

# Ryan C. Hurley

Associate Professor of Mechanical Engineering

Secondary Appointments, Civil & Systems Engineering, Materials Science and Engineering

Deputy Director and Faculty Fellow of the Hopkins Extreme Materials Institute

Associate Director, Materials Science in Extreme Environments University Research Alliance

Johns Hopkins University, 3400 North Charles Street, Malone 140, Baltimore MD, 21218

rhurley6@jhu.edu, <http://hurley.me.jhu.edu> (Updated April 7, 2026)

## PROFESSIONAL PREPARATION

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Lawrence Livermore National Laboratory	Computational Geosciences	Postdoc, 10/2015-11/2017
California Institute of Technology	Applied Mechanics	Ph.D., 9/2015
California Institute of Technology	Applied Mechanics	M.S., 6/2012
University of Maryland, College Park	Civil Engineering	B.S., 6/2011

## APPOINTMENTS

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Johns Hopkins University

*Primary Appointments*

Associate Professor, Mechanical Engineering 7/2023-Present

Assistant Professor, Mechanical Engineering 1/2018-6/2023

*Other Appointments*

Associate Director, Materials Science in Extreme Environments URA 07/2025-Present

Secondary Appointment, Materials Science and Engineering 11/2024-Present

Deputy Director, Hopkins Extreme Materials Institute 7/2024-Present

Secondary Appointment, Civil & Systems Engineering 3/2020-Present

Faculty Fellow, Hopkins Extreme Materials Institute 1/2018-Present

Assistant Research Professor of Mechanical Engineering 10/2015-12/2017

Postdoctoral Research Staff Member, Lawrence Livermore National Laboratory 11/2015-11/2017

Graduate Research Assistant, California Institute of Technology 10/2011-9/2015

## AWARDS AND HONORS

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Career Impact Award, Johns Hopkins University 2025

Catalyst Award, Johns Hopkins University 2023

Air Force Office of Scientific Research (AFOSR) Young Investigator Program (YIP) Award 2022

2021 Best Paper Award, Journal of American Ceramic Society, for two papers titled “Models for the behavior of boron carbide in extreme dynamic environments” and “Fragmentation and granular transition of ceramics for high rate loading”. Awarded at MS&T22. 2022

Army Educational Outreach Program (AEOP) Mentor of the Year Award 2021

U.S. National Science Foundation (NSF) CAREER Award, PMP Program, CBET Division 2020

Secretary’s Appreciation Award, U.S. DOE, for contributions to the Source Physics Experiment 2017

1st Place, Young Stress Analyst Competition, ICEM16 Conference (Cambridge, UK) 2014

1st Place, Computational Mechanics Poster Competition, EMI Conference (Evanston, IL) 2013

University of Maryland Presidential Scholarship 2007-2011

A. James Clark School of Engineering Scholarship 2007-2011

## STUDENT / MENTEE AWARDS AND HONORS

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**Shachi Singh (Ph.D. student)** – 2025 Best Poster Award, Powders & Grains Conference 2025

**Sohanjit Ghosh (Ph.D. student)** – People’s Choice Award for Best Poster at the 2025 Materials Science in Extreme Environments Annual Technical Meeting 2025

**Shachi Singh (Ph.D. student)** – 2025 IAF Emerging Space Leaders (ESL) Grant Winner 2025

<b>Shachi Singh (Ph.D. student)</b> – Winner, EMI 2025 Poromechanics Student Paper Competition	2025
<b>Sohanjit Ghosh (Ph.D. student)</b> – Travel Fellowship to attend 2025 Shock Compression of Condensed Matter (SCCM) Conference (APS)	2025
<b>Sohanjit Ghosh (Ph.D. student)</b> – Winner of 2025 EMI Granular Materials Committee Student Video Competition, Experimental Category (ASCE)	2025
<b>Sohanjit Ghosh (Ph.D. student)</b> – People’s Choice Award for Best Poster at the 2024 Materials Science in Extreme Environments Annual Technical Meeting	2024
<b>Shachi Singh (Ph.D. student)</b> – People’s Choice Award for Best Poster at the 2024 Mach Conference	2024
<b>Brett Kuwik (Ph.D. student)</b> – People’s Choice Award for Best Poster in 2023 Materials Science in Extreme Environments Annual Technical Meeting	2023
<b>Adyota Gupta (Ph.D. student)</b> – People’s Choice Award for Best Poster in 2023 Mach Conference	2023
<b>Adyota Gupta (Ph.D. student)</b> – Audience Vote for Best Poster in Interactions Matter Session of 2021 Society of Engineering Science Conference	2021
<b>Brett Kuwik (Ph.D. student)</b> – Judge’s Vote for Best Poster in Interactions Matter Session of 2021 Society of Engineering Science Conference	2021
<b>Max Garcia (Undergraduate Student)</b> – Judge’s Vote for Best Poster (2nd Author) in Interactions Matter Session of 2021 Society of Engineering Science Conference	2021

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#### JOURNAL PUBLICATIONS

**Hurley Postdoc or Research Scientist advisee at Johns Hopkins University**

**Hurley current Ph.D. or M.S. advisee at Johns Hopkins University**

**Hurley current Undergraduate or High School advisee at Johns Hopkins University**

**\*Hurley as PI and corresponding author at Johns Hopkins University**

**§Hurley as PI and corresponding author at Lawrence Livermore National Lab**

**†Hurley’s advisee or co-advisee at Johns Hopkins University**

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#### Manuscripts In Review

6. **S. Ghosh**, M. Homel **Z. Deng**, **R.C. Hurley\***. A predictive stochastic continuum framework for concrete subjected to high-velocity impact loading, *In review*. doi.org/10.2139/ssrn.6032287
5. **Z. Deng**, **B. Kuwik**, T. Hufnagel, **R.C. Hurley\***. Quantifying Impact Damage Across Length Scales in Concrete: Macro-, micro-, and nano-scale damage characterization, *In review*.
4. **Z. Deng**, T. Hufnagel, **R.C. Hurley\***. Damage anisotropy in concrete following projectile impact, *In review*.
3. **R.C. Hurley\***, B. Marks, & E. Andò. In-situ full-field imaging in modern experimental granular mechanics, *In review*.
2. A.G. DiOrio, **R.C. Hurley**, J. El-Awady. Computational methodology for evaluating alumina particle impact erosion of ductile materials, *In review*.
1. K. Moody, M. Li, I. Crawford, C.E. Maher, **K. Lee**, T. Horn. K. Newhall, **R.C. Hurley**, K.E. Daniels, C. Rock. A Methodology for Manufacturing 3D Disordered Metamaterials Using Laser Powder Bed Fusion from Granular Packings and Hyperuniform Point Clouds. *In review*.

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#### Published, In Press, or Accepted

60. **S. Bose**, **M.M. Thakur**, **G. Shahin**, K. Shanks, A. Das, J.S. Park, P. Kenesei, H. Sharma, **R.C. Hurley\***. Stress and strain heterogeneity and persistence in uniaxially- and triaxially-loaded sandstone, *Journal of Geophysical Research, Solid Earth*, 131(4), e2025JB033263.
59. **K. Lee**, **B. Kuwik**, **R.C. Hurley\***. Dynamic Heterogeneity and Facilitation in Sheared Granular Materials: Insights from 3D Triaxial Testing, *Physical Review E*, 113, 045402.
58. **M.M. Thakur**, **S. Pattisapu**, **R.C. Hurley\*** (2026). Material heterogeneity-driven fracture propagation in concrete, *International Journal of Mechanical Sciences*, 111300.

57. **S. Ghosh, Z. Deng, G. Kim**, C. Goodman, J. Moreno, R. Nunez, M.A. Foster, **R.C. Hurley\*** (2026). Quantifying 3D ejecta velocities during high-velocity impact experiments into concrete. *International Journal of Impact Engineering*, 208, 105543.
56. **K. Lee, R.C. Hurley\*** (2025). Microscopic dynamics of particle rearrangement and its correlation with stick-slip behavior in granular shear, *Physical Review E*, 112, 015413.
55. **R.C. Hurley\*, Y. Tian, M. Thakur**, H. Sharma, J.S. Park, P. Kenesei, **A. Gupta**, & **K. Lee** (2025). Crystallographic texture, structure, and stress transmission in Nugget sandstone examined with X-ray tomography and diffraction microscopy, *Journal of Geophysical Research: Solid Earth*, 130, E2025JB031690.
54. **B. S. Kuwik, M. Daud, G. Kim, A. Looney, S. Budoff, R.C. Hurley\*** (2025). Microscopic and Macroscopic Failure Mechanisms in Sintered Soda-Lime Glass Spheres Used as Sandstone Surrogates. *International Journal of Rock Mechanics and Mining Sciences*, 192, 106124.
53. L. Yang, **B. Kuwik, S. Singh, S. Ghosh**, J. Moreno, **R.C. Hurley**, K.T. Ramesh (2025). A mechanism-based constitutive model for competent rocks subjected to impact loading. *Journal of Geophysical Research: Solid Earth*, E2024JB031101.
52. **M. Thakur**, N. Axel Henningsson, J. Engqvist, P.O. Autran, J.P. Wright, & **R.C. Hurley\*** (2025). Grain-scale stress heterogeneity in concrete from in-situ X-ray measurements, *Cement and Concrete Research*, 190, 107789.
51. **S. Ghosh, M. M. Thakur, R. Hurley\*** (2025). Quantifying 3D time-resolved kinematics and kinetics during rapid granular compaction, Part II: dynamics of heterogeneous pore collapse. *Journal of the Mechanics and Physics of Solids*, 196, 106007.
50. C. Zhai, D. Wei, H. Song, **R. Hurley**, S. Huang, Y. Gan, & M. Xu (2024). Frictional contacts between rough grains with fractal morphology. *Journal of Geophysical Research: Solid Earth*, 129, e2023JB028361.
49. **A. Gupta**, K.T. Ramesh & **R. Hurley\*** (2024). Instabilities in Granular Media: Particle Dynamics and Stress Fluctuations. *Journal of the Mechanics and Physics of Solids*, 193, 105843.
48. **S. Ghosh, M. M. Thakur, R. Hurley\*** (2024). Quantifying 3D time-resolved kinematics and kinetics during rapid granular compaction, Part I: quasistatic and dynamic deformation regimes. *Journal of the Mechanics and Physics of Solids*, 191, 105765.
47. A.S. Baumgarten, J. Moreno, **B. Kuwik, S. Ghosh, R.C. Hurley**, K.T. Ramesh (2024). A predictive model for fluid-saturated, brittle granular materials during high-velocity impact events. *Journal of the Mechanics and Physics of Solids*, 187, 105644.
46. M. Bhat M I, **R.C. Hurley**, & T.G. Murthy (2024). Micro mechanics of contact-bound cohesive granular materials in confined compression. *Physical Review E*, 109 (5), 054903.
45. **M. Thakur, S. Ghosh, R.C. Hurley\*** (2024). On rapid compaction of granular materials: Combining experiments with in-situ imaging and mesoscale modeling. *Journal of the Mechanics and Physics of Solids*, 105576.
44. **A. Gupta**, K.T. Ramesh & **R.C. Hurley\*** (2024). An Inclusion Model for Predicting Granular Elasticity Incorporating Force Chain Mechanics. *Granular Matter*, 26(2), 40.
43. **B. Kuwik**, J. Moreno, M. Shaeffer, G. Simpson & **R.C. Hurley\*** (2024). The response of dry and water saturated silica sand to high velocity impact *International Journal of Impact Engineering*, 186, 104883.
42. **M. Thakur, S. Enright**, & **R.C. Hurley\*** (2023). Phase segmentation in X-ray CT images of concrete with implications for mesoscale modeling, *Construction and Building Materials*, 403, 133033.

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Above This Line: After Promotion to Associate Professor at Johns Hopkins University

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41. **R.C. Hurley\*, G. Shahin, B.S. Kuwik**, & **K. Lee** (2023). Assessing continuum plasticity postulates with grain stress and local strain measurements in triaxially compressed sand, *Proceedings of the National Academy of Sciences*, 120 (32) e2301607120.
40. **R.C. Hurley\***, D.C. Pagan, E.B. Herbold, & **C. Zhai** (2023). Examining the applicability of micromechanics theories for cementitious composites using *in-situ* X-ray measurements, *International Journal of Solids and Structures*, 267, 112162.

39. X. Sun, **B.S. Kuwik**, Q. Yang, S. Chocron, **R.C. Hurley**, R.A. Haber, J. C. LaSalvia, K.T. Ramesh. (2023). Effects of Particle Size, Shape and Loading Rate on the Normal Compaction of an Advanced Granular Ceramic, *Powder Technology*, 417, 118243.
38. **B. Kuwik**, **G. Kim**, **C. Zhai**, **M. Daud**, & **R.C. Hurley\*** (2023). Roughness and humidity effects on contact, friction, and contact plasticity revealed by micromechanical testing and analysis, *Tribology International*, 178(B), 108075.
37. **M. Thakur**, N. Axel Henningsson, J. Engqvist, P.O. Autran, J.P. Wright, & **R.C. Hurley\*** (2023). On mesoscale modeling of concrete: Role of heterogeneities on local stresses, strains, and representative volume element, *Cement and Concrete Research*, 163, 107031.
36. **G. Shahin** & **R.C. Hurley\*** (2022). Micromechanics and strain localization in sand in the ductile regime, *Journal of Geophysical Research - Solid Earth*, 127, e2022JB024983.
35. **B. Kuwik**, **M. Garcia**, & **R.C. Hurley\*** (2022). Experimental breakage mechanics of confined granular media across strain rates, *International Journal of Solids and Structures*, 259, 112024.
34. **G. Shahin** & **R.C. Hurley\*** (2022). HP-TACO: A High-Pressure TriAxial COmpression Apparatus for *In-Situ* X-ray Measurements in Geomaterials, *Review of Scientific Instruments*. 91, 113907.
33. **K. Lee**, & **R.C. Hurley\*** (2022). Force inference in 3D granular materials: Uncertainty analysis and application to force statistics in 3D, *Physical Review E*, 105, 064902.
32. **R.C. Hurley\*** & **C. Zhai** (2022). Opportunities and needs for measuring time-resolved force chain evolution in 3D granular materials, *Papers in Physics*, 14, 140003.
31. A. Bhattacharjee, **R.C. Hurley**, L. Graham-Brady (2022). Fragmentation and granular transition of ceramics for high rate loading, *Journal of the American Ceramic Society*, 105 (5), 3062-3080.
30. **C. Zhai**, **N. Albayrak**, J. Engqvist, S.A. Hall, J. Wright, M. Majkut, E.B. Herbold, & **R.C. Hurley\*** (2022). Quantifying local rearrangements in 3D granular materials: rearrangement measures, correlations, and relationship to stresses, *Physical Review E*, 105 (1), 014904.
29. **G. Shahin**, E.B. Herbold, S.A. Hall, & **R.C. Hurley\*** (2022). A hierarchy of length scales in the mechanical behavior of 3D granular materials, *Extreme Mechanics Letters*, 51, 101590.
28. K.T. Ramesh, L. Graham-Brady, W. Goddard, **R.C. Hurley**, M. Robbins, A. Tonge, A.L. Tonge, A. Bhattacharjee, J.T. Clemmer, Q. Zeng, W. Li, Y. Shen, Q. An, N. Mitra. (2021). Models for the behavior and failure of boron carbide in extreme dynamic environments, *Journal of the American Ceramic Society*, 105 (5), 3043-3061.
27. **A. Gupta**, R. Crum, **C. Zhai**, K.T. Ramesh, & **R.C. Hurley\*** (2021). Measuring particle-scale 3D granular dynamics during rapid compression from 2D X-ray images, *Journal of Applied Physics*, 129: 225902.
26. A. Bhattacharjee, A. Bhaduri, **R.C. Hurley**, L. Graham-Brady (2021). Failure modeling and sensitivity analysis of ceramics under impact, *Journal of Applied Mechanics*, 88(5), 051007.
25. D. Wei,, **R.C. Hurley**, L.H. Poh, D. Dias-da-Costa, & Y. Gan (2020). The role of particle morphology on concrete fracture behavior: A meso-scale modelling approach. *Cement and Concrete Research*, 134, 106096.
24. **C. Zhai**, E.B. Herbold, & **R.C. Hurley\*** (2020). The influence of structure and forces on ultrasound transmission in granular media, *Proceedings of the National Academy of Sciences*, 117 (18), 16234-16242.
23. **M. Cil**<sup>†</sup>, Q. Zeng, **R.C. Hurley**, & L. Graham-Brady (2020). An integrative model for the dynamic behavior of brittle materials based on microcracking and breakage mechanics, *Journal of the Dynamic Behavior of Materials*, 1-17.
22. Stamati, O., Andò, E., E. Roubin, R. Cailletaud, M. Wiebicke, G. Pinzon, C. Courture, **R.C. Hurley**, *et. al.* (2020). spam: Software for Practical Analysis of Materials, *Journal of Open Source Software*, 5 (51), 2286.
21. **C. Zhai**, D.C. Pagan, & **R.C. Hurley\*** (2020). *In-situ* X-ray tomography and 3DXRD measurements of cemented granular materials. *JOM*, 72, 18-27.
20. **Cil, M.**<sup>†</sup>, **R.C. Hurley**, & L. Graham-Brady (2020). A constitutive model for brittle granular materials considering the competition between breakage and dilation, *Journal of Engineering Mechanics*,

146(1), 04019110.

19. **R.C. Hurley\*** & J.D. Hogan (2020). Workshop on Mathematical Challenges in Brittle Material Failure. *Journal of the Dynamic Behavior of Materials*, 6, 14-23.
18. **C. Zhai**, E.B. Herbold, S.A. Hall, & **R.C. Hurley\*** (2019). Particle rotations and energy dissipation during mechanical compaction of granular materials. *Journal of the Mechanics and Physics of Solids*, 129, 19-38.
17. **M. Cil†**, **R.C. Hurley**, & L. Graham-Brady (2019). A rate-dependent constitutive model for brittle granular materials based on breakage mechanics. *Journal of the American Ceramic Society*, 102(9), 1-11.
16. **R.C. Hurley\*** & D.C. Pagan (2019). An *in-situ* study of stress evolution and fracture growth during compression of concrete. *International Journal of Solids and Structures*, 168, 26-40.
15. **R.C. Hurley\***, E.B. Herbold, & D.C. Pagan (2018). Characterization of crystal structure, kinematics, stresses, and rotations in angular granular quartz during compaction. *Journal of Applied Crystallography*, 51(4), 1021-1034.
14. J.P. Marshall, **R.C. Hurley**, A.D., I. Vlahinic, C. Senatore, K. Iagnemma, B. Trease, & J.E. Andrade (2018). Failures in sand in reduced gravity environments. *Journal of the Mechanics and Physics of Solids*, 113, 1-12.
13. **R.C. Hurley§\***, J. Lind, D.C. Pagan, M.C. Akin, & E.B. Herbold (2018). *In situ* grain fracture mechanics during uniaxial compaction of granular solids. *Journal of the Mechanics and Physics of Solids*, 112, 273-290.

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Above This Line: Research Substantially or Fully Executed at Johns Hopkins University

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12. O. Vorobiev, S. Ezzedine, & **R.C. Hurley** (2018). Near-field non-radial motion generation from underground chemical explosions in jointed granite. *Geophysical Journal International*, 212(1), 25-41.
11. **R.C. Hurley§**, S.A. Hall, & J. Wright, (2017). Multi-scale mechanics of granular solids from grain-resolved x-ray measurements. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 473(2207), 0491.
10. **R.C. Hurley§**, J. Lind, D.C. Pagan, M.C. Akin, & E.B. Herbold (2017). Linking initial microstructure and local response during quasi-static granular compaction. *Physical Review E*, 96(1), 012905.
9. **R.C. Hurley**, O.Y. Vorobiev, & S.M. Ezzedine (2017). An algorithm for continuum modeling of rocks with multiple embedded nonlinearly-compliant joints. *Computational Mechanics*, 60(2), 235-252.
8. **R.C. Hurley**, & J.E. Andrade (2017). Continuum modeling of rate-dependent granular flows in SPH. *Computational Particle Mechanics*, 4(1), 119-130.
7. **R.C. Hurley**, S.A. Hall, J.E. Andrade & J. Wright (2016). Quantifying interparticle forces and heterogeneity in 3D granular materials. *Physical Review Letters*, 117, 098005.
6. **R.C. Hurley**, K.W. Lim, G. Ravichandran, & J.E. Andrade (2016). Dynamic inter-particle force inference in granular materials: Method and application. *Experimental Mechanics*, 56(2), 217-229.
5. **R.C. Hurley**, & J.E. Andrade (2015). Friction in inertial granular flows: competition between dilation and grain-scale dissipation rates. *Granular Matter*, 17(3), 287-295.
4. **R.C. Hurley**, E. Marteau, G. Ravichandran, & J.E. Andrade (2014). Extracting inter-particle forces in opaque granular materials: beyond photoelasticity. *Journal of the Mechanics and Physics of Solids*, 63, 154-166.
3. A.M. Booth, **R.C. Hurley**, M.P. Lamb, & J.E. Andrade (2014). Force chains as the link between particle and bulk friction angles in granular material. *Geophysical Research Letters*, 41(24), 8862-8869.
2. X. Zhao, **R. Hurley**, M. Sutton, W. Fourney, U. Leiste, & X. Deng (2014). Small scale models subjected to buried blast loading part II: frame accelerations with hulls and additional mitigation methods. *Experimental Mechanics*, 54(5), 857-869.
1. X. Zhao, G. Shultis, **R. Hurley**, M. Sutton, W. Fourney, U. Leiste, & X. Deng (2014). Small scale models subjected to buried blast loading part I: floorboard acceleration and related passenger injury metrics with protective hulls. *Experimental Mechanics*, 54(4), 539-555.

## BOOK CHAPTERS

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- M. Saadatfar, **R.C. Hurley**, B. Marks (2025). Advances in Imaging of Granular Matter, in *Packing Problems in Soft Matter Physics*, Royal Society of Chemistry, Eds. Chan, Hutzler, Mughal, O’Hern, Wang, Weaire.

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Above This Line: Research Substantially or Fully Executed at Johns Hopkins University

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- **R.C. Hurley**, K.W. Lim, & J.E. Andrade (2015). Grain-Scale Measurements During Low Velocity Impact in Granular Media. *Rapid Penetration into Granular Media: Visualizing the Fundamental Physics of Rapid Earth Penetration*, pp. 291-317.
- T. Brodrick, **R.C. Hurley**, & W.L. Fourney (2014). Mitigation of loading on personnel in light-armored vehicles using small model testing. *Blast Mitigation*, (pp. 249-277), Springer, New York.

## PEER-REVIEWED CONFERENCE PROCEEDINGS

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- **A. Busaidi**, **S. Ghosh**, **M. Thakur**, **S. Bose**, **R.C. Hurley\*** (2026). Digital Twins for Rock Mechanics from X-ray Tomography and Diffraction Microscopy. In *58th U.S. Rock Mechanics/Geomechanics Symposium*. American Rock Mechanics Association. Tuscon, AZ, USA. June 2026.
- **S. Bose**, **B. Kuwik**, **A. Busaidi**, **R.C. Hurley\*** (2026). In-Situ Visualization of Strain Localization and Deformation in Sandstone under High Pressure. In *58th U.S. Rock Mechanics/Geomechanics Symposium*. American Rock Mechanics Association. Tuscon, AZ, USA. June 2026.
- **S. Singh**, **B. Kuwik**, J. Moreno, **R.C. Hurley\*** (2025). Atmospheric effects on high-velocity impact cratering in porous sandstones. *Powders and Grains, 2025*. Goa, India, December 2025.
- **S. Ghosh**, **M. Thakur**, **R.C. Hurley\*** (2025). Pore collapse during impacts in granular materials. *Powders and Grains, 2025*. Goa, India, December 2025.
- **S. Ghosh**, **G. Kim**, **E. Chua**, C. Goodman, J. Moreno, M. Foster, **R.C. Hurley\*** (2025). Ejecta characterization following hypervelocity impacts on geomaterials. *LPI Contributions* 3090, 1026.
- **S. Singh**, **B. Kuwik**, J. Moreno, M. Foster, **R.C. Hurley\*** (2025). Hypervelocity impacts on porous rocks: The effect of porosity and air pressure. *LPI Contributions* 3090, 2196.
- **R.C. Hurley\***, **G. Shahin** (2023). In-situ X-ray measurements of grain stress and strain during uniaxial compaction of miniature sandstone samples. In *57th U.S. Rock Mechanics/Geomechanics Symposium*. American Rock Mechanics Association. Atlanta, GA, USA. June 2023.
- **B. Kuwik**, **R.C. Hurley\*** (2021). Quantifying Energy Dissipation Due to Breakage During Confined Dynamic Granular Compaction. *EPJ Web of Conferences for Powders & Grains*, 249, 07006. Virtual Conference, July 2021.
- **R.C. Hurley\*** (2021). Stress and force measurement uncertainties in 3D granular materials. *EPJ Web of Conferences for Powders & Grains*, 249, 02009. Virtual Conference, July 2021.

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Above This Line: Research Substantially or Fully Executed at Johns Hopkins University

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- E.B. Herbold, M.A. Homel, J. Lind, R. Crum, **R.C. Hurley**, B.J. Jensen, A.J. Iverson, C.T. Owens, C.A. Carlson, & M.C. Akin (2018). Microscale investigation of dynamic impact of dry and saturated glass powder. *AIP Conference Proceedings*, 1979, 070015. St. Louis, MO, July 2017.
- M.A. Homel, E.B. Herbold, J. Lind, Darren C. Pagan, R. Crum, **R.C. Hurley**, & M.C. Akin (2018). Microscale investigation of dynamic impact of dry and saturated glass powder. *AIP Conference Proceedings*, 1979, 070015. St. Louis, MO, July 2017.
- **R.C. Hurley**, S.A. Hall, J.E. Andrade, & J. Wright (2017). Force measurements in stiff, 3D opaque granular materials. *EPJ Web of Conferences for Powders & Grains*, 140, 02006. Montpellier, France, July 2017.
- **R.C. Hurley**, & J.E. Andrade (2015). A smoothed particle hydrodynamics method for coupled gas-porous media flows. *Engineering Mechanics Institute (EMI) Computational Inelasticity Paper Competition*, Stanford, CA, June 2015.
- **R.C. Hurley**, & J.E. Andrade (2015). Strength of granular materials in transient and steady state rapid shear. *Procedia Engineering*, 103, 237-245. Boulder, CO, April 2015.

## OTHER CONFERENCE PROCEEDINGS

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- **R.C. Hurley**, & Andrade, J.E. (2015). A smoothed particle hydrodynamics method for coupled gas-porous media flows. *Engineering Mechanics Institute (EMI) Computational Inelasticity Paper Competition*, Stanford, CA, June 2015.

## CURRENT SUPPORT AT JOHNS HOPKINS UNIVERSITY

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Hurley's share of current and completed support at JHU as PI: \$6.3M

- Department of Energy (DOE). "Direct 3D X-ray Probes of Rock Texture, Structure, and Stress Heterogeneity, and Digital Twins to Study Their Effects". Role: Sole PI. Hurley's share of funding during period of performance: **\$598,790**. Period of Performance: 7/15/2025 - 7/14/2028.
- National Science Foundation (NSF). "FMSG: Bio: Just Add Water and Cyanobacteria: Biomanufacturing Routes to Cement and Stabilized Soil". Role: Co-PI. Other Co-PIs: Michael Betenbaugh and Yayuan Liu, JHU. Hurley's share of funding during period of performance: **\$165,027**. Period of Performance: 5/1/2025 - 4/30/2027.
- National Nuclear Security Administration (NNSA), Department of Energy (DOE). "Heterogenous Materials in Extreme Dynamic Environments: Mechanics and Kinetics Through Coupling Experiments with *In-situ* Measurements and Mesoscale Models". Role: PI. Hurley's share of funding during period of performance: **\$651,313**. Period of Performance: 3/1/2025 - 2/28/2028.
- U.S. National Science Foundation (NSF), DMR. "Collaborative Research: DMREF: Iterative Design and Fabrication of Multiscale Hyperuniform Materials for Targeted Mechanical and Transport Properties". Role: PI for JHU. Lead PI/Institution: K. Daniels / NCSU. Other PIs/Institutions: C. Rock / NCSU; K. Newhall / UNC; M Porter / UCLA. Hurley funding during period of performance: **\$323,000**. Total funding to all PIs and institutions: \$2,000,000. Period of Performance: 12/1/2023 - 11/30/2027.
  - PI of Supplement for DMREF/FM Collaboration (**\$50,000** not reflected in main share above).
- U.S. Defense Threat Reduction Agency (DTRA). "Constitutive Models for Soils, Rocks, and Concrete". (part of "Materials Science in Extreme Environments University Research Alliance" (MSEE URA)). Role: PI, Leader of Focus Area (4 PIs total). Hurley's core share of funding during period of performance (excluding supplements below): **\$1,231,716**. Total funding to app PIs and institutions: \$47,060,000. Period of Performance: 7/1/2020 - 12/31/2027.
  - PI of Supplements for 2023 Impact Research Workshop (**\$82,070**, not reflected in main share above) and impact experiments at JHU (**\$132,930**, not reflected in main share above).
  - Congressionally-funded supplement for enhancing research efforts (**\$224,029**, not reflected in main share above).
  - PI of FY2024 and FY2026 Sprint Project Supplements on "Characterization of Mechanical Properties and Dynamic Deformation Mechanisms in Concrete Across Various Strength Regimes" (**\$720,000**, not reflected in main share above).

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### Beginning of completed Support

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- Small Business Innovation Research (SBIR) Phase 1 with Karagozian & Case, Inc.. "Understanding Fragment Impact on Responding Surfaces". Role: PI. Hurley's share of funding during period of performance: **\$14,866**. Period of Performance: 7/1/2025 - 12/31/2025
- U.S. Department of Energy (DOE). "Integrated X-ray Probes for In-Situ Deformation and Fracture Studies of Sandstone". Role: Sole PI. Funding during period of performance: **\$496,977**. Period of Performance: 7/15/2022 - 7/14/2025.
- Johns Hopkins University, Office of the President, Catalyst Award. "Assessing Fundamental Postulates of Plasticity Theories for Geomaterials". Role: Sole PI. Funding during period of performance: **\$75,000**. Period of Performance: 7/1/2023 - 6/30/2025.
- U.S. Air Force Office of Scientific Research (AFOSR). "YIP: Effects of Material and Morphology on 3D Particle and Pore Dynamics During Rapid Compaction of Granular Materials". Role: Sole PI.

- Funding during period of performance: **\$450,000**. Period of Performance: 3/1/2022 - 2/28/2025.
- U.S. National Science Foundation (NSF), CBET. “CAREER: Quantifying Local Rearrangements and Their Effects in 3D Granular Materials”. Role: Sole PI. Funding during period of performance: **\$535,414**. Period of Performance: 5/1/2020 - 4/30/2025.
    - U.S. National Science Foundation (NSF). “REU Supplement for NSF Award#1942096”. Role: Sole PI. Funding during period of performance: **\$6,825**. Period of Performance: 6/1/2023 - 5/31/2023.
  - U.S. National Science Foundation (NSF), CMMI. “Concrete Micromechanics Validated with In-Situ Stress and Strain Measurements”. Role: Sole PI. Funding during period of performance: **\$351,556**. Period of Performance: 9/1/2021 - 8/31/2024.
    - U.S. National Science Foundation (NSF). “REU Supplement for NSF Award#2125023”. Role: Sole PI. Funding during period of performance: **\$7,800**. Period of Performance: 6/1/2023 - 5/31/2023.
  - United States Geological Survey (USGS). “Force Chain Buckling as a Granular Fault Gouge Stick-Slip and Seismicity Mechanism”. Role: Sole PI. Funding during period of performance: **\$95,593**. Period of Performance: 4/15/2023 - 4/14/2023.
  - Defense University Research Instrumentation Program (DURIP), Army Research Office (ARO). “An Extreme Pressure Triaxial Compression Apparatus for In-Situ Studies of Geomaterial Deformation Mechanisms”. Role: Sole PI. Funding during period of performance: **\$116,464**. Period of Performance: 1/1/2023 - 12/31/2023.
  - U.S. Army Research Laboratory (ARL). “Calibrating and Validating Granular Flow Model Parameters to Aid in Integrative Modeling” (part of Materials in Extreme Dynamic Environments (MEDE) Collaborative Research Alliance). Role: PI within Ceramics Group. Hurley’s share of funding during period of performance: **\$134,651**. Period of Performance: 6/1/2019 - 12/31/2021.
  - Space@Hopkins, Johns Hopkins University. “Electrostatically-Charged Contact Mechanics in Lunar and Martian Dust Environments”. A seed grant. Role: PI (w/ Rui Ni, JHU). Share of Funding: **\$18,866**. Period of Performance: 9/1/2020 - 8/31/2021.
  - Defense University Research Instrumentation Program (DURIP), Army Research Office (ARO). “A System for In-Situ Studies of the Contact Mechanics Between Geomaterials”. Role: Sole PI. Funding: **\$151,845**. Period of Performance: 4/4/2019 - 4/3/2020.
  - Army Research Office (ARO). “Workshop on Identifying Mathematical Challenges Associated with Dynamic Failure of Brittle Materials”. Role: Sole PI. Share of Funding: **\$18,768**. Period of Performance: 1/25/2019 - 9/24/2019.
  - Subcontract from Lawrence Livermore National Laboratory to Johns Hopkins University, “Unraveling Force Chains and Failure in Granular Materials”. Role: Sole PI. Funding: **\$69,556**. Period of Performance: 1/25/2018 - 9/31/2018.

**PENDING SUPPORT AT JOHNS HOPKINS UNIVERSITY** \_\_\_\_\_

Hurley’s share of pending support at JHU as PI: \$1,687,782

**COMPLETED SUPPORT AT LAWRENCE LIVERMORE NATIONAL LABORATORY** \_\_\_\_\_

- Laboratory Directed Research and Development (LDRD) Grant, Lawrence Livermore National Laboratory, “Unraveling Force Chains and Failure in Granular Materials”. Role: Sole PI. Funding: **\$550,000**. Period of Performance: 10/1/2016 - 9/31/2018 (departed LLNL on 11/8/2017).

**INVITED SEMINARS (CONFERENCE KEYNOTES, UNIVERSITY AND LABORATORY SEMINARS, DOCTORAL SCHOOLS)** \_\_\_\_\_

24. **R.C. Hurley** (March 2026). Impact and Penetration of Sand, Rocks, and Concrete: New Diagnostics, Models, and Insight. Army Research Laboratory, Aberdeen Proving Grounds. (**Invited Lab Seminar**).
23. **R.C. Hurley** (March 2026). Deformation Mechanisms of Geomaterials and Heterogeneous Materials

- in Extreme Conditions. Applied Physics Laboratory, Research and Exploratory Development Division. **(Invited Lab Seminar)**.
22. **R.C. Hurley** (July 2025). Effects of Material and Morphology on 3D Particle and Pore Dynamics During Rapid Compaction of Granular Materials. *DMI/ACM YIP Lecture Series*, Air Force Office of Scientific Research (AFOSR), Virtual. **(Invited AFOSR/AFRL Seminar)**.
  21. **R.C. Hurley** (September 2024). Quantifying Geomaterial Micromechanics with In-Situ X-ray Probes. *Department of Materials Science Seminar Series*, Johns Hopkins University, Baltimore, MD. **(Invited University Seminar)**.
  20. **R.C. Hurley** (September 2024). Granular Mechanics Across Time and Length Scales: Insights from Quasi-Static and Dynamic Testing with In-Situ X-ray Measurements. *IS-Grenoble 2024*, Grenoble, France. **(Invited Conference Plenary)**.
  19. **R.C. Hurley** (August 2024). A Grain's View of Triaxial Tests in Sands and Rocks. *Xi'an Jiaotong University*, Xi'an, China. **(Invited University Seminar)**.
  18. **R.C. Hurley** (July 2024). A Grain's View of Triaxial Tests in Sands and Rocks. *Engineering Mechanics and Energy*, University of Tsukuba, Tsukuba, Japan. **(Invited University Seminar)**.
  17. **R.C. Hurley** (February 2024). A Grain's View of Triaxial Tests in Sands and Rocks. *Granular Forum*, School of Civil Engineering, University of Sydney, Sydney, Australia. **(Invited University Seminar)**.
  16. **R.C. Hurley** (October 2023). Granular Mechanics Across Time and Length Scales: Insights from In-Situ X-ray Measurements. *Institute for Geophysics and Planetary Physics (IGPP) Seminar*, Department of Earth and Planetary Sciences, University of California, Santa Cruz, Santa Cruz, CA. **(Invited university seminar)**.
  15. **R.C. Hurley** (May 2023). Mechanics of Granular Materials Across Time and Length Scales: Insights from Quasi-Static and Dynamic Testing with In-Situ X-ray Measurements. *Center for Science and Protection of Engineered Environments (SPREE) Seminar Series*, Department of Civil and Environmental Engineering, Northwestern University, Northwestern University, Evanston, Ill. **(Invited university seminar)**.
  14. **R.C. Hurley** (February 2023). Using X-rays to Study the Micromechanics of Granular Materials Across Time and Length Scales. *Rocky Mountain Mechanics Seminar Series*, CU Boulder, Colorado. **(Invited university seminar)**.
  13. **R.C. Hurley** (September 2022). Measuring Stresses and Forces in 3D Granular Materials with X-rays. *A two-hour lecture given as part of the 2022 ALERT Geomaterials Doctoral School*, Grenoble, France. **(Invited doctoral school seminar)**.
  12. **R.C. Hurley** (September 2022). Measuring Stresses and Forces in Granular Materials with Photoelasticity. *A two-hour lecture given as part of the 2022 ALERT Geomaterials Doctoral School*, Grenoble, France. **(Invited doctoral school seminar)**.
  11. **R.C. Hurley** (December 2021). Quantifying the Micromechanics of Sand and Concrete With X-rays. *Department Seminar Series*, Department of Mechanical and Industrial Engineering, New Jersey Institute of Technology, Virtual. **(Invited university seminar)**.
  10. **R.C. Hurley** (April 2021). Quantifying the Causes of Local Rearrangements in 3D Granular Media Using Machine Learning. *Laboratoire 3SR (Soils, Solids, Structures)*, University of Grenoble, 3SR Seminar Series, Grenoble, France, Virtual. **(Invited university seminar)**.
  9. **R.C. Hurley** (April 2021). Experimental Micromechanics of 3D Granular Materials with Applications to Force Chains, Waves, Rearrangements, Length Scales. *Center for Science and Protection of Engineered Environments (SPREE) Seminar Series*, Department of Civil and Environmental Engineering, Northwestern University, Virtual. **(Invited university seminar)**.
  8. **R.C. Hurley** (September 2020). Experimental Micromechanics of 3D Granular Materials: Force Chains, Waves, and Rearrangements. University of California, Santa Cruz, CA, Virtual. **(Invited university seminar)**.
  7. **R.C. Hurley** (August 2020). Experimental Micromechanics of 3D Granular Materials: Force Chains, Waves, and Rearrangements. Sandia National Laboratory, Albuquerque, NM, Virtual. **(Invited**

- laboratory seminar).
6. **R.C. Hurley** (April 2020). Mechanics of Granular Materials at "Micro" Length and Time Scales from *In-Situ* X-ray Measurements *Mechanical Engineering Department Seminar Series, Johns Hopkins University*, Baltimore, Maryland, Virtual. **(Invited university seminar)**.
  5. **R.C. Hurley** (January 2020). Quantifying Micro-scale Mechanisms of Geomaterial Behavior Using X-rays. *Laboratoire 3SR (Soils, Solids, Structures), University of Grenoble, 3SR Seminar Series*, Grenoble, France. **(Invited university seminar)**.
  4. **R.C. Hurley** (July 2019). Measuring Contact- and Particle-Scale Behavior in 3D Granular Materials with X-rays and Waves. *Granular Forum, University of Sydney*, Sydney, Australia. **(Invited university seminar)**.
  3. **R.C. Hurley** (May 2019). Measuring Contact- and Particle-Scale Behavior in 3D Granular Materials with X-rays and Waves. *Complex Matter and Biophysics Seminar Series, North Carolina State University*, Raleigh NC. **(Invited university seminar)**.
  2. **R.C. Hurley** (November 2018). X-ray Tomography and Diffraction for Granular Micromechanics. *Hong Kong University Civil Engineering Department Seminar*, Hong Kong, China. **(Invited university seminar)**.
  1. **R.C. Hurley** (October 2018). Combining *In-situ* X-ray Imaging and Diffraction to Understand the Micromechanics and Failure Processes of Granular Materials. *Brown Bag Seminar Series, Indian Head NSWC*, Indian Head, MD. **(Invited laboratory seminar)**.

#### INVITED TALKS (WORKSHOPS, CONFERENCES, SYMPOSIA) \_\_\_\_\_

31. **R.C. Hurley** (August 2026). Mapping Stress and Strain in Granular Materials and Rocks, Applications to Pressure Solution Creep. *Lorentz Workshop on Evolving Grain Boundaries in Deforming Rocks, Ceramics and Metals*, Leiden, Netherlands. **(Invited Workshop Talk)**.
30. **R.C. Hurley** (April 2026). Mapping Stress and Strain in Granular Materials and Rocks. *ISRD Workshop on Integration of Tomography and Diffraction Techniques for Rock Mechanics*, Argonne National Lab, Illinois. **(Invited Workshop Talk)**.
29. **R.C. Hurley** (June 2025). High Pressure Granular Mechanics at Low and High Strain Rates. *North-eastern Granular Materials Workshop*, Yale University, New Haven, CT. **(Invited Workshop Talk)**.
28. **R.C. Hurley** (September 2024). Fundamental Research on Sand, Sandstone, and Concrete Subjected to High Pressures and Impacts: Recent Developments at JHU in the MSEE URA. *Nuclear Weapons Effects Collaborative (NVEC) Meeting*, Virtual.
27. **R.C. Hurley** (August 2024). 4D Grain Stress and Strain Measurements in Triaxially-Compressed Sand: Recent Results and Challenges. *2024 Society of Engineering Science Meeting*, Hangzhou, China. **(Invited symposium talk)**.
26. **R.C. Hurley** (June 2024). Mechanics of Geomaterials in Extreme Conditions *2024 Hopkins Exploratory Engineering Program (HEEP)*, Baltimore, Maryland. **(Invited talk)** to 23 distinguished undergraduate visitors from India.
25. **R.C. Hurley** (May 2024). In-situ X-ray Tomography and High-Energy Diffraction Microscopy for Sands, Rocks, and Concrete: Examples and Challenges. *2024 Advanced Photon Source (APS) Users' Meeting*, Lemont, Illinois. **(Invited symposium talk)**.
24. **R.C. Hurley** (May 2023). Ultrasound and Acoustic Wave Propagation Measurements in Rocks and Granular Media Made Concurrently with In-Situ Synchrotron X-ray Imaging. *2023 American Society of Acoustics (ASA) Meeting*, Chicago, Illinois. **(Invited symposium talk)**.
23. **R.C. Hurley** (March 2023). Advances in Micromechanics and Digital Twin Modeling of Concrete and Geologic Materials Aided by In-Situ Tomography and 3D X-ray Diffraction. *TMS 2023 Annual Meeting*, San Diego, CA. **(Invited symposium talk)**.
22. **R.C. Hurley** (October 2022). Linking Granular Micromechanics to Macroscopic Plasticity in Triaxial Tests and Other Geometries. *Society of Engineering Science (SES) Annual Meeting*, University of Texas, A&M. **(Invited symposium keynote)**.
21. **R.C. Hurley** (September 2022). In-Situ Multi-Modal X-ray Imaging for Structure and Stress Distri-

- butions in Mechanically-Loaded Granular Media. *Lorentz Workshop, "Image is Everything"*, Leiden, Netherlands. **(Invited workshop keynote)**.
20. **R.C. Hurley** (March 2022). Towards Quantitative Measurement and Use of Grain Stresses and Forces in Granular Materials. *Workshop titled: Mechanics of Granular Materials: What's Next?*, International Research Network GeoMech, Virtual. **(Invited workshop keynote)**.
  19. **R.C. Hurley** (January 2022). Linking Mechanisms to Penetration Response of Sands and Rocks: Experiments, Models, and Uncertainty Quantification in the MSEE URA. *Nuclear Weapons Effects Collaborative (NWECC) Meeting*, Virtual. **(Invited talk at invite-only DTRA meeting)**.
  18. **R.C. Hurley** (September 2021). Inferring 3D Granular Dynamics From In-Situ X-ray Radiography and XPCI: Recent Advances, Limitations, and Opportunities. *Workshop on Enabling 3D Mesoscale Imaging Under Dynamic Conditions*, Los Alamos National Laboratory, Virtual. **(Invited workshop keynote)**.
  17. **R.C. Hurley** (March 2021). Quantifying Local Rearrangements in Granular Media Using X-ray Tomography, Diffraction, and Machine Learning. *APS March Meeting 2021*, Virtual. **(Invited conference talk)**.
  16. **R.C. Hurley** (January 2021). Research on Geomaterial Constitutive Laws in the MSEE-URA and Related Challenges and Capabilities for Dynamic Material Behavior Studies. *Nuclear Weapons Effects Collaborative (NWECC) Meeting*, Virtual. **(Invited talk at invite-only DTRA meeting)**.
  15. **R.C. Hurley** (June 2020). Simultaneous *In-Situ* Synchrotron Tomography and Diffraction to Study the Mechanical Behavior of Granular Materials *1st In-Situ Studies of Rock Deformation (ISRDR) Workshop*, Cornell, NY, Virtual. **(Invited workshop presentation)**.
  14. **R.C. Hurley** (March 2020). Mechanics of Deformation in 3D Granular Materials using X-ray Measurements. *APS March Meeting 2020*, Virtual. **(Invited conference talk)** [Cancelled due to COVID19].
  13. **R.C. Hurley** (January 2020). Microstructural Characterization: Applications to Granular Cohesion. *International Fine Particle Research Institute (IFPRI) Workshop on Particle Technology: Mechanisms of Cohesion at the Single Particle Level and Their Influence on Bulk Properties*, Philadelphia, Pennsylvania. **(Invited talk at invite-only industry consortium (IFPRI) workshop)**.
  12. **R.C. Hurley** (October 2019). Multi-Scale Relationships from Grain-Resolved In-Situ Measurements in 3D Granular Materials. *Society of Engineering Science (SES) Annual Meeting*, St. Louis, Missouri. **(Invited symposium keynote)**.
  11. **R.C. Hurley** (July 2019). In-situ X-ray Tomography and Diffraction: Probing Granular Micromechanics and Energy Dissipation During Compaction. *International Conference on Tomography of Materials & Structures (ICTMS)*, Cairns, Australia. **(Invited symposium keynote)**.
  10. **R.C. Hurley** (May 2019). Measuring Contact- and Particle-Scale Behavior in 3D Granular Materials. *Frontiers in Applied and Computational Mathematics, Northeastern Complex Fluids & Soft Matter Workshop*, New Jersey Institute of Technology, Newark NJ. **(Invited workshop talk)**.
  9. **R.C. Hurley** (December 2018). Combining *In-situ* X-ray Imaging and Diffraction to Understand the Micromechanics and Failure Processes of Granular Materials. *Multi-scale Materials Under the Nanoscope, Annual Workshop of GDRI M2UN*, Georgetown University, Washington DC. **(Invited workshop talk)**.
  8. **R.C. Hurley** (June 2018). Grain-resolved structure, stress, and force measurements in friction 3D granular materials. *Granular Matter Gordon Research Conference*, Easton, MA. **(Invited workshop talk)**.

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Above This Line: Research Substantially or Fully Executed at Johns Hopkins University

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7. **R.C. Hurley**, (December 2017). Studies of micromechanics and failure in granular materials using X-ray computed tomography and diffraction. *GM3: Geo-Mechanics: From Micro to Macro, UK Annual Traveling Workshop*, London, England. **(Invited conference keynote (only keynote talk at conference))**.
6. **R.C. Hurley** (June 2017). Understanding mechanics and stress transmission in granular solids by

- combining 3DXRD and XRCT. *CHESS User's Meeting*, Ithaca, NY. (**Invited workshop keynote**).
5. **R.C. Hurley** (May 2016). Inter-particle force inference in opaque granular materials imaged using XRCT and 3DXRD. *SIAM Conference on Mathematical Aspects of Materials Science*, Philadelphia, PA. (**Invited conference talk in invite-only session**).
  4. **R.C. Hurley**. A Smoothed Particle Hydrodynamics Method for Coupled Gas-Porous Media Flows. *Engineering Mechanics Institute Annual Meeting*, Palo Alto, CA. (**Invited Talk in Student Paper Competition in Computational Inelasticity, 2nd Place Finish**).
  3. **R.C. Hurley** (September 2014). Inferring inter-particle forces in opaque granular materials. *British Society for Strain Measurement Workshop*, Teddington, UK. (**Invited poster**).
  2. **R.C. Hurley** (July 2014). Measuring dynamic inter-particle force transmission in opaque granular media. *International Conference on Experimental Mechanics*, Cambridge, UK. (**Invited talk, First Place in Young Stress Analyst Competition**).
  1. **R.C. Hurley** (June 2014). The microscopic origin of friction in granular matter. *U.S. National Congress on Theoretical and Applied Mechanics (USNCTAM)*, East Lansing, MI. (**Invited session keynote**).

### INVITE-ONLY WORKSHOP PARTICIPATION (TALKS OR OTHER ROLES) \_\_\_\_\_

Participation at invited speaker level or invited participant (for workshops not involving talks).

15. *Lorentz Workshop on Evolving Grain Boundaries in Deforming Rocks, Ceramics, and Metals*, August 2026.
14. *ISRD Workshop on Integration of Tomography and Diffraction Techniques for Rock Mechanics*, April 2026.
13. *Nuclear Weapons Effects Collaborative Meeting, Defense Threat Reduction Agency (DTRA)*, September 2024 (virtual).
12. *2024 Hopkins Exploratory Engineering Program (HEEP) Seminar Series*, Johns Hopkins University, Baltimore, Maryland, June 2024.
11. *Getting Into Shape: Pushing for Exotic Particulate Media Mechanics, Lorentz Workshop*, Leiden, Netherlands, June 2023.
10. *ALERT Geomaterials Doctoral School*, Aussois, France, September 2022.
9. *Image is Everything, Lorentz Workshop*, Leiden, Netherlands, September 2022.
8. *Mechanics of Granular Media: What's Next?*, *International Research Network GeoMech and Northwestern University*, March 2022 (virtual).
7. *Process-Structure-Performance: X-ray Experiments to Understand Materials Behavior, Los Alamos National Laboratory (LANL)*, February 2022 (virtual).
6. *Nuclear Weapons Effects Collaborative Meeting, Defense Threat Reduction Agency (DTRA)*, January 2022 (virtual).
5. *Enabling 3D Mesoscale Imaging Under Dynamic Conditions, Los Alamos National Laboratory (LANL)*, September 2021 (virtual).
4. *Nuclear Weapons Effects Collaborative Meeting, Defense Threat Reduction Agency (DTRA)*, January 2021 (virtual).
3. *1st In-Situ Studies of Rock Deformation (ISRD) Workshop*, Cornell University, June 2020 (virtual).
2. *Workshop on Particle Technology: Mechanisms of Cohesion at the Single Particle Level and Their Influence on Bulk Properties, International Fine Particle Research Institute (IFPRI)*, Philadelphia, January 2020.
1. *Multi-scale Materials Under the Nanoscope, GDRI M2UN*, Georgetown University, December 2018.

### CONTRIBUTED PRESENTATIONS BY HURLEY AND MENTEES \_\_\_\_\_

\*Hurley as PI or Co-PI while at Johns Hopkins University

**Hurley group postdoc advisee at Johns Hopkins University**

**Hurley group Ph.D. advisee at Johns Hopkins University**

**Hurley group Undergraduate or High School advisee at Johns Hopkins University**

(Underlined author is presenter)

- K.. Lee, C. Maher, K. Newhall **R.C. Hurley\*** (March 2026). Bending Cutoff Governs Phononic Band Gaps in Elastic Beam Lattices. *2026 APS March Meeting / Global Physics Summit*, Denver, CO. (Oral presentation).
- K.. Lee, **B. Kuwik**, **R.C. Hurley\*** (March 2026). Emergence of Dynamic Heterogeneity and Facilitation in 3D Sheared Granular Materials. *2026 APS March Meeting / Global Physics Summit*, Denver, CO. (Poster presentation).
- **S. Ghosh**, **B. Kuwik**, **M. Thakur**, **S. Singh**, **R.C. Hurley\*** (March 2026). Unraveling High Strain Rate and Pressure Phenomena in Geomaterials With In-Situ Diagnostics and Digital Twins. *TMS 2026*, San Diego, CA. (Oral presentation).
- **S. Singh**, **B. Kuwik**, **R.C. Hurley\*** (December 2025). Impacting cratering in sandstones: Effect of porosity and atmospheric pressure. *2025 Powders and Grains Conference*, Goa, India. (Poster presentation).
- **S. Ghosh**, **M. Thakur**, **P. Dainer**, **J. Li**, **J. Zacharia**, **R.C. Hurley\*** (December 2025). Estimating pore size evolution during shock compaction in granular materials. *2025 Powders and Grains Conference*, Goa, India. (Oral presentation).
- **R.C. Hurley\***, **B. Kuwik**, **K. Lee**, J. Ball, E. Ando, **A. Gupta**, **Y. Tian**, F. Aymanns, J. Queralt, A. Henningsson, A. King (October 2025). 4D Stress and Strain Measurements in Sand and Rocks. *2025 SES Technical Meeting*, Atlanta, GA. (Oral presentation).
- **S. Bose**, **G. Shahin**, **M. Thakur**, **R.C. Hurley\*** (August 2025). Quantifying Stress and Strain Heterogeneity in Mult-Axially-Loaded Rocks with X-rays. *ISR-D-SEES Workshop*, Chicago, IL. (Poster presentation).
- **Z. Deng**, **S. Ghosh**, J. Moreno, **R.C. Hurley\*** (June 2025). Nanoindentation-based characterization of concrete damage due to high-velocity projectile impact. *2025 Society of Experimental Mechanics (SEM) Conference*, Milwaukee, WI. (Oral presentation).
- **S. Singh**, **B. Kuwik**, **R.C. Hurley\*** (May 2025). Impacting cratering in sandstones: Effect of porosity and atmospheric pressure. *2025 Engineering Mechanics Institute (EMI) Conference*, Anaheim, CA. (Oral presentation).
- **S. Ghosh**, **M. Thakur**, **P. Dainer**, **J. Li**, **J. Zacharia**, **R.C. Hurley\*** (May 2025). Estimating pore size evolution during shock compaction in granular materials. *2025 Engineering Mechanics Institute (EMI) Conference*, Anaheim, CA. (Oral presentation).
- **Z. Deng**, **S. Ghosh**, J. Moreno, **R.C. Hurley\*** (May 2025). Nanoindentation-based characterization of concrete damage due to high-velocity projectile impact. *2025 Engineering Mechanics Institute (EMI) Conference*, Anaheim, CA. (Oral presentation).
- **Z. Deng**, **S. Ghosh**, J. Moreno, **R.C. Hurley\*** (April 2025). Nanoindentation-based characterization of concrete damage due to high-velocity projectile impact. *Mach Conference*, Annapolis, MD. (Oral presentation).
- **S. Singh**, **B. Kuwik**, J. Moreno, **R.C. Hurley\*** (March 2025). Hypervelocity impacts on porous rocks: The effect of porosity and air pressure. *Lunar and Planetary Science Conference*, Woodlands, TX. (Poster presentation).
- **S. Ghosh**, **G. Kim**, **E. Chua**, **R.C. Hurley\*** (March 2025). Ejecta characterization following hypervelocity impacts on geomaterials. *Lunar and Planetary Science Conference*, Woodlands, TX. (Oral presentation).
- **S. Ghosh**, **M. Thakur**, **R.C. Hurley\*** (August 2024). Effects of Material and Morphology on 3D Particle and Pore Dynamics During Rapid Compaction of Granular Materials. *2024 Triservice Review*, National Harbor, MD. (Oral and poster presentation).
- **S. Ghosh**, **M. Thakur**, **R.C. Hurley\*** (June 2024). Combining In-situ Experiments and Mesoscale Modeling. *2024 Granular Matter Gordon Research Conference*, Easton MA. (Oral and poster presentation).
- **M. Thakur**, **S. Ghosh**, **R.C. Hurley\*** (June 2024). Mesoscale Framework for Predicting 3D Grain and Pore Dynamics in Rapid Compaction of Granular Materials. *2024 Society of Engineering*

- Mechanics (SEM) Annual Conference*, Vancouver, WA. (Oral presentation).
- **R.C. Hurley\***, E. Andó (June 2024). Advances in 4D Grain Stress and Strain Measurements in Triaxially-Compressed Geomaterials. *2024 Society of Engineering Mechanics (SEM) Annual Conference*, Vancouver, WA. (Oral presentation).
  - **R.C. Hurley\*** (May 2024). Pushing the boundaries of stress and strain measurements in triaxially-compressed sand. *2024 Engineering Mechanics Institute (EMI) Conference*, Chicago, Ill. (Oral presentation).
  - **B. Kuwik**, **R.C. Hurley\*** (April 2024). Micro and macro-scale mechanical response of cemented granular materials. *2024 Mach Conference*, Annapolis, MD. (Poster presentation).
  - **S. Singh**, **R.C. Hurley\*** (April 2024). Exploring Sandstone Failure Under Triaxial Compression and High-Velocity Impact. *2024 Mach Conference*, Annapolis, MD. (Poster presentation).
  - **S. Ghosh**, **M. Thakur**, **R.C. Hurley\*** (March 2024). ????. *2024 LPSC Conference*, Woodlands, TX. (Oral presentation).
  - **A. Gupta**, K.T. Ramesh, **R.C. Hurley\*** (October 2023). A Force-Chain Based Plasticity Model for Prediction of Stress Drops in Granular Media. *SES Annual Conference*, Minneapolis, MN. (Oral presentation)
  - **R.C. Hurley\***, **G. Shahin**, **B. Kuwik**, **K.. Lee**. (October 2023). Examining Micromechanics and Continuum Plasticity Postulates in Triaxially-Compressed Sand. *SES Annual Conference*, Minneapolis, MN. (Oral presentation).
  - **S. Ghosh**, **M. Thakur**, **R.C. Hurley\*** (June 2023). Pore collapse during shock compression in granular materials: Comparing in-situ experiments with analytical models. *Shock Compression of Condensed Matter (SCCM)*, Chicago, GA. (Oral and poster presentation).
  - **B. Kuwik**, **R.C. Hurley\*** (June 2023). From 2D to 3D: Resolving flow fields around sand penetrators from flash x-ray imaging. *Shock Compression of Condensed Matter (SCCM)*, Chicago, GA. (Oral presentation).
  - **B. Kuwik**, J. Moreno, M. Shaeffer, G. Simpson, **R.C. Hurley\*** (June 2023). The response of dry and water saturated silica sand to high velocity impact. *Shock Compression of Condensed Matter (SCCM)*, Chicago, GA. (Poster presentation).
  - **K.. Lee**, **R.C. Hurley\*** (June 2023). Particle-scale kinematics and kinetics of particle rearrangement in granular materials. *2023 Engineering Mechanics Institute (EMI) Conference*, Atlanta, GA. (Oral presentation).
  - **R.C. Hurley\***, **G. Shahin**, **Y. Tian**, E. Andó, O. Torgersrud, E. Stavropoulou, A. King (June 2023). In-situ Measurements of Stresses and Kinematics in Triaxial Tests. *2023 Engineering Mechanics Institute (EMI) Conference*, Atlanta, GA. (Oral presentation).
  - **M. Thakur**, **R.C. Hurley\*** (April 2023). Role of heterogeneities on local stresses and strains in concrete using x-ray computed tomography imaging, 3D x-ray diffraction measurements and mesoscale simulations. *Mach Conference*, Towson, MD. (Oral presentation).
  - **A. Gupta**, K.T. Ramesh, **R.C. Hurley\*** (April 2023). An Analytical, Multiscale Model for Predicting Granular Elasticity Incorporating Force Chain Mechanics. *Mach Conference*, Towson, MD.
  - **R.C. Hurley\***, **G. Shahin**, **Y. Tian**, Edward Andó, Øyvind Torgersrud, Eleni Stavropoulou, Andrew King (March 2023). In-Situ Measurements of Stress Fluctuations and Kinematics in Triaxial Tests. *APS March Meeting*, Las Vegas, NV. (Oral presentation).
  - **M. Thakur**, **R.C. Hurley\*** (November 2022). Role of heterogeneities on local stresses and strains in concrete using x-ray computed tomography imaging, 3D x-ray diffraction and mesoscale simulations. *iDICs Conference, 2022*, Boston, MA. (Oral presentation).
  - **S. Ghosh**, **R.C. Hurley\*** (October 2022). Effects of particle size and material on the 3D particle scale dynamics of shock compression in granular materials. *Society of Engineering Science (SES) Annual Conference, 2022*, College Station, Texas. (Oral presentation).
  - **A. Gupta**, K.T. Ramesh, **R.C. Hurley\*** (October 2022). Linking microscopic force-chains to macroscale mechanical response in granular media. *Society of Engineering Science (SES) Annual Conference, 2022*, College Station, Texas. (Oral presentation).

- [G. Shahin](#), [R.C. Hurley\\*](#) (August 2022). Strain localization and micromechanics in ductile sand. *Rock Deformation Gordon Research Conference (GRC)*, Lewiston, ME. (Poster presentation).
- [R.C. Hurley\\*](#) (August 2022). Unlocking grain-resolved stresses in rocks with multi-modal x-ray measurements. *Rock Deformation Gordon Research Conference (GRC)*, Lewiston, ME. (Poster presentation).
- [S. Ghosh](#), [R.C. Hurley\\*](#) (June 2022). Inferring 3D particle-scale dynamics from 2D in-situ x-ray images in rapid compaction of granular materials. *Granular Matter Gordon Research Conference (GRC)*, Easton, MA. (Poster presentation).
- [K. Lee](#), [R.C. Hurley\\*](#) (June 2022). Uncertainty analysis of inferred inter-particle forces in granular materials: application to 3D experimental data. *Granular Matter Gordon Research Conference (GRC)*, Easton, MA. (Poster presentation).
- [R.C. Hurley\\*](#), [G. Shahin](#) (June 2022). A New Device for In-Situ Laboratory and Synchrotron Studies of Geomaterials During High Pressure Triaxial Tests. *International Conference on Tomography of Materials and Structures*, Grenoble, France. In-person oral presentation.
- [R.C. Hurley\\*](#), [A. Gupta](#), R. Crum, [C. Zhai](#), K.T. Ramesh (June 2022). Quantifying Particle-Scale 3D Granular Dynamics During Rapid Compaction from Time-Resolved In-Situ 2D X-ray Images. *Society of Experimental Mechanics (SEM) Annual Meeting*, Pittsburgh, PA. In-person oral presentation.
- [R.C. Hurley\\*](#), D. Pagan, E. Herbold, [C. Zhai](#), [G. Shahin](#), [B. Kuwik](#) (June 2022). Examining the Micromechanics of Cementitious Composites and Rocks Using In-Situ X-ray Tomography and 3D X-ray Diffraction. *Society of Experimental Mechanics (SEM) Annual Meeting*, Pittsburgh, PA. In-person oral presentation.
- [R.C. Hurley\\*](#), [B. Kuwik](#), [M. Garcia](#) (June 2022). Quantification of Breakage During the Compaction of Granular Materials. *Society of Experimental Mechanics (SEM) Annual Meeting*, Pittsburgh, PA. In-person oral presentation.
- [R.C. Hurley\\*](#) (June 2022). Micromechanics of Cementitious Composites Through X-ray Tomography and Diffraction. *2022 Engineering Mechanics Institute (EMI) Conference, 2022*, Johns Hopkins University, Baltimore, MD. In-person oral presentation.
- [M. Thakur](#), [R.C. Hurley\\*](#) (June 2022). Role of Heterogeneities on Local Stresses and Strains in Concrete Using X-ray Computed Tomography and Mesoscale Simulations. *2022 Engineering Mechanics Institute (EMI) Conference*, Johns Hopkins University, Baltimore, MD. In-person oral presentation.
- [G. Shahin](#), [R.C. Hurley\\*](#) (June 2022). Hierarchy of Structural and Mechanical Length Scales in Granular Systems. *2022 Engineering Mechanics Institute (EMI) Conference*, Johns Hopkins University, Baltimore, MD. In-person oral presentation.
- [B. Kuwik](#), [M. Garcia](#), [R.C. Hurley\\*](#) (June 2022). From 2D to 3D: Resolving Flow Fields Around Sand Penetrators from Flash X-ray Imaging. *Engineering Mechanics Institute (EMI) Conference, 2021*, Johns Hopkins University, Baltimore, MD. In-person oral presentation.
- [R.C. Hurley\\*](#), G. Shahin (April 2022). Sand Under Pressure: New In-Situ Quantification of High Pressure Triaxial Tests. *2022 Mach Conference*, Baltimore, Maryland.
- [B. Kuwik](#), [R.C. Hurley\\*](#) (April 2022). From 2D to 3D: Resolving Flow Fields Around Sand Penetrators from Flash X-ray Imaging. *2022 Mach Conference*, Virtual.
- [A. Gupta](#), K.T. Ramesh, [R.C. Hurley\\*](#) (April 2022). The effect of force-chain buckling and fabric on bulk stiffness and stress response in granular media. *2022 Mach Conference*, Virtual.
- [R.C. Hurley\\*](#), C. Zhai (March 2022). Quantifying Rearrangement Statistics, Correlations, and Contributions to Macroscopic Strain in 3D Granular Materials Using X-ray Measurements. *2022 APS March Meeting*, Chicago, Illinois.
- [B. Kuwik](#), [M. Garcia](#), [R.C. Hurley\\*](#) (October 2021). Quantification of breakage during the compaction of granular materials. *Society of Engineering Science Annual Conference, 2021*, Virtual. *Judge's Vote for Best Poster in Interactions Matter Session of 2021 Society of Engineering Science Conference*.
- [A. Gupta](#), K.T. Ramesh, [R.C. Hurley\\*](#) (October 2021). The effect of force-chain buckling and

fabric on bulk stiffness and stress response in granular media. *Society of Engineering Science Annual Conference, 2021*, Virtual. *Audience Vote for Best Poster in Interactions Matter Session of 2021 Society of Engineering Science Conference.*

- **R.C. Hurley\*** (July 2021). Stress and force measurement uncertainties in 3D granular materials. *Powders and Grains Conference, 2021*, Virtual.
- **B. Kuwik, R.C. Hurley\*** (July 2021). Breakage mechanics and particle morphology analysis of dynamically-compacted granular materials. *Powders and Grains, 2021*, Virtual.
- **R.C. Hurley\***, C. Zhai (June 2021). X-ray tomography and 3D X-ray diffraction for quantifying particle rearrangements in granular materials. *3DMS Conference, 2021*, Virtual.
- **A. Gupta**, K.T., Ramesh, **R.C. Hurley\*** (April 2021). The effect of fabric on stability and wave propagation in granular media. *Mach Conference, 2021*, Virtual.
- **R.C. Hurley\***, C. Zhai (April 2021). History, structure, and stress dependence of local rearrangements in 3D granular media from machine learning. *Mach Conference, 2021*, Virtual.
- **A. Gupta**, R.C. Crum, **C. Zhai**, K.T., Ramesh, **R.C. Hurley\*** (March 2021). Inferring 3D Particle Kinematics from 2D X-ray Images. *APS March Meeting, 2021*, Virtual.
- **C. Zhai, N. Albayrak**, J. Engqvist, S.A. Hall, J. Wright, M. Majkut, E.B. Herbold, & **R.C. Hurley\*** (January 2021). History, structure, and stress dependence of local rearrangements in 3D granular media from machine learning. *Sand and Sound 2021 (Symposium with JHU, NCSU, Scripps)*, Virtual.
- **R.C. Hurley\*** (January 2021). In-Situ X-ray Tomography and 3D X-ray Diffraction for Studying Geomaterials. *Sand and Sound 2021 (Symposium with JHU, NCSU, Scripps)*, Virtual.
- **C. Zhai**, E.B. Herbold, **R.C. Hurley\*** (January 2021). Ultrasound wave propagation in granular materials. *Sand and Sound 2021 (Symposium with JHU, NCSU, Scripps)*, Virtual.
- **Gupta, A.**, Ramesh, K.T., **R.C. Hurley\*** (January 2021). Inferring 3D Particle Kinematics from 2D X-ray Images. *Sand and Sound 2021 (Symposium with JHU, NCSU, Scripps)*, Virtual.
- **C. Zhai**, E.B. Herbold, **R.C. Hurley\*** (September 2020). Ultrasound wave propagation in granular materials. *Society of Engineering Science, 2020 Virtual Conference (SES 2020)*.
- **Gupta, A.**, Ramesh, K.T., **R.C. Hurley\*** (September 2020). The effect of fabric on stability and wave propagation in granular media. *Society of Engineering Science, 2020 Virtual Conference (SES 2020)*.
- **Gupta, A.**, Ramesh, K.T., **R.C. Hurley\*** (January 2020). Quantifying Kinematics During High Strain-Rate Loading of Granular Materials. *44th International Conference and Expo on Advanced Ceramics and Composites (ICACC 2020)*, Daytona Beach, FL.
- **R.C. Hurley\*** & D.C. Pagan (October 2019). X-ray tomography and diffraction measurements to study elasticity and fracture in concrete. *Society of Engineering Science (SES) Annual Meeting*, St. Louis, Missouri.
- **Gupta, A.**, Ramesh, K.T., **R.C. Hurley\*** (October 2019). Quantifying Kinematics During High Strain-Rate Loading of Granular Materials. *Society of Engineering Science (SES) Annual Meeting*, St. Louis, Missouri.
- **C. Zhai**, E.B. Herbold, **R.C. Hurley\*** (October 2019). Ultrasound Wave Propagation in Granular Materials. *Society of Engineering Science (SES) Annual Meeting*, St. Louis, Missouri.
- **R.C. Hurley\*** & D.C. Pagan (July 2019). X-ray tomography and diffraction measurements to study elasticity and fracture in concrete. *International Conference on Tomography of Materials & Structures (ICTMS)*, Cairns, Australia.
- **R.C. Hurley\***, D.C. Pagan, Lind, J., Akin, M.C., E.B. Herbold (June 2019). In-situ Tomography and Diffraction Measurements to Study Elasticity and Fracture in Concrete. *2019 Engineering Mechanics Institute (EMI) Annual Meeting*, Pasadena, CA.
- **C. Zhai**, E.B. Herbold, **R.C. Hurley\*** (June 2019). Ultrasound Wave Propagation in Granular Materials. *2019 Engineering Mechanics Institute (EMI) Annual Meeting*, Pasadena, CA.
- **C. Zhai**, E.B. Herbold, S.A. Hall, **R.C. Hurley\*** (June 2019). An in-situ study of grain kinematics and micromechanics under uniaxial and triaxial compaction. *Granular Matter Gordon Research Conference (GRC)*, Easton, MA. (Poster presentation).

- **R.C. Hurley\***, D.C. Pagan, Lind, J., Akin, M.C., E.B. Herbold (May 2019). Combining in-situ X-ray tomography and diffraction to study the effects of microstructure on fracture in concrete and granular materials. *Society of Experimental Mechanics Annual Meeting*, Reno, NV.
- **R.C. Hurley\***, C. Zhai, E.B. Herbold, S.A. Hall, Wright, J. (April 2019). Experimental studies of micro-macro relations and length scales in granular materials. *Mach Conference*, Annapolis, MD.
- **R.C. Hurley\***, S.A. Hall, Engqvist, J., E.B. Herbold, Majkut, M., Wright, J. (October 2018). In-situ X-ray Tomography and Diffraction Studies of Granular Micromechanics. *Society of Engineering Science Annual Meeting*, Madrid, Spain.
- **R.C. Hurley\***, D.C. Pagan, Lind, J., Akin, M.C., E.B. Herbold (June 2018). X-ray imaging of fracture and comminution during compaction of granular materials. *U.S. National Congress on Theoretical and Applied Mechanics (USNCTAM)*, Chicago, IL.
- **R.C. Hurley\***, Nair, S.D., Nygren, K.E., D.C. Pagan (May 2018). Non-Destructive X-ray Probes of Fracture Network and Stress Evolution in Cement-Based and Matrix-Based Composites During Loading. *Engineering Mechanics Institute Annual Meeting (ASCE)*, Boston, MA.
- **R.C. Hurley\***, D.C. Pagan, Lind, J., Akin, M.C., E.B. Herbold (April 2018). Characterizing quasi-static grain fracture and comminution during compaction of granular solids using X-ray measurements. *Mach Conference*, Annapolis, MD.
- **R.C. Hurley\***, S.A. Hall, Wright, J., E.B. Herbold (March 2018). Investigating continuum properties of granular materials using discrete experiments and simulations. *APS March Meeting*, Los Angeles, CA.

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Above This Line: Research Substantially or Fully Executed at Johns Hopkins University

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- **R.C. Hurley**, E.B. Herbold, D.C. Pagan, S.A. Hall, Wright, J., Lind, J., Akin, M.C. (July 2017). Investigating *in situ* failure in granular materials. *Society of Engineering Science 2017 Meeting*, Boston, MA.
- **R.C. Hurley**, S.A. Hall, Andrade, J.E., Wright, J. (July 2017). Inter-particle force measurements in 3D, frictional, opaque granular materials. *Powders and Grains*, Montpellier, France.
- **R.C. Hurley**, Lind, J., Akin, M.C., D.C. Pagan, E.B. Herbold, Homel, M.A., Crum, R. (June 2017). Microstructure and Failure Analysis During Granular Compaction Using XRCT and 3DXRD. *International Conference on Tomography in Materials and Structures*, Lund, Sweden.
- **R.C. Hurley**, S.A. Hall, Andrade, J.E., Wright, J. (July 2016). Inter-particle force measurements in 3D, frictional, opaque granular materials. *Gordon Research Conference on Granular Matter*, Easton, MA.
- **R.C. Hurley**, Vorobiev, O.Y., Ezzedine, S.M. (July 2016). Modeling wave propagation in jointed rock masses at various spatial resolutions. *SEG/AGU Conference on Upper Crustal Rock Physics*, Hilo, HI.
- **R.C. Hurley**, Andrade, J.E. (Oct. 2015). SPH modeling of granular flows with viscoplastic constitutive laws. *Society of Engineering Science Annual Meeting*, College Station, TX.
- **R.C. Hurley**, Andrade, J.E. (Sept. 2015). Coupled gas-porous media flows using Smoothed Particle Hydrodynamics. *IV International Conference on Particle-Based Methods*, Barcelona, Spain.
- **R.C. Hurley**, Andrade, J.E. (Oct. 2014). Friction in Inertial Granular Flows: Microscopic and Macroscopic Origins. *Society of Engineering Science*, West Lafayette, IN.
- **R.C. Hurley**, Lim, K.W., Andrade, J.E. (July 2014). A novel method for measuring dynamic force transmission in granular materials. *International Conference on Experimental Mechanics*, Cambridge, UK.
- **R.C. Hurley**, Andrade, J.E. (Aug. 2013). The origin of friction and rate-dependence in dense granular flows. *Engineering Mechanics Institute Annual Meeting (ASCE)*, Evanston, IL. (First Place in Computational Mechanics Poster Competition).

## TEACHING AT JOHNS HOPKINS UNIVERSITY

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UG=Undergrad. G=Grad(Typical Year). Overall student review of quality: mean / median / total possible.

- Mechanics of Solids & Materials II (G1-Core. 19 students). Review: TBD. Spring 2026.

- Mechanics of Solids & Materials I (G1-Core. 24 students). Review: 4.74/5.0/5.0. Fall 2025.
- Micromechanics of Heterogeneous and Granular Materials (G1+Elective. 8 students). Review: 4.63/5.0/5.0. Fall 2024
- Mechanics of Solids & Materials I (G1-Core. 24 students). Review: 4.35/4.0/5.0. Fall 2023.
- Mechanics of Solids & Materials II (G1-Core. 13 students). Review: 4.75/5.0/5.0. Spring 2023.
- Mechanics of Solids & Structures: Theory and Applications II (EP Program). Spring 2023
- Modern Tools and Applications in Experimental Solid Mechanics (UG/G1-Elective). Review: 4.6/4.0/5.0. Fall 2022.
- Mechanics of Solids & Materials II (G1-Core. 13 students). Review: 4.64/5.0/5.0. Spring 2022.
- Mechanics of Solids & Structures: Theory and Applications II (EP Program). Spring 2022
- Mechanics of Solids & Materials I (G1-Core. 16 students). Review: 3.69/4.0/5.0. Fall 2021.
- Mechanics of Solids & Materials II (G1-Core. 11 students). Review: 4.40/4.5/5.0. Spring 2021
- Micromechanics of Heterogeneous and Granular Materials (G1+Elective. 9 students). Review: 4.50/4.5/5.0. Fall 2020
- Mechanics of Solids & Materials II (G1-Core. 9 students). Review: 4.56/5.0/5.0. Spring 2020
- Mechanics of Solids & Materials I (G1-Core. 16 students). Review: 4.40/5.0/5.0. Fall 2019.
- Mechanics of Solids & Materials II (G1-Core. 9 students). Review: 4.33/5.0/5.0. Spring 2019.
- Mechanics of Solids & Materials II (G1-Core. 16 students). Review: 3.81/4.0/5.0. Spring 2018.
- Mechanics of Solids & Materials Graduate Seminar (40+ students and postdocs, engaged in research presentations, group presentations, and external presentations). Fall 2019 - Spring 2023.
  - *Role involves working closely with student organizers to design group presentations, external presentations from faculty, and professional development workshops*

## ADVISING (RESEARCH AND ACADEMIC) AT JOHNS HOPKINS UNIVERSITY \_\_\_\_\_

- Research and Scientific Staff Mentees:
  - Mohmad Mohsin Thakur, Assistant Research Scientist (2022 - 2024). Now at Los Alamos National Lab.
  - Michael Mengason, NIST-PREP Associate Research Scientist (2022 - 2023). Now a Research Geologist, NIST Infrastructure Materials Group.
- Postdoctoral Advisees:
  - Zhifei Deng (2024 - 2025), transitioned to Associate Professor at Wuhan University
  - Xiao Zhang (2022 - 2023) NIST-PREP Postdoc, NIST Mentor Dr. Aron Newman
  - Ye Tian (2022 - 2023), transitioned to Associate Professor at Liaoning Academy of Materials
  - Mohmad Mohsin Thakur (2021 - 2022), transitioned to Postdoctoral Fellow, Los Alamos National Lab
  - Ghassan Shahin (2020 - 2022), transitioned to Marie Curie Postdoctoral Fellow, EPFL
  - Chongpu Zhai (2018 - 2021), transitioned to Associate Professor, Xi'an Jiaotong University
  - Mehmet Cil (2017 - 2019), transitioned to at Cibor Geoconsultants (co-advisor L. Graham-Brady)
- Ph.D. Student Advisees (**Bold**=Graduated):
  - Shachi Singh, Ph.D. Student (2023 - present)
  - Subham Bose, Ph.D. Student (2023 - present)
  - **Sohanjit Ghosh**, Ph.D. Student (2021 - 2026)
    - \* Thesis: *Dynamic Behavior of Heterogeneous Materials: Integrating Experiments and Digital Twin Numerical Modeling at Different Length Scales*
  - Kwangmin Lee, Ph.D. Student (2020 - present)
  - **Brett Kuwik**, Ph.D. Student (August, 2019 - January 22, 2024, now at Merck)
    - \* Thesis: *Particle Friction, Breakage, and Damage: Deformation Mechanisms of Brittle Granular Materials*
  - **Adyota Gupta**, Ph.D. Student (2018 - March 19, 2024, now at Exponent, Menlo Park) (K.T. Ramesh as co-advisor (Hurley primary))

- \* Thesis: *Advances in Measurement Techniques and Micromechanical Modeling for Granular Media*
- \* Intern at Eglin Air Force Base through AFRL Scholar Program, summer 2022.
- M.S. Student Advisees:
  - Ahmed Al Busaidi, M.S. Student (2026 - present)
  - Siddhartha Pattisapu, M.S. Student (2022 - 2024, now at Tesla)
  - Surya Kolluri, M.S. Student (2020 - 2022, now Ph.D. student in Solid Mechanics at Brown University)
    - \* Master's Essay: *Local rearrangement and micromechanical similarities between shear bands and simple shear in granular materials.*
  - Ziheng Wang, M.S. Student (2020 - 2021, now Ph.D. student at Purdue University)
  - Arthur Ding, M.S. Student (2018 - 2020, now at JHU Applied Physics Laboratory)
- D. Eng. Students Committee Member:
  - Austin DiOrio, D.Eng. Student (2021 - 2024) (Primary Advisor Jaafar El-Awady)
- Undergraduate Researchers:
  - Jack Maier, Sophomore in Mechanical Engineering, JHU (Hosted through NSERC program, Summer 2025)
  - Cole Peters, Junior in Mechanical Engineering, JHU (Hosted through NSERC program, Summer 2024)
  - Elizabeth Chua, Freshman in Mechanical Engineering, JHU (Hosted through NSERC program, Summer 2024)
  - Amelia Chiu, Freshman in Civil and Architectural Engineering, Stanford (Hosted through NSERC program, Summer 2024)
  - Trevor Sumlin, Junior in Geological Sciences, UNC (Hosted through NSERC program, Summer 2023)
  - Luke Moon, JHU ME (Summer 2023. Transitioned to Master's Program, JHU)
  - Jabiri Lawrence, JHU ME (Summer 2023. Transitioned to Ph.D. Program, Princeton University.)
  - Sean Enright, JHU ME (Fall 2022.)
  - Maximilian Garcia, JHU ME, MSEE Intern (2021 - 2022)
  - Jacob Kim, JHU ME (2021 - Present, now on leave of absence for Korean military service)
  - Maxim Daud, JHU ME (2019 - 2022, Full-Time in Summer 2022, now in U.S. Marine Corp)
  - Samuel Budoff, Sophomore in Mechanical Engineering, West Point (Hosted through NSERC program, Summer 2022)
  - Aiden Looney, Sophomore in Operations Research, West Point (Hosted through NSERC program, Summer 2022)
  - Dan Zanko, JHU ME (Spring 2018)
- High School Researchers:
  - Johan Zacharia, Loyola Blakefield High School (Army Educational Outreach Program (AEOP) Research & Engineering Apprenticeship (REAP) Program, Summer 2024).
  - Joanne Li, Thomas S. Wootton High School (Army Educational Outreach Program (AEOP) Research & Engineering Apprenticeship (REAP) Program, Summer 2023).
  - Phoebe Dainer, Walt Whitman High School (Army Educational Outreach Program (AEOP) Research & Engineering Apprenticeship (REAP) Program, Summer 2022).
  - Nahuel Albayrak, Chesapeake Science Point High School (Army Educational Outreach Program (AEOP) Research & Engineering Apprenticeship (REAP) Program, Summers 2020 and 2021. Transitioned to UGrad in Applied Mathematics at Johns Hopkins University.)
- Undergraduate Academic Advising
  - Faculty Advisor to 20 ME Undergraduates in Class of 2025.

- Department Qualifying Examination (DQE):
  - Organizer for Mechanics and Materials Qualifying Exam, 2019-2024.
- Graduate Board Oral (GBO) Examination Committee or Thesis Proposal Committee:
  - 2018: (1x) Civil Engineering, (2x) Mechanical Engineering.
  - 2019: (1x) Physics.
  - 2020: (2x) Civil Engineering.
  - 2022: (5x) Mechanical Engineering
  - 2024: (1x) Earth and Planetary Sciences, (1x) Mechanical Engineering, (2x) Physics and Astronomy
- Defense Committee Member (+Hurley as Thesis Reader/Signer for Library, <sup>0</sup>Hurley as Chair).
  - 2018: (1x)
    - \* Thomas C. O'Connor (Physics and Astronomy, Advisor Mark Robbins)
  - 2019: (1x)
    - \* Joel T. Clemmer (Physics and Astronomy, Advisor Mark Robbins)
  - 2020: (2x)
    - \* +Joseph Monti (Physics and Astronomy, Advisor Mark Robbins)
    - \* +Alex (Xiangyu) Sun (Mechanical Engineering, Advisor KT Ramesh)
  - 2021: (4x)
    - \* +Amartya Bhattacharjee (Civil and Systems Engineering, Advisor Lori Graham-Brady)
    - \* +Jason Parker (Mechanical Engineering, Advisor KT Ramesh)
    - \* +Yuan Tian (Materials Science & Engineering, Advisor Mingwei Chen)
    - \* Derek Brehm (Physics and Astronomy, Advisor Petar Maksimovic)
  - 2022: (1x)
    - \* <sup>0</sup>Xia Yan (Civil Engineering, Advisor Thomas Gernay)
  - 2023: (4x)
    - \* Shengzhi Luan (Civil Engineering, Advisor Stavros Gaitanaros)
    - \* <sup>0</sup>Alberto Torres (Civil Engineering, Advisor James Guest)
    - \* <sup>0</sup>Justin Unger (Civil Engineering, Advisor James Guest)
    - \* <sup>0</sup>+Gary Simpson (Mechanical Engineering, Advisor KT Ramesh)
    - \* Thirupathi Maloth (Civil Engineering, Advisor Somnath Ghosh)
  - 2024: (4x)
    - \* + Brett Kuwik (Mechanical Engineering, Advisor Ryan Hurley)
    - \* + Adyota Gupta (Mechanical Engineering, Advisor Ryan Hurley)
    - \* Michael Vladimirov (Civil and Systems Engineering, Advisor James Guest)
    - \* + Mostafa Omar (Mechanical Engineering, Advisor Jaafar El-Awady)
  - 2025: (4x)
    - \* + Bibek Datta (Mechanical Engineering, Advisor Vicky Nguyen)
    - \* + Kate Brizzolara (Mechanical Engineering, Advisor Kevin Hemker)
    - \* Chenzhi Ma (Civil and Systems Engineering, Advisor Thomas Gernay)
    - \* + Jake Diamond (Mechanical Engineering, Advisor KT Ramesh)
- Co-advised (w/ Prof. Rui Ni) JHU's SEDS (Students for Exploration and Development of Space) team in NASA's 2021 Lunar Dust Challenge. Attended weekly meetings, provided technical feedback, provided use of laboratory facilities for prototyping. Fall 2020.
- Faculty review committee for Biomedical Engineering Senior Design Team designing "Osteocast", a deformable and reusable cast for wrist fractures that uses vacuum-induced stiffening of granular media. Attended meetings and provided technical feedback. Fall 2018 – Fall 2019.

## INSTITUTIONAL SERVICE AT JOHNS HOPKINS UNIVERSITY \_\_\_\_\_

- Hopkins Extreme Materials Institute
  - (July 2024 - Present): **Deputy Director**. Main activities include Chairing the annual Mach

- Conference in Annapolis, MD, workforce development initiatives, and research infrastructure initiatives.
- Materials Science in Extreme Environments University Research Alliance (MSEE URA)
    - (2025 - Present): **Associate Director of the MSEE-URA**. Activities include workforce development initiatives including student internships, a student symposium, workshops, short courses, and travel fellowships, as well as coordination of future research directions and initiatives.
    - (2020 - Present): **Focus Area Leader of “Geomaterial Constitutive Laws” (RA1-FA2), one of seven focus areas**. Main activities include coordinating biweekly meetings with four 4 PIs and 10+ students and meeting with DTRA and DOD contractors for technical and workforce development discussions, and coordinating with program managers to ensure that the basic research program evolves to meet the needs of DTRA.
    - (2018 - 2020): **Proposal Development**. Aided with \$35M/5-yr proposal effort by leading development of four-PI focus area proposal on “Geomaterial Constitutive Laws” and the “Facilities and Other Resources” document for the 18-institute, 40-PI proposal.
  - Johns Hopkins University’s Mechanical Testing Laboratory (MTL)
    - (Fall 2023 - Present): Led development of a vision document and business plan for a core Whiting School of Engineering (WSE) Mechanical Testing Laboratory, a shared research facility providing mechanical testing capabilities for the entire JHU community and its collaborators. Activities include establishing and engaging faculty groups to discuss focus areas and equipment needs and ongoing discussions and negotiations with the WSE Dean’s office.
  - PI of major shared facilities:
    - MicroCT Facility containing an RX Solutions EasyTom 160 and Deben Load Stages.
    - Impact Facility including an Instron CAEST 9350 Droptower Impact System.
    - Particle Characterization Facility including a Morphologi4 ID.
  - Faculty Search Committees:
    - Hopkins Extreme Materials Institute, 2023.
    - Mechanical Engineering Department, 2021-2022.
    - Mechanical Engineering Department, 2018.
    - Hopkins Extreme Materials Institute, 2018.
  - Committees / Reviews:
    - Reviewer for JHU Nexus Awards, 2024.
    - Reviewer for Robbins Ph.D. and Future Faculty awards, July 2022.
    - Reviewer for eight SURPASS white papers by WSE/APL research teams, June 2022.
    - Member, Mechanical Graduate Recruiting and Admissions Committee, 2022-Present.
    - Member, Mechanical Engineering Department Seminar Committee, 2019-Present.
    - Member, Steering Committee, Hypervelocity Facility for Impact Research (HyFIRE), 2019-Present.
    - Selection and Purchasing Committee, Hopkins Extreme Materials Institute’s Micro-Computed Tomography Machine, 2018.

## EDUCATIONAL SERVICE OUTSIDE OF JOHNS HOPKINS UNIVERSITY \_\_\_\_\_

- Organizer and Instructor for ALERT Geomaterials’ immersive Doctoral School in Aussois, France, September 2022 (co-organizers and co-instructors Benjy Marks, Edward Andó, Joshua Dijksman) .
  - Developed and presented four hours of interactive lectures and two hours of Q&A within broader 2.5-day / 20-hour program for over 100 doctoral students and postdocs to gain practical experience with techniques on the cutting edge of “Advanced Experimental Geomechanics”. Specific topics presented by Hurley include photoelasticity (setting up and using polariscopes to analyze granular mechanics) and multi-modal x-ray measurements (combining x-ray tomography and 3D x-ray diffraction to make structure, kinematics, and stress measurements in granular materials, concrete, and rocks).

- Thesis committee member: Sungyeon Hong, Australia National University, Canberra (advisor, Mohammad Saadatfar), December 2023.
- Thesis committee member: Manasa Bhat, Indian Institute of Science (IISc), Bangalore (advisor, Tejas Murthy), 2020-present.
- Thesis/defense examiner: Olga Stamati, Laboratoire 3SR, University Grenoble, Alpes, France (advisors, Y. Malecot, E. Roubin), May 2020. (with F. Hild, Y. Malecot, J.S. Baptist, E. Andó, E. Roubin.)
- Mentor of six Summer Undergraduate Research Fellows (SURFs) at Lawrence Livermore National Laboratory (2017) and California Institute of Technology (2013).

## SERVICE TO THE PROFESSION

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- The Mach Conference
  - **Chair of Annual Mach Conference** (2020 - 2025). Main activities include design of technical program, communication with 1,000+ community members, weekly logistical and financial meetings with conference staff, vendor fundraising.
- Workshop and Conference Organization
  - **Member-at-large, Executive Committee, Shock Compression of Condensed Matter Topical Group, American Physical Society** (2026 - 2027). Elected by community for two-year appointment as member-at-large, with main responsibilities including development of seminar series, biannual conference, and related activities in collaboration with other members of Executive Committee.
  - **Lead organizer of 2026 Lorentz Workshop on “Evolving grain boundaries in deforming rocks, ceramics and metals”** (2025 - present). Activities include developing a 5 page proposal, coordinating with 50+ colleagues in geosciences, materials science, and synchrotron science, and successfully defending the proposal for award of approximately 30k euro in in-kind donation from the Lorentz Center at Leiden University, Netherlands. August 17 - 23, 2026.
  - **Core committee member of the TC105 (Technical Committee of “Geomechanics from Micro to Macro”) for ISSMGE (International Society of Soil Mechanics and Geotechnical Engineering)** (2024 - present). Main activities include spearheading a new Round Robin activity (2025-2027) engaging researchers world-wide on X-ray imaging of geomaterials and initiating and leading a new student video competition for the community.
  - **Organizer of the 2023 HEMI/MSEE Impact Research Workshop and Short Course** (2023). Main activities include curation of technical program and schedule, moderation of event, communication and fund raising from DTRA. The five-day event involved 65 students and researchers from the DOD, DOE, and academia and covered core topics related to gas gun impact experiments and diagnostics.
  - **Co-organizer and moderator of Society of Engineering Science (SES) mini-symposium** (2022 - present). Topic: the mechanics and physics of granular materials.
  - **Leader organizer (In-situ Studies of Rock Deformation, NSF Research Network) Workshops**. Workshop on “Integration of Tomography and Diffraction Techniques for Rock Mechanics: Critical Challenges and Needs” scheduled for April 2026 at the Advanced Photon Source, Argonne National Laboratories. Activities included speaker curation, schedule development, scientific leadership, invitations, and session moderation.
  - **Session organizer and moderator of ISRD (In-situ Studies of Rock Deformation, NSF Research Network) Workshops**. Workshops hosted in 2022 and 2025 and focused on the intersection of geosciences and neutron and synchrotron measurements. Activities included speaker curation, invitations, and session moderation.
  - **Co-organizer of Workshop on “In-situ x-ray tools for structural materials”**, Cornell High Energy Synchrotron Source (CHESS), Ithaca, NY, July (2021).
  - **Lead organizer and PI of a 2019 Army Research Office (ARO) funded workshop on “Mathematical Challenges Associated with Failure of Brittle Solids”**, Johns Hopkins University,

Baltimore, MD.

- **Technical committee member of the Engineering Mechanics Institute (EMI) Granular Materials Technical Committee (GMTC)** (2019 - present). Main activities include organizing and moderating an annual mini-symposium (2020-present) and organizing and judging an annual student video competition (2023 - present).
- Editorial service
  - Invited Associate Editor, ASCE Journal of Geotechnical and Geoenvironmental Engineering (JGGE). July 2026 - present.
  - Sole editor of the iMechanica Journal of the Month Club, February 2023 - January 2024.
  - Co-editor of Open Geomechanics, a diamond open-access journal launched in 2018 to foster the publication of open-access geomechanics research (<https://opengeomechanics.centre-mersenne.org>). Other co-editors: C. Viggiani, D.M. Wood, I. Herle, C. Tamagnini, E. Ando, J. Dijkstra, B Marks, D.J. Frost, C. Arson, E. Gerolymatou
- Proposal reviewing in past 5 years
  - American Chemical Society Petroleum Research Fund
  - U.S. Department of Energy (DOE)
  - U.S. National Science Foundation (NSF)
  - U.S. Army Research Office (ARO)
  - U.S. National Aeronautics and Space Administration (NASA)
  - Cornell High Energy Synchrotron Source (CHESS) beamtime proposals
- Paper reviewing within past 5 year
  - *Journal of the Mechanics and Physics of Solids, International Journal of Mechanical Sciences, Proceedings of the National Academy of Sciences of the United States of America, Scientific Reports, Physical Review Letters, Journal of Applied Mechanics, Soft Matter, Granular Matter, Journal of Geophysical Research, Journal of Engineering Mechanics, Proceedings of the Royal Society of London A, Acta Geotechnica, Computer Methods in Applied Mechanics and Engineering, Computational Mechanics, International Journal for Numerical and Analytical Methods in Geomechanics, Review of Scientific Instruments, PLoS One, International Journal of Solids and Structures, Experimental Mechanics, Physica A., and several more.*

## PROFESSIONAL MEMBERSHIPS AND COMMITTEES

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- In-Situ Rock Deformation Steering Committee (IRSD), 2022-Present.
  - *Lead organizer of a 2026 workshop on “Integration of Tomography and Diffraction Techniques for Rock Mechanics: Critical Challenges and Needs”, April 2026*
  - *Lead development of one scientific session for 2025 Science Workshop, Fall 2024*
  - *Moderator of a portion of 3rd ISRD-RCN workshop on Neutron Scattering and Imaging, July 2023*
- American Society of Civil Engineers (ASCE), 2020-Present
  - International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), 2020-Present. Corresponding TC105 Committee Member from USA (Geo-Mechanics from Micro to Macro).
    - \* *Joined 8-person core committee responsible for programming TC105 activities and planning the conference which is held once per four years, Fall 2024 - present.*
    - \* *Spearheading student video competition and round robin on image analysis for geomaterials, Fall 2025 - present.*
  - Engineering Mechanics Institute (EMI) Member, 2015-Present. Member of *Granular Materials* and *Computational Mechanics* technical committees. For Granular Materials Technical Committee (GMTC):
    - \* *Solicited and reviewed abstracts for mini-symposia between 2020 - 2025.*
    - \* *Served as a judge for the 2022, 2023, and 2024 student poster competitions.*
    - \* *Served as meeting secretary for GMTC meetings at annual EMI Conference in 2023 and 2024.*

- Society of Experimental Mechanics (SEM), 2019-Present.
- Society of Engineering Science (SES), 2017-Present.
  - *Co-organized mini-symposium on experiments, theory, and modeling of granular materials, 2023 and 2024 conferences.*
- American Physical Society (APS) (Active in DSOFTE), 2016-Present.
  - *For DSOFTE: Served as judge for student poster competition, 2022 APS March Meeting*

#### PROFESSIONAL DEVELOPMENT COURSES

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- *Foundations of Leadership and Management, Carey Business School, Johns Hopkins University, January 2023* – 18-hour Executive Education course.
- *Leading Organizational Change, Carey Business School, Johns Hopkins University, November 2022* – 18-hour Executive Education course.
- *Interpersonal Communication and Conflict Management, Carey Business School, Johns Hopkins University, January 2023* – 18-hour Executive Education course.
- *Best Practices in University Teaching, Johns Hopkins University, January 2022*, a 13-hour course offered by the Johns Hopkins University Center for Teaching Excellence and Innovation covering: effective assessment strategies, evidence-based teaching strategies, inclusive pedagogy.