Engineering Congress & Exposition 2012
- Member, American Society of Mechanical Engineers, Society of Engineering Science, American Physical Society.
- Member, ASME mechanics of soft materials technical committee 2012–present
- Ad Hoc Reviewer for: *Journal of the Mechanics and Physics of Solids*, *International Journal of Solids and Structures*, *Journal of Applied Mechanics*, *Computer Methods in Applied Mechanics and Engineering*, *Extreme Mechanics Letters*, *Experimental Mechanics*, *Mechanics of Materials*, *International Journal of Plasticity*, *Applied Mechanics Reviews*, *European Journal of Mechanics - A/Solids*, *Journal of Fluid Mechanics*, *Soft Matter*, *Physical Review Letters*, *Physical Review E*, *Physical Review Fluids*, *European Physical Journal E*, *Granular Matter*, *Computational Particle Mechanics*, *Acta Materialia*, *Journal of Materials Research*, *Proceedings of the Royal Society A*, *Comptes Rendus Physique*, *Scientific Reports*, *US Army Research Office*.
- Review Panels: National Science Foundation

Honors and Awards

- Eshelby Mechanics Award for Young Faculty 2020
- James R. Rice Assistant Professor of Solid Mechanics July 2016 – Present
- Pi Tau Sigma Gold Medal, ASME 2016
- School of Engineering Dedicated Faculty Award, Brown University Tau Beta Pi 2016
- NSF Early Faculty Career Development (CAREER) Award 2016
- Richard B. Salomon Faculty Research Award, Brown University 2015
- Haythornthwaite Research Initiation Grant, ASME Applied Mechanics Division 2014
- Wunsch Foundation Silent Hoist and Crane Award, Outstanding TA: Mechanics and Materials II 2009
- Tau Beta Pi Fellowship 2006
- Dupont Presidential Fellowship, MIT 2006
- Chancellor's Award for Student Excellence, State University of New York 2006
- Tau Beta Pi, New York Tau 2004
- Pi Tau Sigma, New York Alpha Eta 2004

Teaching

Brown Courses

- ENGN 0310, Mechanics of Solids and Structures, (enrollment: 81 students) Fall 2025
Course effectiveness: 4.77; Instructor effectiveness: 4.93
- ENGN 2980 S71, Independent Study, (enrollment: 4 students) Fall 2025
- ENGN 1300, Structural Analysis, (enrollment: 38 students) Spring 2025
Course effectiveness: 4.81; Instructor effectiveness: 4.93
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Spring 2025
- ENGN 1971 S07, Independent Study in Mechanical Engineering, (enrollment: 1 student) Spring 2025
- ENGN 1973 S07, Independent Study in Engineering Design, (enrollment: 1 student) Spring 2025
- ENGN 0310, Mechanics of Solids and Structures, (enrollment: 52 students) Fall 2024
Course effectiveness: 4.71; Instructor effectiveness: 4.74
- ENGN 2980 S71, Independent Study, (enrollment: 1 student) Fall 2024
- ENGN 1972 S07, Independent Study in Engineering Design, (enrollment: 3 students) Fall 2024
- ENGN 2290, Plasticity, (enrollment: 7 students) Spring 2024
Course effectiveness: 5.00; Instructor effectiveness: 5.00
- ENGN 2980 S71, Independent Study, (enrollment: 2 students) Spring 2023
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Fall 2023
- ENGN 2220, Mechanics of Solids, (enrollment: 14 students) Spring 2023
Course effectiveness: 4.73; Instructor effectiveness: 4.91
- ENGN 2980 S71, Independent Study, (enrollment: 2 students) Spring 2023
- ENGN 0310, Mechanics of Solids and Structures, (enrollment: 41 students) Fall 2022
Course effectiveness: 4.84; Instructor effectiveness: 4.86
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Fall 2022
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Spring 2022
- ENGN 2210, Continuum Mechanics, (enrollment: 4 students) Fall 2021
Course effectiveness: 5.00; Instructor effectiveness: 5.00
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Fall 2021
- ENGN 2220, Mechanics of Solids, (enrollment: 3 students) Spring 2021
Course effectiveness: 5.00; Instructor effectiveness: 5.00
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Spring 2021
- ENGN 1750, Advanced Mechanics of Solids, (enrollment: 19 students) Fall 2020
Course effectiveness: 4.63; Instructor effectiveness: 4.63
- ENGN 2980 S71, Independent Study, (enrollment: 4 students) Fall 2020
- ENGN 2220, Mechanics of Solids, (enrollment: 10 students) Spring 2020
Course effectiveness: 4.89; Instructor effectiveness: 4.89

- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Spring 2020
- ENGN 0310, Mechanics of Solids and Structures, (enrollment: 34 students) Fall 2019
Course effectiveness: 4.87; Instructor effectiveness: 4.97
Note: Starting in Fall 2019, the highest rating in the course feedback system is 5.
- ENGN 2980 S71, Independent Study, (enrollment: 2 students) Fall 2019
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Spring 2019
- ENGN 0310, Mechanics of Solids and Structures, (enrollment: 44 students) Fall 2018
Course effectiveness: 1.38; Instructor effectiveness: 1.15
- ENGN 2980 S71, Independent study, (enrollment: 2 students) Fall 2018
- ENGN 2290, Plasticity, (enrollment: 8 students) Spring 2018
Course effectiveness: 1.00; Instructor effectiveness: 1.00
- ENGN 2980 S71, Independent Study, (enrollment: 4 students) Spring 2018
- ENGN 0310, Mechanics of Solids and Structures, (enrollment: 36 students; co-taught with P. Guduru) Fall 2017
- ENGN 2980 S71, Independent Study, (enrollment: 2 students) Fall 2017
- ENGN 2220, Mechanics of Solids, (enrollment: 10 students) Spring 2017
Course effectiveness: 1.13; Instructor effectiveness: 1.11
- ENGN 2980 S71, Independent Study, (enrollment: 1 student) Spring 2017
- ENGN 1750, Advanced Mechanics of Solids, (enrollment: 38 students) Fall 2016
Course effectiveness: 1.37; Instructor effectiveness: 1.23
- ENGN 2980 S71, Independent Study, (enrollment: 1 student) Fall 2016
- ENGN 2290, Plasticity, (enrollment: 12 students) Spring 2016
Course effectiveness: 1.18; Instructor effectiveness: 1.18
- ENGN 2980 S71, Independent Study, (enrollment: 2 students) Spring 2016
- ENGN 1750, Advanced Mechanics of Solids, (enrollment: 32 students) Fall 2015
Course effectiveness: 1.22; Instructor effectiveness: 1.15
- ENGN 2980 S71, Independent Study, (enrollment: 1 student) Fall 2015
- ENGN 2220, Mechanics of Solids, (enrollment: 18 students) Spring 2015
Course effectiveness: 1.00; Instructor effectiveness: 1.00
- ENGN 2980 S71, Independent Study, (enrollment: 3 students) Spring 2015
- ENGN 1750, Advanced Mechanics of Solids, (enrollment: 27 students) Fall 2014
Course effectiveness: 1.30; Instructor effectiveness: 1.17
- ENGN 2290, Plasticity, (enrollment: 17 students) Spring 2014
Course effectiveness: 1.38; Instructor effectiveness: 1.08
- ENGN 1750, Advanced Mechanics of Solids, (enrollment: 21 students; co-taught with P. Guduru) Fall 2013

Ph.D., Sc.M., and Honors theses directed

- Daren Liu (2014–2019, Ph.D. 2019); Michael Jandron (2014–2019, Ph.D. 2019); Shihong Li (2015–2020, Ph.D. 2020); Xiuqi Li (2016–2021, Ph.D. 2021); Anastasia Tzoumaka (2017–2022, Ph.D. 2022); Harkirat Singh (2018–2023, Ph.D. 2023); Zicheng Yan (2020–2025, Ph.D. 2025); Srijan Neogi (2020–2026, Ph.D. 2026, co-advised with P. Guduru); Thomas Pilvelait (2020–2026, Ph.D. 2026, co-advised with P. Guduru); Andrew Bagnoli (2021–present, Ph.D. candidate); Surya Kolluri (2023–present, Ph.D. candidate); Tengxiao Li (2025–present, Ph.D. candidate); Yuhao Wang (2014–2016, Sc.M. 2016); Leinani Roylo (2021–2022, Sc.M. 2022); Naimah Majeed-Sloanel (2023–2024, Sc.M. 2024); Thanin Kovitchindachai (2015–2016, Honors thesis 2016); Matthew Petersen (2015–2017, Honors thesis 2017); Sungwon La (2023–2024, Honors thesis 2024)