Steve WaiChing Sun, PhD

Associate Professor
Civil Engineering and
Engineering Mechanics Department
Columbia University
610 SW Mudd, Mail Code:4709
New York, NY 10027
Web page: www.poromechanics.org

Office Phone: (212) 851-4371
Cell Phone: (925) 960-3713
Fax: (212)854-6267
Email: wsun@columbia.edu
Researcher ID: A-2638-2009

Education

PhD. Theoretical and Applied Mechanics, Northwestern University, 09/2008-06/2011

M.A. Civil Engineering, Princeton University, 06/2007-05/2008

M.S. Civil Engineering (Geomechanics), Stanford University, 09/2005-06/2007

B.S. Civil Engineering,University of California, Davis, 09/2002-06/2005

Research Statement

The PI's research group specializes in the creation, derivation, implementation, verification and validation of data-driven, theoretical, and computational models for engineering applications related to porous media, with special emphasis on geological applications.

Honors and Awards

Selected individual awards received by the PI

- **UPS Foundation Visiting Professorship**, Department of Civil and Environmental Engineering, Stanford University (scheduled for 2021-2022).
- **John Argyris Award for Young Scientists**, the International Association for Computational Mechanics, 2020. The IACM recognizes outstanding accomplishments, particularly outstanding published papers, by researchers 40 or younger biennially. Eligibility requires that the nominee not turn 41 in the year the award is presented. The IACM John Argyris Award for Young Scientists is sponsored by Elsevier to honor Professor John Argyris' significant contributions in the field.
- **NSF CAREER Award**, National Science Foundation (Mechanics of Materials and Structures Program, Civil, Mechanics and Manufacturing Innovation Division), 2019. The NSF's most prestigious award in support of junior faculty who exemplify the role of teacher-scholar through outstanding research and excellent education.
- **EMI Leonardo Da Vinci Award**, the Engineering Mechanics Institute of American Society of Civil Engineers, 2018. The purpose of the award is to recognize outstanding young investigators early in their careers for promising ground-breaking developments in the field of Engineering Mechanics and Mechanical Sciences as relevant to Civil Engineering, understood in the broadest sense. The award is given annually to a young investigator, generally under 35 years of age or have worked no more than 7 years since receiving their doctoral degree, and whose contributions have the promise to define new directions in theory and application of Engineering Mechanics, in the vein of Leonardo da Vinci (1452-1519), a man of unquenchable curiosity and feverishly inventive imagination. The EMI of ASCE selected the PI "*for his fundamental contributions to computational multiscale poromechanics*".

- **Zienkiewicz Numerical Methods in Engineering Prize**, Institution of Civil Engineers (ICE) and John Wiley & Sons, 2017. Instituted following a donation by John Wiley & Sons Ltd to commemorate the work of Professor Olgierd Cecil Zienkiewicz CBE. DSc FRS FREng of the Institute for Numerical Methods in Engineering, University of Wales, Swansea. The medal is awarded biennially by the Institution of Civil Engineers (ICE) to a researcher under 40 for the paper which contributes most to research in numerical methods in engineering, among 8 prime peer-reviewed journals published by ICE or Wiley, i.e., Géothechnique, Géothechnique Letters, International Journal for Numerical Methods in Engineering, International Journal for Numerical Methods in Biomedical Engineering, International Journal for Numerical Methods in Fluids, International Journal for Numerical and Analytical Methods in Geomechanics, International Journal of Numerical Modelling: Electronic Networks, Devices and Fields, and ICE Proceedings.
- **AFOSR Young Investigator Program Award**, Air Force Office of Scientific Research, US Air Force, 2017. The Air Force's Young Investigator Program (YIP) award is one of the most prestigious honors bestowed by the US Air Force to outstanding scientists beginning their independent careers. The program is designed to identify and support talented scientists and engineers who show exceptional promise for doing creative research in order to encourage their teaching and research careers.
- **ARO Young Investigator Program Award**, Army Research Office, US Army, 2015. The Army's Young Investigator Program (YIP) award is one of the most prestigious honors bestowed by the US Army to outstanding scientists beginning their independent careers. The program is designed to identify and support talented scientists and engineers who show exceptional promise for doing creative research in order to encourage their teaching and research careers.
- **Caterpillar Best Paper Prize**, Springer-Verlag Berlin Heidelberg, 2013. Selected annually among all journal articles published in *Acta Geotechnica* in 2013. Previous awardees include Yannis Dafalias (2014) and Franz-Josef Ulm (2012).

Other individual awards received by the PI

- **Dresden Fellowship**, Technische Universität Dresden, Germany, 2016.
- **Recognition Award** for contribution to Albany Project, Sandia National Laboratories, Department of Energy, 2016.
- **DURIP Award**, United States Department of Defense and Army Research Office, 2015.
- **Claude R. Hocott Lectureship**, Department of Petroleum and Geosystem Engineering, the University of Texas at Austin, 2015.
- **Provost Diversity Award**, Provost's Office, Columbia University, 2015.
- **Visiting Professorship**, Technische Universität Dresden, Germany, 2015, 2016 and 2017.
- **Visiting Professorship**, University of Perugia, Italy, 2015.
- **Visiting Professorship**, Chinese University of Hong Kong, Hong Kong, 2014, 2015.
- **IUTAM Travel Fellowship**, selected as one of the six young investigators to present at IUTAM symposium on "Connecting Multiscale Mechanics to Complex Material Design", International Union of Theoretical and Applied Mechanics, 2014.
- **USNCTAM Travel Fellowship**, 16th US National Congress of Theoretical & Applied Mechanics, 2010

- **USACM Travel Fellowship**, 9th World Congress of Computational Mechanics, 2010
- **NSF Travel Fellowship**, International Workshop on Multiscale and Multiphysics Processes in Geomechanics, 2010
- **Tuition Scholarship**, Summer School on Accelerators for Science and Engineering, National Science Foundation, 2008
- **Graduate Fellowship**, Northwestern University, 2008
- **Graduate Fellowship**, Princeton University, 2007
- **Graduate Fellowship**, Stanford University, 2005
- **John W. and Ernestine L. Heinrich Scholarship**, University of California, Davis, 2004
- **American Public Works Associations Scholarship**, American Public Works Associations, 2004
- **PEER Scholarship**, Pacific Earthquake Engineering Research Center, 2004
- **MORE Undergraduate Research Fellowship**, University of California, Davis, 2004

Awards received by PI's students and group Members

- **Mindlin award** (SeonHong Na, Kun Wang), Department of Civil Engineering and Engineering Mechanics, Columbia University, 2018 & 2019.
- **Travel Scholarship** (Kun Wang and Chuanqi Liu), Workshop on Meshfree and Particle MEthods: Applicatiopn and Theory, Santa Fe, 2018.
- **Travel Scholarship** (Eric Bryant), 3rd Biennial CO2 for EOR as CCUS conference, Petroleum Research School of Norway, 2017.
- **Dongju Lee Memorial Award** (SeonHong Na), Columbia University, 2017.
- **Travel Scholarship** (SeonHong Na), US National Congress of Computational Mechanics, Montreal, Canada, 2017.
- **Teaching Assistant Award** (SeonHong Na), Columbia University (Soil MEchanics), 2017.
- **2nd Place in Best Paper Student Competition** (SeonHong Na), Engineering Mechanics Institute, Modeling Inelasticity and Multiscale Behavior Committee, EMI 2016 & PMC 2016, Vanderbilt University, Nashville, TN, 2016.
- **Best Poster Presentation Award** (Yang Liu), US National Congress of Computational Mechanics, San Diego, CA, 2015.
- **Travel Scholarship** (Kun Wang), Society of Engineering Science Meeting at Texas A&M University, 2015.
- **Travel Scholarship** (Yang Liu), US National Congress of Computational Mechanics, San Diego, CA, 2015.
- **Travel Scholarship** (SeonHong Na), Engineering Mechanics Institute Conference, Stanford, 2015.
- **Travel Scholarship** (SeonHong Na), deal.ii Workshop, Texas A&M University, 2015.

Work Experience

Associate Professor Department of Civil Engineering and Engineering Mechanics, Columbia University, 07/2020-current

Assistant Professor Department of Civil Engineering and Engineering Mechanics, Columbia University, 01/2014-07/2020

Senior Member of Technical Staff Mechanics of Materials, Sandia National Laboratories (Livermore), 12/2012-01/2014

Postdoctoral Appointee, Mechanics of Materials, Sandia National Laboratories (Livermore), 06/2011-12/2012

Journal Articles

$*$ indicates current or former students, $\star$ indicates postdocs, † indicates visiting scholars.

1. R.I. Borja and **W.C. Sun**, Estimating inelastic sediment deformation from local site response simulations, *Acta Geotechnica*, 2(3):183-195, 2007 [URL].
2. R.I. Borja and **W.C. Sun**, Co-seismic sediment deformation during the 1989 Loma Prieta Earthquake, *Journal of Geophysical Research*, Vol.113, B08314,doi:10.1029/2007JB005265, 2008. [URL]
3. **W.C Sun**, J.E. Andrade, J.W. Rudnicki, A multiscale method for characterization of porous microstructures and their impact on macroscopic effective permeability, *International Journal for Numerical Methods in Engineering*, 88(12), 1260-1279, doi:10.1002/nme.3220, 2011. [URL]
4. **W.C. Sun**, J.E. Andrade, J.W. Rudnicki and P. Eichhubl, Connecting microstructural attributes and permeability from 3-D tomographic images of in situ compaction bands using multi-scale computation, *Geophysical Research Letter*, doi:10.1029/2011GL047683, 2011. (featured in EARTH magazine September 2011 issue [LINK])[URL]
5. **W.C. Sun** , An unified method to predict diffuse and localized instabilities in sands, *Geomechanics and Geoengineering*, 8(2):65-75 doi:10.1080/17486025.2012.695403, 2013 [URL].
6. **W.C. Sun**, J.T. Ostien and A.G. Salinger, A stabilized assumed deformation gradient finite element formulation for strongly coupled poromechanical simulations at finite strain, 37(6):2755-2788, doi:10.1002/nag.2161, *International Journal for Numerical and Analytical Methods in Geomechanics*, 2013. [URL]
7. **W.C. Sun**, M.R. Kuhn and J.W.Rudnicki, A multiscale DEM-LBM analysis on permeability evolutions inside a dilatant shear band, *Acta Geotechnica*, 8(5):465-480 doi:10.1007/s11440-013-0210-2, 2013 [URL] (Caterpillar Best Paper Prize in the year of 2013).
8. A. Mota, **W.C. Sun**, J.T.Ostein, J.W. Foulk III and K.N. Long, Lie-Group interpolation and variational recovery for internal variables, *Computational Mechanics*, 52(6):1281-1299, 2013. [URL]
9. **W.C. Sun**, Q. Chen and J.T. Ostien, Modeling hydro-mechanical responses of strip and circular footings on saturated collapsible geomaterials, *Acta Geotechnica*, 9(5):903-934, 2014. [URL].
10. **W.C. Sun** and A. Mota, A large deformation multiscale overlapped coupling formulation for strain localization, *Computational Mechanics*, 54(3):803-820, doi:10.1007/s00466-014-1034-0, 2014.[URL]
11. **W.C. Sun**, A stabilized finite element formulation for monolithic thermo-hydro-mechanical simulations at finite strain, *International Journal for Numerical Methods in Engineering*, 103(11):798-839, doi:10.1002/nme.4910, 2015. [URL]. (This paper is one of the 5 most cited papers from 2015 to 2016 in IJNME [URL] .)
12. M.R. Kuhn, **W.C. Sun**, Q. Wang*, Stress-induced anistropy in granular materials, fabric, stiffness and permeability, *Acta Geotechnica*, 10(4):399-419, doi:10.1007/s11440-015-0397-5, 2015. [URL]

13. K. Wang* and **W.C. Sun**, Anisotropy of a tensorial Bishop coefficient under suction-controlled triaxial loadings, *ASCE Journal of Engineering Mechanics*, doi:10.1061/(ASCE)EM.1943-7889.0001005, 2015. [URL]

14. Y. Liu*, **W.C. Sun**, J. Fish, Parameter identification for critical state plasticity models based on multilevel extended digital database, *Journal of Applied Mechanics*, 83(1), 011003, 2015. [URL]

15. Y. Liu*, **W.C. Sun**, Z. Yuan, J. Fish,A nonlocal multiscale discrete-continuum model for predicting mechanical behavior of granular materials, *International Journal for Numerical Methods in Engineering*, 106(2):129-160, doi:10.1002/nme.5139, 2016. (PhD Student Yang Liu won 2015 best poster competition at USNCCM San Diego). [URL]

16. N. Guo, J. Zhao, **W.C. Sun**, Multiscale analysis of shear failure of thick-walled hollow cylinder in dry sand, *Geotechnqiue Letters*, 6(1):77-82, 2016. [URL]

17. S. Na*, **W.C. Sun**, Wave propagation and strain localization in a fully saturated softening porous medium under the non-isothermal conditions, *International Journal for Numerical and Analytical Methods in Geomechanics*, 40(10):1485-1510, doi:10.1002/nag.2505, 2016. [URL]

18. Z. Zheng†, **W.C. Sun**, J. Fish, Micropolar effect on the cataclastic flow and brittle-ductile transition in high-porosity rocks, *Journal of Geophysical Research: Solid Earth*, doi:10.1002/2015JB012179, 2016.

19. K. Wang*, **W.C. Sun**, A semi-implicit discrete-continuum coupling method for porous media based on the effective stress principle at finite strain, *Computer Methods in Applied Mechanics and Engineering*, 304(1):546-583, doi:10.1002/nag.2505, 2016. [URL]

20. K. Wang*,**W.C. Sun**, S. Salanger, S. Na*, G. Khaddour, Identifying micropolar material parameters via micro-CT images, *International Journal of Multiscale Computational Engineering*, 14(4): 389–413, doi:10.1615/IntJMultCompEng.2016016841, 2016. [URL]

21. A.G. Salinger, R.P. Pawlowski, Eric T. Phipps, R.A. Bartlett, G.A. Hansen, I. Kalashnikova, J.T. Ostien, **W.C. Sun**, Q. Chen, A. Mota, R.A. Muller, E. Nielsen, X. Gao. Albany: A component-based partial differential equation code build on Trilinos, *International Journal for Multiscale Computational Engineering*, doi:10.1615/IntJMultCompEng.2016017040, 2016. [URL]

22. **W.C. Sun**, Foreword: Computational Poromechanics, *International Journal of Multiscale Computational Engineering*, doi:10/.1615/IntJMultCompEng.2016018596, 2016.

23. **W.C. Sun**, Z. Cai*, J. Choo⋆, Mixed Arlequin method for multiscale poromechanics problems, *International Journal for Numerical Methods in Engineering*, 111:624-659 doi:10.1002/nme.5614, 2017. [URL]

24. K. Wang*, **W.C. Sun**, A unified variational framework for modeling fractures and compaction bands in brittle fluid-infiltrating porous media, Computer Methods in Applied Mechanics and Engineering, 318:1-32 doi:10.1016/j.cma.2017.01.017, 2017. [URL] (This paper is among the most downloaded articles in CMAME [URL] .)

25. S. Na*, **W.C. Sun**, Computational thermo-hydro-mechanics for multiphase freezing and thawing porous media in the finite deformation range, *Computer Methods in Applied Mechanics and Engineering*, 318:667-700, doi:10.1016/j.cma.2017.01.028, 2017. (Student selected as runner-up for the 2017 best paper competition at EMI Nashville). [URL]

26. I. Wollny, **W.C. Sun**, M. Kaliske, A hierarchical sequential ALE poromechanics model for tire-water-road interaction on fluid-infiltrating roads, *International Journal of Numerical Methods in Engineering*, doi:10.1002/nme.5537, 2017. [URL]

27. S. Na*, **W.C. Sun**, H. Yoon, M. Ingraham, Effects of elastic heterogeneity on the fracture pattern and macroscopic effective toughness of Mancos Shale in Brazilian tests, *Journal of Geophysical Research: Solid Earth*, doi:10.1002/2016JB013374, 2017. [URL]

28. H. Xin†, **W.C. Sun**, J. Fish, a surrogate modeling approach for additive-manufactured materials, *International Journal of Multiscale Computational Engineering*, accepted, 2017.

29. H. Xin†, **W.C. Sun**, J. Fish, Thermo-mechanical discrete element simulations on Powder-Bed Sintering-based Additive Manufacturing, *International Journal of Mechanical Sciences*, doi:10.1016/j.ijmecsci.2017.11.028, 2017. [URL]

30. O.I. Ulven†, **W.C. Sun**, Capturing the two-way hydro-mechanical coupling effect on fluid-driven fracture in a dual-graph lattice beam model, *International Journal for Numerical and Analytical Methods in Geomechanics*, 42(5):736-767, doi:10.1002/nag.2763, 2017. [URL]

31. K. Wang*, **W.C. Sun**, A multiscale multi-permeability poroplasticity model linked by recursive homogenizations and deep learning, *Computer Methods in Applied Mechanics and Engineering*, 334(1):337-379, https://doi.org/10.1016/j.cma.2018.01.036, 2018. [URL]

32. S. Na*, **W.C. Sun**, Computational thermomerchanics of crystalline rock salt Part I: a combined phase field/crystal plasticity approach for single grain simulations, *Computer Methods in Applied Mechanics and Engineering*, 338:657-691, doi:10.1016/j.cma.2017.12.022, 2018. [URL]

33. J. Choo⋆, **W.C. Sun**, Coupled phase-field and plasticity modeling of geological materials: from brittle fracture to ductile flow, *Computer Methods in Applied Mechanics and Engineering*, 330:1-32, doi:10.1016/j.cma.2017.10.009, 2018. [URL]

34. J. Choo⋆, **W.C. Sun**, Cracking and damage from crystallization in pores: Coupled chemo-poro-mechanics and phase-field modeling, *Computer Methods in Applied Mechanics and Engineering*, 335:347-379, doi:10.1016/j.cma.2018.01.044, 2018. [URL]

35. **W.C. Sun**, T-F. Wong, Prediction of permeability and formation factors of sandstone with multiscale lattice Boltzmann/finite element simulation on microtomographic images, *International Journal of Rock Mechanics and Mining Sciences*, 106:269-277, doi:10.1016/j.ijrmms.2018.04.020, 2018. [URL]

36. R. Gupta, S. Salager, **W.C. Sun**, K. Wang*, Open-source support toward validating and falsifying discrete mechanics models using synthetic granular materials Part I: Experimental tests with particles manufactured by a 3D printer, *Acta Geotechnica*, doi:10.1007/s11440-018-0703-0, 2018. [URL]

37. G. Liu†, **W.C. Sun**, S. M. Lowinger, Z Zheng, M Huang, J. Peng, Coupled flow network and discrete element modeling of injection-induced crack propagation and coalescence in brittle rock ,*Acta Geotechnica*, doi:10.1007/s11440-018-0682-1, 2018. [URL]

38. E. Bryant*, **W.C. Sun**, Mixed-mode phase field fracture for secondary cracks in anisotropic brittle rocks with consistent kinematics, *Computer Methods in Applied Mechanics and Engineering*, 342:561-584, doi:10.1016/j.cma.2018.08.008, 2018. [URL]

39. X. Zhong†, **W.C. Sun**, An adaptive reduced-dimensional discrete element model for dynamic responses of granular materials with high-frequency noises, *International Journal of Multiscale Computational Engineering*, 16(4):345-366, doi:10.1615/IntJMultCompEng.2018026895, 2018. [URL]

40. L. Mishnaevsky, C. Linder, **W.C. Sun**, Preface: Multiscale computational analysis of complex materials, *International Journal of Multiscale Computational Engineering*, doi:10.1615/IntJMultCompEng.2018027912, 2018.

41. K. Wang*, **W.C. Sun**, An updated Lagrangian LBM-DEM-FEM coupling model for dual-permeability porous media with embedded discontinuities, *Computer Methods in Applied Mechanics and Engineering*, 334:276-305, doi:10.1016/j.cma.2018.09.034, 2019. [URL]

42. K Wang*, **W.C. Sun**, Meta-modeling game for deriving theory-consistent, micro-structure-based traction-separation laws via deep reinforcement learning, *Computer Methods in Applied Mechanics and Engineering*, 346:216-241, doi:10.1016/j.cma.2018.11.026, 2019. [URL]

43. A. Qinami†, E. Bryant*, **W.C. Sun**, M. Kaliske, Circumventing mesh bias by r- and h-adpative techniques for variational eigen-fracture, *International Journal of Fracture*, doi:10.1007/s10704-019-00349-x, 2019.

44. C. Liu⋆, **W.C. Sun**, Shift domain material point method for solids in the finite deformation range, *Computational Particle Mechanics*, doi: 10.1007/s40571-019-00239-y, 2019.

45. K. Kang*, **W.C. Sun**, Q. Du, A cooperative two-player game for automated generations of elastoplasticity theories and models with AI-guided experimentation,*Computational Mechanics*, doi:,10.1007/s00466-019-01723-1, 2019. [URL]

46. E. Bryant*, **W.C. Sun**, A micromorphic-regularized anisotropic Cam-clay for capturing size-dependent anisotropy of geomaterials, *Computer Methods in Applied Mechanics and Engineering*, 354:56-95, doi:10.1016/j.cma.2019.05.003, 2019. [URL]

47. Y. Heider⋆,, **W.C. Sun**, Phase-field fracture in unsaturated porous media: application to drying-induced cracking, *Computer Methods in Applied Mechanics and Engineering*, , 359:112647, doi:10.1016/j.cma.2019.112647, 2019.

48. S. Na*, E.C. Bryant*, **W.C. Sun**, A configurational force for adaptive re-meshing of gradient-enhanced poromechanics problems with history-dependent variables, *Computer Methods in Applied Mechanics and Engineering*, 357, 2019. [URL]

49. Y. Heider⋆, K. Wang*, **W.C. Sun**, SO(3)-invariance of graph-based deep neural network for anisotropic elastoplastic materials, *Computer Methods in Applied Mechanics and Engineering*, tentatively accepted, 2019.

50. R. Ma⋆, **W.C. Sun**, FFT-based higher-order vs. mnulti-phase-field approaches for simulating strongly anisotropic brittle fracture, *Computer Methods in Applied Mechanics and Engineering*, 362:112781, 2019.

51. R. Ma⋆, **W.C. Sun**, Computational thermomechanics for crystalline rock. Part II: modeling damage-plasticity, healing and precipitation creeps in strongly anisotropic polycrystalline materials, *Computer Methods in Applied Mechanics and Engineering*, 369, 2020. [URL]

52. H.S Suh*, **W.C Sun**, An open-source FEniCS implementation of a phase field fracture model for micropolar continua, International *Journal for Multiscale Computational Engineering*, oi:10.1615/IntJMultCompEng.2020033422, 2019.

53. H.S. Suh*, D.T. O'Conner, **W.C. Sun**, A phase field model for cohesive fracture in micropolar continua, *Computer Methods in Applied Mechanics and Engineering*, 369, 2020. [URL]

54. N. Vlassis*, Ran Ma⋆, **W.C. Sun**, Geometric deep learning for computational mechanics Part I: Stored elastic energy functional for anisotropic materials undergoing large deformation, *Computer Methods in Applied Mechanics and Engineering*, 2020.

55. C. Liu⋆, **W.C. Sun**, ILS-MPM: An unbiased Nitsche's algorithm for frictional level set contacts via material point method, *Computer Methods in Applied Mechanics and Engineering*, 2020. [URL]

56. X. Zhong†, **W.C. Sun**, Y. Dai, Proper-orthogonal-decomposition-based dimensional reduction methods for explicit discrete element simulations, submitted to *Granular Matter*, 2019.

57. K. Wang*, **W.C. Sun**, A non-cooperative mulit-agent game for self-generating/improved physics-constrained constitutive laws with AI-guided experimentations, submitted to *Computer Methods in Applied Mechanics and Engineering*, 2020.

Journal Articles in Preparation

1. N. de Marchi†, **W.C. Sun**, Finite element simulations of shear wave splitting in fluid-infiltrating porous media, in preparation.

2. N. Bouklas, **W.C. Sun**, A stabilized equal-order finite element method for coupled diffusion-deformation of Hydrogels in the finite deformation range, in preparation.

Peer Reviewed Conference Proceedings and Book Chapters

1. E.C. Bryant*, **W.C. Sun**, A micromorphic regularized anisotropic Cam-clay model for capturing the anisotropic size effect of shale, clay and mudstone, 5th US Rock Mechanics/Geomechanics Symposium, American Rock Mechanics Association, New York, 2019.
2. S. Na*, **W.C. Sun**,A multi-phase-field/polycrystal plasticity for rock salt: micromorphic regularized grain-boundary slip, 5th US Rock Mechanics/Geomechanics Symposium, American Rock Mechanics Association, New York, 2019.
3. S. Na*, **W.C. Sun**, A multi-phase-field anisotropic damage-plasticity model for crystalline rocks, *China-Europe Conference on Geotechnical Engineering*, Springer Series in Geomechanics and Geoengineering, doi:10.1007/978-3-319-97112-413, 2018. [URL]
4. I. Wollny, **W.C. Sun**, Modeling of the tire-soil-water interaction of fluid-infiltrated road via a hierarchical sequential poromechanics ALE formulation, 6th European Conference on Computational Mechanics, Glasgow, the United Kingtom, 2018
5. K. Wang*, **W.C. Sun**, Data-driven discrete-continuum method for partially saturated micro-polar Porous Media, *6th Biot Conference on Poromechanics*, doi:10.1061/9780784480779.070, 2017. [URL]
6. K. Wang*, **W.C. Sun**, Micropolar DEM-FEM method for granular materials, *Proceedings in European Congress of Computational Mechanics*, Crete Island, Greece, 2016.
7. J. Zhao, N. Guo, **W.C. Sun**, A multiscale study of inherent anisotropy and strain localization in granular soils, *15th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering*, Japan, 2015.
8. **W.C. Sun**, Stabilized mixed finite element modeling of unsaturated flow barrier and fractured porous media at finite strain, *17th US National Congress on Theoretical and Applied Mechanics*, Michigan State University, 2014.
9. **W.C. Sun**, M.R. Kuhn and J.W. Rudnicki, A micromechanical analysis on permeability evolution of a dilatant shear band, ARMA 14-7626, *40th US Rock Mechanics and Geomechanics Symposium*, Minneapolis, MN, USA, 2014.
10. Q. Chen, **W.C. Sun** and J.T. Ostien, Finite element analysis of hydro-mechanical coupling of fully saturated collapsible geomaterials, *Proceedings of GeoShanghai 2014 Conference*, Shanghai, China, 2014.
11. **W.C. Sun**, J.E. Andrade, Diffuse bifurcations of porous media under partially drained conditions, *Springer Series in Geomechanics and Geoengineering*, 2:61-64, doi:10.1007/978-3-642-19630-0_16, 2011.[URL]
12. **W.C. Sun**, J.E. Andrade, Capturing the effective permeability of field compaction band using hybrid lattice Boltzmann/Finite element simulations, *Proceedings of 9th World Congress of Computational Mechanics/APCOM 2010*, Sydney, Australia, doi:10.1088/1757-899X/10/1/012077, 2010. [URL]
13. **W.C. Sun** and J.E. Andrade, Surface slumping of submarine slope and its relation to material instability, *Proceedings of 16th US National Congress on Theoretical and Applied Mechanics*, University Park, Pennsylvania, 2010.
14. N. Lenoir, J.E. Andrade, **W.C. Sun** and J.W. Rudnicki, In situ permeability measurement inside compaction bands using X-ray CT and lattice Boltzmann calculations, *Proceedings of 3th International Workshop on X-ray CT for geomaterials*, New Orleans, Louisiana, 2010.
15. J.E. Andrade, and **W.C. Sun**, Predictive framework for simulation of instabilities in sands, *Jornadas Geotecnicas Colombianas, Bogotá*, Colombia, 2009.

Technical Reports

1. **W.C. Sun**, Final Report: Cryo-mechanics of unsaturated frozen soils during freeze-thaw cycle, US Army Research Office, 2018. [URL]
2. **W.C. Sun**, A multiscale analysis on the moisture effect on dynamic responses of granular matters, US Army Research Office, 2016.
3. **W.C. Sun**, A multi-scale framework for modeling instabilities in fluid-infiltrated porous solids, PhD dissertation, Northwestern University, 2011.
4. B. Jeremic, C. Zhao, M. Preisig, K. Sett, **W.C. Sun**, Geomechanics Simulation Tools for PBEE, PEER Year 8 Progress Report, Vol. II, pp. B150-B155, Pacific Earthquake Engineering Research Center, UC Berkeley, 2005.
5. B. Jeremic, J. Putnam, Z. Yang, K. Sett, C. Zhao, J. Liao, G. Jie, **W.C. Sun**, Earthquake Response of Bridge Abutment Backfill Constructed with Tire Shreds, Department of Civil and Environmental Engineering, UC Davis, 2004.

Invited Department Seminars and Keynotes

1. , **W.C. Sun**, Some applications of graph theory in data-driven multi-scale mechanics, USACM Summer Seminar, July 17, 2020
2. N. N. Vlassis, R Ma, **W.C. Sun**, Geometric Learning for Computational Mechanics, Asian Pacific Congress on Computational Mechanics, Taipei, December 19th, 2019.
3. **W.C. Sun**, A non-cooperative zero-sum game for creating, validating and falsifying predictive poromechanics models, University of Nottingham., December 13th, 2019.
4. **W.C. Sun**, A Gradient damage-plasticity framework for fluid-infiltrating geomaterials with size-dependent anisotropy, University of Nottingham., December 13th, 2019.
5. **W.C. Sun**, A non-cooperative game for creating, validating and falsifying predictive polycrystal and granular materials with non-Euclidean internal variables, Mechanical and Aerospace Engineering colloquium, Sibley School of Mechanical and Aerospace Engineering, Cornell University, October 29th, 2019.
6. **W.C. Sun**, A non-cooperative game for creating, validating and falsifying predictive polycrystals with non-Euclidean internal variables, Department of Civil and Environmental Engineering, Northwestern University, October 17th, 2019.
7. **W.C. Sun**, A micromorphic phase field framework for geomaterials with size-dependent strong anisotropy, Department of Civil and Environmental Engineering, University of Illinois Urbana-Champaign, October 16th, 2019.
8. **W.C. Sun**, Micromorphic gradient plasticity for shale, soil and other polycrystalline rock, Invited Seminar, Lawrence Livermore National Laboratory, 2019.
9. **W.C. Sun**, A cooperative mulit-agent game for self-generating/improved physics-constrained constitutive laws with AI-guided experimentations, Computational Data Science Approach for Materials, J.R. Oppenheimer Study Center, Los Alamos National Laboratory, Los Alamos, New Mexico, 2019.
10. **W.C. Sun**, Title to be determined, Invited Seminar, Lawrence Livermore National Laboratory (tentatively scheduled in June, 2019).
11. **W.C. Sun**, Phase field damage-plasticity frameworks for fluid-infiltrating geomaterials with size-dependent anisotropy for geological disposals, , Department of Civil and Environmental Engineering, Stanford University, 2019.

12. **W.C. Sun**, A cooperative multi-agent game for automated physical model generations with AI-guided experimentation, Mesh-free Methods and Advances in Computational Mechanics Workshop, Meshfree Methods and Advances in Computational Mechanics Workshop, Pleasanton, California , 2019.

13. **W.C. Sun**, W.C. Sun, Computational soil mechanics beyond critical state plasticity, Winter Workshop on Mineral-bonded Composite for Enhanced Structural Impact Safety, Technische Universität Dresden, Germany, 2019.

14. **W.C. Sun**,A meta-modeling game for deriving theory-consistent microstructure-based constitutive laws for poromechanics problems, Department of Civil and Environmental Engineering, Department of Civil and Environmental Engineering, Pennsylvania State University, 2018.

15. **W.C. Sun**, An adaptive micromorphic-regularized Cam-clay-type model for fluid-infiltrating geological materials, Cold Regions Research and Engineering Laboratory, US Army Corps of Engineers, Hanover, New Hampshire, 2019.

16. **W.C. Sun**, A cooperative two-player game for automated generations of elasto-plasticity theories and models with AI-guided experimentation, the 3rd Mesoscale Modeling of Explosive Initiation Workshop, Fort Walton Beach, Florida, 2018.

17. **W.C. Sun**, A multiscale damage-plasticity model for capturing brittle-ductile transition in anisotropic fluid-infiltrating porous rock, Department of Mechanical, Aerospace, and Nuclear Engineering, Rensselaer Polytechnic Institute, 2018.

18. **W.C. Sun**, Meta-modeling of geological materials: generating mathematical models by hybridizing theory and data, Los Alamos National Laboratory, 2018.

19. **W.C. Sun**, Meta-modeling of porous media with strain localization and embedded strong discontinuities, Sandia National Laboratories, 2018.

20. **W.C. Sun**,Deep-learning enabled multiscale poromechanics: from brittle fracture to ductile flow, Department of Civil Engineering and Engineering Mechanics, Duke University, 2018.

21. **W.C. Sun**, A reinforcement learning approach for modeling the brittle-ductile transition in geological materials, ExxonMobil Research and Engineering Company, 2018.

22. **W.C. Sun**,K-fold validation for hybridized theory-based/data-driven anisotropic path-dependent constitutive models for geological materials and beyond, Naval Research Laboratory, 2018.

23. **W.C. Sun**, A multiscale damage-plasticity model for anisotropic fluid-infiltrating crystalline rock salt, Department of Civil and Environmental Engineering, the George Washington University, 2018.

24. **W.C. Sun**, Data-driven computational geomechanics, Department of Civil Engineering, the University of Hong Kong, 2017.

25. **W.C. Sun**, Accelerating multiscale discrete-continuum modeling of fluid-infiltrating geomaterials with deep learning, Department of Civil and Environmental Engineering, Hong Kong University of Science and Technology, 2017.

26. **W.C. Sun**, Hybrid data-driven multiscale modeling of brittle and ductile responses of fluid-infiltrating geomaterials, 2017 AFOSR Young Investigator Research Program Meeting, Basic Research Innovation and Collaboration Center (BRICC), Arlington, 2017.

27. **W.C. Sun**, A multiscale damage-plasticity model for compaction band and fractures in anisotropic fluid-infiltrating porous media, Department of Earth Science and Engineering, Imperial College London, the United Kingdom, 2017.

28. **W.C. Sun**, Data-driven multiscale modeling of fractured porous media with cross-validations, Lund University, Lund, Sweden, 2017.

29. **W.C. Sun**, Data-driven multiscale geomechanics, Geomechanics Department, Sandia National Laboratories, 2017.

30. **W.C. Sun**, A discrete-continuum coupling model for fractured porous media with embedded branched-discontinuities in the finite deformation range, Department of Civil and Environmental Engineering, Princeton University, 2017.

31. **W.C. Sun** A critical comparison of variational phase field and eigen-erosion modeling of fractures in fluid-infiltrating porous media: from brittle faulting to cataclastic flow, Department Seminar, Department of Civil and Environmental Engineering, Georgia Institute of Technology, 2017.

32. **W.C. Sun** Data-driven computational poromechanics across length scales, Henry L. Pierce Laboratory Seminar Series, Massachusetts Institute of Technology, 2017.

33. **W.C. Sun** Multiscale discrete-continuum modeling of porous media in extreme environments, Department Seminar, Department of Civil and Environmental Engineering, New Jersey Institute of Technology, 2017.

34. **W.C. Sun**, Data-driven multiscale poromechanics for cold region applications, Cold Regions Research and Engineering Laboratory, US Army Corps of Engineers, Hanover, New Hampshire, 2016.

35. **W.C. Sun**, A variational eigen-deformation model for simulating compaction band and fracture propagation in fluid-infiltrating porous media, Jointed Department Seminar, Department of Civil and Environmental Engineering, Department of Mechanical Engineering, Northwestern University, 2016.

36. **W.C. Sun**, Multiscale discrete-continuum modeling of fluid-infiltrating, partially-frozen and quasi-brittle porous media, Lawrence Livermore National Laboratory, Livermore, California, 2016.

37. **W.C. Sun**, Modeling fluid-infiltrating, partially-frozen and quasi-brittle porous media with nonlocal discrete-continuum techniques, Lecture Series on Interaction Modeling in Mechanized Tunneling, Ruhn-University Bochum, Germany, 2016.

38. **W.C. Sun**, Computational mechanics for porous media in extreme environments, Department Seminar, Technical University of Dresden, Germany, 2016.

39. **W.C. Sun**, Computational geomechanics for fluid-infiltrating, thermal-sensitive and partially frozen granular materials, Machine-ground Interaction Consortium Workshop: Next Generation Mobility Modeling and Simulation, the Suburban Collection Showplace, 46100 Grand River Avenue, Novi, Michigan, 2016.

40. **W.C. Sun**, Modeling and validating a micropolar multiscale model for wetted granular matters, keynote Lecture, the International Symposium on Plasticity and Its Current Applications, Keauhou Bay, Hawaii, 2016.

41. **W.C. Sun**, Some remarks on modeling fluid-infiltrating, thermal-sensitive, and partially-frozen porous media across length scales, Applied Mechanics Colloquia, John A. Paulson School of Engineering and Applied Sciences, Harvard University, 2016.

42. **W.C. Sun**, Computational Thermoporomechanics, University of Perugia, Perugia, Italy, 2015.

43. **W.C. Sun**, Validation and Verification of Discrete-continuum coupling modeling of granular materials, 3D Printing and Digital Rock Physics Workshop, Santa Fe, New Mexico, 2015. Albuquerque, New Mexico, 2015.

44. **W.C. Sun**, Coupling dissimilar hydromechanical models for fluid-saturated porous media from grain to field scales, Los Alamos National Laboratory, Los Alamos, New Mexico, 2015.

45. **W.C. Sun**, Multiscale Modeling for fluid-infiltrating fractured porous media, Claude R. Hocott Lecture, Department of Petroleum and Geosystems Engineering, the University of Texas at Austin, Austin, Texas, 2015.

46. **W.C. Sun**, Concurrent and hierarchical multiscale modeling of shear bands in fluid infiltrating solids multiscale modeling of deformation bands, Civil and Material Engineering Seminar, University of Illinois at Chicago, 2014.

47. **W.C. Sun**, Two-scale modeling of shear bands in fluid infiltrating solids, Joint Materials/Solid Mechanics Seminar Series, Brown University, 2014.

48. **W.C. Sun**, Modeling Thermo-hydro-mechanics at finite strain, UC Davis Geotechnical Seminar Series, University of California, Davis, 2013.

49. **W.C. Sun**, Modeling multiphysical coupling effects of deformation bands across length scales, Lawrence Livermore National Laboratory, Livermore, California, 2013.

50. **W.C. Sun**, Modeling fully coupled hydromechanical process in porous media across different length scales, invited seminar, department of civil and environmental engineering, the Hong Kong Polytechnic University, Hong Kong, China, 2013.

51. **W.C. Sun**, Multiscale modeling of thermo-hydro-mechaical coupling effects in deformation band, Department of Civil and Environmental Engineering, Carnegie Mellon university, Pittsburgh, Pennsylvania, 2013.

52. **W.C. Sun**, Modeling fully coupled hydromechanical process in porous media across different length scales, Shell Westhollow Technology Center, Novenmber 28th, Houston, Texas, 2012.

53. **W.C. Sun**, Computational poromechanics across different length scales, Engineering Science Center, Sandia National Laboratories, Albuquerque, New Mexico, 2012.

54. **W.C. Sun**, Analyzing interplays between microstructures and macroscopic transport properties of shear-enhancedbands with a multi-scale framework, Army Research Laboratory, Aberdeen Proving Ground, Maryland, 2011.

55. **W.C Sun**, A multiscale analysis on porous microstructures of deformation bands and their implications on macroscopic transport of pore-fluid, Los Alamos National Laboratory, New Mexico, 2011.

56. **W.C Sun**, A multiscale analysis of strain localizations in fully saturated porous media, Naval Research Laboratory, John C.Stennis Space Center, Mississippi, 2011.

57. **W.C Sun**, Connecting micro-structural attributes and macroscopic fluid transport properties of two-phase porous media with a multi-scale framework,Oak Ridge National Laboratory, Oak Ridge, Tennessee, 2011.

Conference Presentations

58. **W.C. Sun**, K. Wang, Q. Du, A non-cooperative game for machine-learning computational mechanics, XV International Conference on Computational Plasticity. Fundementals and Applications, Barcelona, Spain, 2019.

59. K. Wang, **W.C. Sun**, Q. Du, A Cooperative Two-player Game for Data-driven Discovery of Elasto-plasticity Knowledge Represented in Directed Graph, the 11th United States National Congress of Computational Mechanics (USNCCM), Austin, Texas, 2019.

60. K. Wang, **W.C. Sun**, An Adaptive Multi-phase-field Prediction Framework for Localized Failures in Geological Materials with Data-clustering, the 11th United States National Congress of Computational Mechanics (USNCCM), Austin, Texas, 2019.

61. E.C. Bryant, **W.C. Sun**, A Micromorphic-regularized Cam-clay-type Model for Capturing Size-dependent Anisotropy in Geological materials, the 11th United States National Congress of Computational Mechanics (USNCCM), Austin, Texas, 2019.

62. Y. Heider, **W.C. Sun**, Data-driven Validation of Bishop's Effective Stress Principle through Deep Reinforcement Learning, the 11th United States National Congress of Computational Mechanics (USNCCM), Austin, Texas, 2019.

63. S. Na, **W.C. Sun**, Adaptive mesh-refinement for poromechanics problems of high-order continua: a configurational force approach, Engineering Mechanics Institute conference, Caltech, Pasadena, 2019.

64. C. Liu, **W.C. Sun**, Shift domain material point method: an image-to-simulation workflow for solids of complex geometries undergoing large deformation, Engineering Mechanics Institute conference, Caltech, Pasadena, 2019.

65. N. Vlassis, **W.C. Sun**, Bootstrapping critical state plasticity models for predicting cyclic undrained responses of granular materials with a hierarchical knowledge polytree, Engineering Mechanics Institute conference, Caltech, Pasadena, 2019.

66. E. Bryant, **W.C. Sun**, A micromorphic-regularized anisotropic Cam-clay-type model for capturing size-dependent anisotropy, Engineering Mechanics Institute conference, Caltech, Pasadena, 2019.

67. R. Ma, **W.C. Sun**, A multiscale FE-FFT approach for modeling crack initiation and propagation in polycrystalline rock salt, Engineering Mechanics Institute conference, Caltech, Pasadena, 2019.

68. K. Wang **W.C. Sun**, An adaptive ensemble phase field predictions for localized failures in geological materials, Engineering Mechanics Institute conference, Caltech, Pasadena, 2019.

69. K. Wang **W.C. Sun**, Q. Du, A cooperative game for automated learning of elasto-plasticity knowledge graphs and models with AI-guided experimentation, Engineering Mechanics Institute conference, Caltech, Pasadena, 2019.

70. **W.C. Sun**, K. Wang, A meta-modeling game for automated generations of cohesive zone models, Mach Conference, the Hopkins Extreme Materials Institute, Annapolis, Maryland, 2019.

71. K. Wang, **W.C. Sun**, N. Vlassis, Computational unsaturated poromechanics enhanced by deep learning, World Congress of Computational Mechanics, New York, 2018.

72. E. Bryant, **W.C. Sun**, A modified phase field model for mixed-mode crack propagation with consistent kinematic modes, World Congress of Computational Mechanics, New York, 2018.

73. K. Wang, X. Zhong, **W.C. Sun**, Dual-basis Dimensional Reduction for Non-dissipative Explicit Dynamic Discrete Element Simulations with High-frequency Noises, World Congress of Computational Mechanics, New York, 2018.

74. S. Na, C. Chukwudozie, **W.C. Sun**, Modeling high-strain-rate responses brittle porous media with fracture opening and closure, World Congress of Computational Mechanics, New York, 2018.

75. K. Wang, **W.C. Sun**, Hybridizing neural network and hand-crafted critical state plasticity model for geomaterials in a directed graph, World Congress of Computational Mechanics, New York, 2018.

76. S. Na, **W.C. Sun**, A Multi-phase-field/Polycrystal Plasticity for the Brittle-ductile Transitions of Crystalline Rock with Precipitating Fluid, World Congress of Computational Mechanics, New York, 2018.

77. E. Bryant, **W.C. Sun**, A coupled anisotropic critical state and eigenrosion theory for capturing the anisotropic plasticity and fractures in shale, Engineering Mechanics Institute Conference, MIT, Cambridge, 2018.

78. K. Wang, **W.C. Sun**, Critical state plasticity model with data-driven hardening and flow roles, Engineering Mechanics Institute Conference, MIT, Cambridge, 2018.

79. S. Na, **W.C. Sun**, A multi-phase-field/crystal Plasticity for crystalline salt with brine inclusions, Engineering Mechanics Institute Conference, MIT, Cambridge, 2018.

80. S. Na, C. Chukwudozie, **W.C. Sun**, Modeling dynamic responses brittle porous media with fracture opening and closure, Engineering Mechanics Institute Conference, MIT, Cambridge, 2018.

81. K. Wang, **W.C. Sun**, N. Vlassis, Multiscale unsaturated poromechanics enhanced by deep learning, Engineering Mechanics Institute Conference, MIT, Cambridge, 2018.

82. J. Choo, **W.C. Sun**, Coupling phase-field and plasticity for unified modeling of brittle and ductile failures in geomaterials, Engineering Mechanics Institute Conference, MIT, Cambridge, 2018.

83. **W.C. Sun**, K. Wang, Hybrid data-drtiven multiscale computational geomechanics across length scales, US Congress of Computational Mechanics, Montreal, Canada, 2017.

84. K. Wang, **W.C. Sun**, A discrete-continuum coupling model for fractured porous media with embedded branched-discontinuities in the finite deformation range, US Congress of Computational Mechanics, Montreal, Canada, 2017.

85. S. Na, **W.C. Sun**, A combined phase field and crystal plasticity approach for capturing thermo-mechanical behavior of polycrystalline rock salt, US Congress of Computational Mechanics, Montreal, Canada, 2017.

86. E. Bryant, **W.C. Sun**, Adaptive Arlequin method for multiscale brittle fracture with subgrid length scales, US Congress of Computational Mechanics, Montreal, Canada, 2017.

87. **W.C. Sun**, K. Wang, J. Choo, S. Na, A critical assessment on phase field and eigen-erosion modeling of fractures in anisotropic fluid-infiltrating porous media, Engineering Mechanics Institute Conference, San Diego, 2017.

88. K. Wang, **W.C. Sun**, Data-driven discrete-continuum method for partially saturated porous media, Engineering Mechanics Institute Conference, San Diego, 2017.

89. K. Wang, **W.C. Sun**, Micro-polar Discrete-continuum coupling method for fluid-infiltrating porous media, Engineering Mechanics Institute Conference, Vanderbilt University, 2016.

90. S. Na, **W.C. Sun**, Computational cryo-mechanics for frozen soil, Engineering Mechanics Institute Conference, Vanderbilt University, 2016.

91. **W.C. Sun**, Z. Cai, Staggered schemes for multiscale Arlequin poromechanics problems, Engineering Mechanics Institute Conference, Vanderbilt University, 2016.

92. **W.C. Sun**, C. Tamagnini, Modeling thermal softening effects in coupled THM problems at finite strain, Engineering Mechanics Institute Conference, Vanderbilt University, 2016.

93. **W.C. Sun**, Multiscale coupling method for fluid-infiltrating porous media at the finite deformation range, Technical University of Dresden, Dresden, Germany, 2015.

94. **W.C. Sun**, Multiscale hydro-mechanical responses of geological materials, Sandia National Laboratories, Albuquerque, New Mexico, 2015.

95. O.I. Ulven, **W.C. Sun**, Fluid transport in reaction-induced fractures, European Geophysical Union General Assembly, Vienna, Austria, 2015.

96. S. Na, **W.C. Sun**, Thermo-hydro-mechanical coupling effects on wave propagation and strain localization in a softening porous medium, Engineering Mechanics Institute Conference, Stanford, California, 2015.

97. **W.C. Sun**, Z. Cai, Modeling the hydromechanical coupling process of fluid-infiltrating solids via the monolithic and operator-splitting Arlequin method, Engineering Mechanics Institute Conference, Stanford, California, 2015.

98. **W.C. Sun**, Teng-fong Wong, SeonHong Na, Kun Wang, Imer Jasiel del Cid, Mechanical, hydraulic and electrical transport properties of sandstone with multiscale lattice Boltzmann/finite element simulations on micro-tomographic and DEM-simulated images, Engineering Mechanics Institute Conference, Stanford, California, 2015.

99. **W.C. Sun**, S. Na, A finite strain thermo-hydro-mechanical model for thermal softening geomaterials, the United State National Congress on Computational Mechanics, San Diego, 2015.

100. **W.C. Sun**, K. Wang, A discrete-continuum coupling approach for predicting anisotropic damages in water-saturated brittle rocks, 2015, the United State National Congress on Computational Mechanics, San Diego, 2015.

101. **W.C. sun**, Concurrent and Hierarchical Multiscale Modeling for Strain Localization in Fluid-infiltrating Porous Solids, Department of Mechanical engineering, Columbia University, 2015.

102. **W.C. Sun**, Multiscale modeling of strong and weak discontinuities in porous media, University of Hong Kong, Hong Kong, 2015.

103. **W.C. Sun**, Concurrent and hierarchical multiscale modeling of fluid-infiltrating solids, Department Seminar, Department of Civil and Environmental Engineering, the Hong Kong University of Science and Technology, Hong Kong, 2015.

104. Y. Liu, **W.C. Sun**, K. Wang, Z. Yuan, J. Fish, A nonlocal multiscale discrete-continuum model for dynamics shear band propagations and ruptures in granular materials, Engineering Mechanics Institute International Conference, Hong Kong Polytechnic University, Hong Kong, 2015.

105. **W.C. Sun**, C. Tamagnini, Modeling deformation bands in thermal softening and fluid infiltrating porous solids at finite strain, John Rudnicki Symposium, SES Meeting, Purdue University, 2014.

106. Y. Liu, **W.C. Sun**, Predicting possible leakage due to dynamics strain localization in granular materials with a coupled continuum-discrete coupling model, SES Meeting, Purdue University, 2014.

107. **W.C. Sun**, A DEM-LBM-FEM model for the formation of a dilatant shear band, 12th Annual Northwestern Granular Materials Workshop, Brown University, 2014.

108. **W.C. Sun**, Modeling multi-physical responses of deformation bands in porous media across length scales, Itasca Consulting Group, Minneapolis, MN, USA, 2014.

109. **W.C. Sun**, M.R. Kuhn, J.W. Rudnicki, A micromehcanical analysis on permeability evolution of a dilatant shear band, ARMA 14-7626, Minneapolis, MN, 2014.

110. **W.C. Sun**, Modeling the multiscale deformation-diffusion process of fluid-infiltrating solids via the Arlequin method, IUTAM symposium, Evanston, IL, 2014.

111. **W.C. Sun**, J.T. Ostien, J.W. Foulk III, a stabilized finite element formulation for monolithic thermo-hydro-mechanical simulations at finite strain, Engineering Mechanics Institute Conference, Evanston, Illinois , 2013.

112. **W.C. Sun** Computational poromechanics across temporal and spatial scales, Department of Civil Engineering and Engineering Mechanics, Columbia University, New York, New York, 2013.

113. A. Mota, **W.C. Sun**, J.T. Ostien, J.W. Foulk III, K.N. Long, Lie-group interpolation and variational recovery for internal variables, the Third International Conference on Computational Modeling of Fracture and Failure of Materials and Structure, Prague, Czech Republic, 2013.

114. **W.C. Sun**, J.T. Ostien, J.W. Foulk III, Modeling fluid flow in deformation bands with stabilized localization mixed finite elements, AGU Fall Meeting, San Francisco, 2012.

115. T-F. Wong, **W.C. Sun**, Prediction of hydraulic and electrical transport properties of sandstone with multiscale lattice Boltzmann/finite element simulation on microtomographic images, AGU Fall Meeting, San Francisco, 2012.

116. J W. Foulk III, **W.C. Sun**, C. San Marchi, B. Somerday, D. Balch, Coupled hydrogen transport and deformation of 21Cr-6Ni-9Mn austenitic stainless steel, 2012 International Hydrogen Conference, Grand Teton National Park, Jackson Lake Lodge, Wyoming, USA, 2012.

117. **W.C. Sun**, Connections between microstructural attributes and macroscopic mechanical and hydraulic responses of deformation bands in idealized and real porous media, Center for Frontiers of Subsurface Energy Security, Sandia National Laboratories, May, 8th, Albuquerque, NM, 2012.

118. T-F. Wong, **W.C. Sun**, Y. Ji, P. Baud, MicroCT imaging of porous sandstone and limestone: Implication on permeability evolution and mechanics damage, DOE basic science workshop, April 4th-5th, Gaithersburg, MD, 2012.

119. **W.C. Sun**, J.E. Andrade, J.W. Rudnicki, P. Eichhubl, Connecting microstructural attributes and macroscopic permeability of a natural shear-enhanced compaction band using multiscale computations, American Geophysical Union Fall Meeting, San Francisco, CA, 2011.

120. **W.C. Sun**, J.E. Andrade, J.W. Rudnicki, Capturing micro-structural attributes and macroscopic fluid transport properties of two-phase porous media with multi-scale framework, 11th US National Congress on Computational Mechanics, July 25-29, Minneapolis, MN, 2011.

121. **W.C. Sun** and J.E. Andrade, Capturing the effective permeability of field compaction bands with hybrid lattice Boltzmann/finite element, World Congress of Computational Mechanics, Sydney, Australia, 2010.

122. **W.C. Sun** and J.E. Andrade, Surface Slumping of Submarine Slope And Its Relation To Material Instability, 16th US National Congress on Theoretical and Applied Mechanics, University Park, Pennsylvania, 2010.

123. **W.C Sun** and J.E. Andrade, Diffuse bifurcations of porous media under partially drained conditions, International Workshop on Multiscale and Multiphysics Processes in Geomechanics, Stanford, California, 2010.

124. **W.C Sun** and J.E. Andrade, Capturing material instability in saturated porous media, US Congress on Computational Mechanics, Columbus, Ohio, 2009.

125. J.E. Andrade, N. Lenoir, **W.C. Sun**, J.W. Rudnicki, X-ray aided permeability computations inside compaction bands in sandstones, American Geophysical Union, Fall Meeting, 2009.

126. B. Jeremic, M. Preisig and **W.C. Sun**, Seismic soil-foundation interaction: numerical modeling issues, 2005 Structures Congress, Structural Engineering Institute, New York, 2005.

127. **W.C. Sun**, OpenSees simulation tools for geotechnical earthquake engineering, PEER Annual Meeting, Menlo Creek, 2005.

128. **W.C. Sun**, OpenSees pre- and post- Processing, 2005 EERI Annual Meeting, Mexico, 2005.

129. **W.C. Sun**, OpenSees pre- and post- Processing with Application to OpenGL and FLTK, Undergraduate Research Conference, University of California, Davis, 2004.

130. M. Preisig and **W.C. Sun**, I-880 test bed simulation, 2004 PEER Annual Meeting, Palm Springs Riviera Resort, 2004.

Teaching Experience

1. **Instructor**, Finite Element and Plasticity in Geotechnical Engineering, Columbia University, CIEN 4195, Fall 2015, Fall 2017, Fall 2019.

2. **Instructor**, Computational Poromechanics, ENME6320, Columbia University, Fall 2014, Fall 2016, Fall 2018.

3. **Instructor**, Soil Mechanics CIEN 3141, Columbia University, Spring 2014, Spring 2015, Spring 2017, Spring 2018, Spring 2019.

4. **Instructor**, Civil Engineering Research, CIEN9101, Columbia University, Fall 2014, Spring 2015, Fall 2016, Fall 2018.

5. **Instructor**, Individual Studies for Civil Engineering Senior, CIEN, 3304, Columbia University, Fall 2014.

6. **Teaching Assistant**, Computational Poromechanics CIVENG 495, Northwestern University, Winter 2009, responsibilities include leading TA session, preparing lecture notes, grading and preparing solutions for homework and exams.

7. **Teaching Assistant**, Modeling of Models in Geotechnical Engineering CEE296, Stanford University, Winter 2006 and Winter 2007, responsibilities include giving brief instructions, demonstrating and leading experiments.

8. **Teaching Assistant**, Geotechnical Engineering CEE101C, Stanford University, Fall 2005 and Fall 2006, responsibilities include giving lectures, leading experiments and grading homework.

Grants and Contracts

Sun research group is currently supported by the Department of Energy, Army Research Office, Air Force Office of Scientific Research, National Science Foundation (CMMI and EAR divisions), Department of Defense, Sandia National Laboratories, the National Nuclear Security Administration, and Columbia University. The PI received the Young Investigator Program Award from the Army Research Office in 2015, another Young Investigator Program Award from the Air Force Office of Scientific Research in 2017 and the NSF CAREER award from the Mechanics of Materials and Structures Program of National Science Foundation in 2019. Since joining Columbia in Spring 2014 and with a $40,000 startup fund, the PI has been awarded more than 5.86 million US dollars for his own research expenses (more than half from single-PI projects, the rest from MURI and other projects). The PI also joined forces in collaborative projects within the department, school, university and with external collaborators on various other projects with total support of over **20.0 million dollars**.

As the Principal Investigator in Funded Single-PI Projects

1. Title: CAREER: Computational failure mechanics across multiple scales with deep reinforcement learning Funding Agency: National Science Foundation
   Duration: 1/1/2019-12/31/2023
   Amount: $594,156
   PI:**W.C. Sun**
2. Title: Phase field modeling of ice-segregation induced fracture and thawing plasticity in frozen geomaterials with unfrozen water
   Funding Agency: Army Research Office
   Duration: 6/1/2018-5/31/2021
   Amount: $360,000
   PI: **W.C. Sun**
3. Title: Broaden undergraduate and high school student participation for cold-region soil mechanics
   Funding Agency: Army Research Office
   Duration: 6/1/2019-5/31/2020
   Amount: $10,000
   PI: **W.C. Sun**
4. Title: INTERN: Adaptive phase field Arlequin moddels for material failures
   Funding Agency: National Science Foundation
   Duration: 1/1/2019-12/31/2019
   Amount: $50,000
   PI: **W.C. Sun**
5. Title: Young Investigator Program Award: Modeling the High-rate Responses of Wetted Granular Materials Across Scales and the Third-party Replicable Validation Exercises Utilizing 3D Printers
   Funding Agency: Air Force Office of Scientific Research
   Duration: 1/1/2017-12/31/2020
   Amount: $360,000
   PI: **W.C. Sun**
6. Title: Broaden undergraduate and high school student participation for cold-region computational geomechanics
   Funding Agency: Army Research Office
   Duration: 6/1/2018-5/31/2019
   Amount: $13,206
   PI: **W.C. Sun**
7. Title: An integrated multiscale experimental-numerical analysis on reconsolidation of salt-clay mixture for disposal of heat-generating waste
   Funding Agency: Department of Energy
   Duration: 10/1/2016-9/31/2019

Amount: $800,000
PI: **W.C. Sun**

8. Title: A phase field Arlequin model for resolving non-local hydromechanical effects of porous media across time and spatial Scales
Funding Agency: National Science Foundation
Duration: 8/1/2015-7/31/2019
Amount: $300,000
PI: **W.C. Sun**
9. Title: Young Investigator Program Award: Understanding hydro-mechanical coupling mechanism of wetted granular matters beyond the pendular regime
Funding Agency: Army Research Office
Duration: 9/1/2015-8/31/2018
Amount: $150,000 from ARO ($347,000 including cost sharing)
PI: **W.C. Sun**
10. Title: Cryo-mechanics of unsaturated frozen soils during freeze-thaw cycle
Funding Agency: Army Research Office, Department of Defense
Duration: 9/1/2015-9/1/2017
Amount: $108,889
PI: **W.C. Sun**
11. Title: A multiscale analysis on the moisture effect of dynamics responses of granular matters
Funding Agency: Army Research Office
Duration: 1/1/2015-9/1/2015
Amount: $50,000
PI: **W.C. Sun**
12. Title: Phase field modeling of anisotropic damages in orthotropic material
Funding Agency: Sandia National Laboratories
Duration: 1/1/2016-7/31/2017
Amount: $30,000
PI: **W.C. Sun**
13. Title: Modeling chemical driven fractured rocks by integrating 3D printing digenesis and multiscale computations
Funding Agency: Columbia University Provost's Grants Program
Duration: 1/1/2015-12/31/2015
Amount: $25,000
PI: **W.C. Sun**
14. Title: Computational Modeling of hydraulic fracture
Funding Agency: Sandia National Laboratories
Duration: 5/25/2016-8/31/2016
Amount: $20,000 (cost sharing from Dean's office $3,478)
PI: **W.C. Sun**
15. Title: A discrete-continuum coupling method for environmental-driven fracture in rock
Funding Agency: Sandia National Laboratories
Duration: 6/1/2015-12/31/2015
Amount: $15,000
PI: **W.C. Sun**
16. Title: Adaptive phase field modeling of crack and anticrack
Funding Agency: Extreme Science and Engineering Discovery Environment (XSEDE)
Duration: 9/1/2015-8/31/2016
Amount: 50,000 Service Unit (roughly equivalent to $\$50,000$)
PI: **W.C. Sun**

17. Title: Broaden undergraduate and high school student participation for cold-region soil mechanics
Funding Agency: Army Research Office
Duration: 6/1/2020-8/31/2020 (tentative, recommended for funding on 1/16/2020)
Amount: $10,222 in total, $10,222 per year
PI: **W.C. Sun**

As Principal Investigator or Co-Principal Investigator in Funded Multiple-PI Projects

17. Title: Center for micromorphic multiphysics porous and particulate materials simulations within exascale computing workflows
Funding Agency: National Nuclear Security Administration
Duration: 6/1/2020-5/31/2025 (tentative, recommended for funding on 1/23/2020)
Amount: $16,000,000 in total (Sun's activities: $846,868 in total)
PI: Richard A Regueiro (Colorado), co-PIs (incomplete list): Christian Linder (Stanford), Amy Clarke (Colorado School of Mine), Khalid Alshibli (University of Tennessee), Hongbing Lu (UT Dallas), **W.C. Sun** (Columbia)
18. Title: MURI: Integrating Multiscale Modeling and Experiments to Develop a Meso-Informed Predictive Capability for Explosives Safety and Performance
Funding Agency: Air Force Office of Scientific Research
Duration: 6/1/2019-5/31/2024
Amount: $7,500,000 (Sun's activities: $ 861,250)
PI: T. Sewell (University of Missouri-Columbia) , co-PI: H.S. Udaykumar (University of Iowa), D. Dlott (University of Illinois at Urbana-Champaign), C. Picu (Rennselaer Polytechnic Institute), S. Chauhuri (University of Illinois at Chicago), **W.C. Sun** (Columbia), S Baek (University of Iowa)
19. I-AIM: Interpretable Augmented Intelligence for Multiscale Material Discovery
Funding Agency: National Science Foundation
Duration: 10/1/2019-9/30/2021
PI: **W.C. Sun** Amount: $2,000,000 (Sun's activities: $ 418,000)
20. Title: GPU-accelerated computing for CUIT Habanero Cluster
Funding Agency: Columbia University
Duration: One-time equipment grant
Amount: $39,000 (with $39,000 matching fund)
PI: P. Gentine, co-PI: D. Blei, S. Agrawal, **W.C. Sun**, H. Waisman
21. Title: Purdue Workshop on Damage Mechanics Challenge
Funding Agency: Purdue University
Duration: One-time grant for workshop expense
Amount: $25,000
PI: L. Pyrak-Nolte (Purdue), co-PI: H. Yoon (Sandia), A. Bobet (Purdue), **W.C. Sun**.
22. Title: 13th World Congress in Computational Mechanics; New York, New York; July 22-27, 2018
Funding Agency: National Science Foundation
Duration: 1/1/2018-8/31/2018
Amount: $\$50,000$)
PI: **W.C. Sun**, co-PI: J. Fish, H. Waisman
23. Title: Data-driven multiscale poromechanics – bridging scales and physics through graph-based machine learning with uncertainty quantification
Funding Agency: Columbia University
Duration: 1/2/2017-8/31/2017
Amount: $\$70,000$
PI: **W.C. Sun**, co-PI: Q. Du
24. Title: A Combined experimental and theoretical investigation of reactive flow in brittle media with applications to solid earth geodynamics
Funding Agency: National Science Foundation

Duration: 8/1/2015-7/31/2018
Amount: $409,036 (Sun's activities: $34,298)
PI: M. Spiegelman , co-PI: **W.C. Sun**, H. Savage, P. Kelemen

25. Title: STTR: Particulate Composite Mixing Processes
Funding Agency: Air Force Office of Scientific Research
Duration: 2/1/2016-1/31/2018 Amount: $414,000 (Sun's activities: $182,896)
PI: H. Yin, co-PI: **W.C. Sun**
26. Title: Collaborative Research: Alteration of mantle peridotite: Geochemical fluxes and dynamics of far from equilibrium transport
Funding Agency: National Science Foundation
Duration: 8/1/2015-7/31/2018
Amount: $1,968,362
(Sun's activities: $68,589)
PI: P. Kelemen, co-PI: **W.C. Sun**, H. Savage, M. Stute, M. Spiegelman
27. Title: Experimental and digital rock physics in relation to hydraulic and electrical transport properties of porous sandstone
Funding Agency: Hong Kong Research Council
Duration: 6/1/2015-12/31/2015
Amount: $160,530 (Sun's activities: $20,000)
PI: T.F. Wong, co-PI: **W.C. Sun**

Student and Postdoctoreal Scholar Advising

It is the goal of this research group to have at least one PhD student graduated per year. Since 2014, the research group has three former group members (2 PhD students and 1 postdoc) who successfully obtain tenure-track positions, and 1 PhD student (Kun Wang) joined Los Alamos National Laboratory as postdoc research scientist. Yang Liu is now at now assistant professor at Northeastern University and SeonHong Na will McMaster University in January 2019. In addition, former postdoc research scientist Jinhyun Choo has joined the University of Hong Kong as assistant professor of Civil and Environmental Engineering since January 2018.

Associate Research Scientist (current team member)

1. Yousef Heider, PhD (Institute of continuum Mechanics, University of Stuttgart, Germany), *High-strain-rate responses of geomaterials*, Fall 2018-current.

Postdoctoral Research Scientist (current team member)

1. Ran Ma, PhD (University of Tennessee), *Computational crystal plasticity of reconsolidated salt*, Fall 2018-current.

Graduate Students (current team members)

1. Eric C. Bryant, PhD student, *Mechanics of hydraulic fracture across length scales*, Fall 2016-current.
2. Nikolaos N. Vlassis, PhD student, *Computational crystal plasticity of geological materials*, Summer 2017-current.
3. Hyoung Suk Suh, PhD student *Image-based multiscale computational poromechanics*, Summer 2018-current.
4. Bahador Bahmani, PhD student *Applications of combinatorics on data-driven computational mechanics*, Fall 2019-current.
5. Jarett Stephen Lo Poliner, Geometric deep learning for energetic materials, pre-qualification exam, Fall 2020-current.
6. Mian Xiao, Mechanics of damage and fragmentation in granular materials: an ILS-MPM approach, pre-qualification exam, Fall 2020-current.

7. Zeyu Xiong, Applications of graph theory for computational discrete mechanics, pre-qualification exam, Fall 2020-current.

Postdoctoral Research Scientist (past team member)

1. Chuanqi Liu (Tsinghua University), now associate professor at Chinese Academy of Sciences, Contact problems for immersed MPM meothd, Fall 2018-Spring 2020.
2. Jinhyun Choo, PhD (Stanford), now assistant professor in the department of civil and environmental engineering at the University of Hong Kong), *Multiscale damage-plasticity of geological materials*, Fall 2016-Fall 2017.
3. Chukwudi Chukwudozie (Louisiana State University, last known position: intern at Exxonmobil), *High-strain-rate responses of geomaterials*, Fall 2017-Spring 2018.
4. Qi Tong, PhD (Berkeley, last known position: associate professor at Fudan University), co-advised with Professor Huiming Yin, discrete element simulations of granular mixing, Summer 2016-Fall 2016.

Graduate Students (past team members)

1. Kun Wang, PhD student, *From multiscale modeling to meta-modeling of fluid-infiltrating porous media*. Spring 2015-Spring 2019 (now postdoctoral research scientist at T-3 group of Los Alamos National Laboratory.
2. SeonHong Na, PhD student (now assistant professor in the department of civil and environmental engineering at McMaster University), *Multiscale thermo-hydro-mechanical-chemical coupling effects for fluid-infiltrating dual-porosity crystalline solids and geomaterials: theory, implementation, and validation*. Fall 2014- 2018.
3. Yang Liu, PhD graduate (now assistant professor in the department of mechanical and industrial engineering at Northeastern University), *Modeling shear bands with multiscale DEM-FEM coupling method in loose and dense grain assemblies*. Spring 2014-Summer 2015.
4. Alberto Martini, MS graduate, *Computational plasticity for reconsolidated rock salt*, Fall 2016-December 2016 (now Eng.ScD student in Professor Maria Feng's group).
5. Weiyi Li, PhD student, *Particulate methods for unsaturated granular materials*, Fall 2016-Spring 2017 (now PhD student in Porfessor Marco Giometto's group).
6. Zhijun Cai, MS graduate, *Adaptive Arlequin Mechanics*. Fall 2014-Spring 2016 (last known employment, CFD engineer at Schuco USA).
7. Qi Wang, MS graduate, *Microstructural attributes and effective conductivity of Fontainebleau sandstone*. Spring 2014-Spring 2015 (now structural engineer at Patuxent Engineering Group).
8. Xian Zhang, MS student, *Multi-phase field method for fluid-driven fractures*. Fall 2015-Spring 2016 (now PhD student in Martin Ostoja-Starzewski's research group at UIUC).
9. Francisco J. Contreras, MS student, *Membrane effect on triaxial compression tests*. Fall 2015-Summer 2016.

Undergraduate Researchers

1. Tracy Paltoo, Undergraduate research student, *wettability of porous media*. Fall 2018.
2. Imer Jasiel del Cid, Undergraduate research student, *Micro-structural attributes of sandstone with low porosity*. Fall 2014-Spring 2015 (now engineer at Boeing).
3. Efram J. Stone, Undergraduate research student, *Micro-structural attributes of sandstone with low porosity*. Summer 2014 (now master student at University of Southern California).
4. Steven M. Lowinger, Undergraduate research student, *Application of graph theory for double-porosity system*, Fall 2015-current.
5. Ji Hoo Woo, Undergraduate research student, *Experimental mechanics of thawing soil*, Fall 2016-current

High School Summer Interns

1. Brooke Lauren (Mother Seton Regional High School), co-advised with PhD student Eric Bryant, *Army Educational Outreach Program*, Summer 2018.
2. Anish Avasthi (Woodlands High School), co-advised with PhD student Eric Bryant, *Army Educational Outreach Program*, Summer 2018.

Short Term Visiting Students (from other universities)

1. Alessandro Milleri (University of Perugia, Italy), Visiting student, *Undrained stress path of frozen sand*, 10/2018-03/2019.
2. Nico De Marchi (University of Padova, Italy), Visiting student, *Shear wave splitting in anisotropic rock*, 09/2018-02/2019.
3. Feng Du, (China University of Mining and Technology-Beijing, China), Visiting Student, *Digial rock physics for dual-porosity media*, 09/2018-09/2019.
4. Yingfeng Sun (China University of Mining and Technology-Beijing, China), Visiting Student, *Digial rock physics for dual-porosity media*, 09/2017-09/2018.
5. Xinran Zhong (Tongji University, China), Visiting Student, *Proper orthogonal decomposition method for poroelastic shell*, 9/2016-09/2018.
6. Haohui Xin (Tongji University, China), Visiting Student, *Multiscale modeling of selective laser sintering*, 9/2015-8/2017.
7. Xin Qin (Tsinghua University, China), Visiting Student, *Proper orthogonal method for dynamic responses of soil*, 9/2016-9/2017.
8. Yingfeng Sun (China University of Mining and Technology, China), Visiting Student, *Multiphase lattice-Boltzmann simulations of dual-porosity porous media*, 12/2016-12/2017.
9. Luca Tassini (University of Perugia, Italy), Visiting Student, *Climate-controlled undrained triaxial compression tests for freezing and thawing soils*, 2/2016-8/2016.
10. Federica Ronchi (University of Perugia, Italy), Visiting Student, *Thermo-hydro-mechanical coupling effect of thermal hardening/softening of soil*, 2/2015-6/2015.
11. Guang Liu (Wuhan University), Visiting Student, *Discrete Element Modeling of Hydraulic Fracture*, 9/2014-8/2015.
12. Zhilin Liu (Nanjing University of Science and Technology), *Meshless method for predicting off-road mobility of vechicle*, 9/2015-9/2016.
13. Ning Liu (Bei-Hang University), *Microstructural modeling of reconsolidated salt*, 9/2015-10/2016.
14. Fadi Abdelijawad (Princeton University), Summer Internship at Sandia National Laboratories (co-advised with Dr. James W Foulk, III), *Localized diffusion in hydrogen embrittled steel*. Summer 2012.

Service to University and Scientific Communities

Technical Committee and Editorial Board Membership

- Associate Editor, Computer Modeling in Engineering and Sciences, 2018-current.
- Editorial Board Member, International Journal for Multiscale Computational Engineering, 2016-current.
- Guest Editor (Computational Poromechanics), International Journal for Multiscale Computational Engineering, 2016.
- Guest Co-editor, with Gregory Wagner (Northwestern) and Miugel Bessa (TU Delft), Data-driven computational Modeling and simulations, Computer Modeling in Engineering and Sciences, 2018.

- Guest Co-editor, with Christian Linder (Stanford) and Leon Mishnaevsky (TU Denmark), Multiscale Multiphysics modeling of materials, International Journal for Multiscale Computational Engineering, 2018.
- Committee Member, ASCE Engineering Mechanics Technical Committee (Computational Mechanics, Granular Mechanics, Elasticity, Poromechanics), 2015-current.
- Committee Member, ASCE Geo-institute, Computational Geotechnics Committee, 2016-current.

Reviewer of the following peer-reviewed journal articles

- Acta Geotechnica
- ASCE Journal of Engineering Mechanics
- ASCE Journal of Geotechnical and Geoenvironmental Engineering
- Computer and Geotechnics
- Computational Particle Mechanics
- Computational Mechanics
- Computer Methods in Applied Mechanics and Engineering
- European Journal of Mechanics A/Solids
- European Journal of Civil Engineering
- Finite Element Analysis and Design
- Granular Matters
- Géotechnqiue
- International Journal of Fracture
- International Journal for Multiscale Computational Engineering
- International Journal for Numerical and Analytical Methods in Geomechanics
- International Journal for Numerical Methods in Engineering
- International Journal of Solids and Structures
- International Journal of Plasticity
- International Journal of Solids and Structures
- Journal of Computational Physics
- Journal of Fluid Mechanics
- Journal of Geophysical Research (Solid Earth)
- Journal of the Mechanics and Physics of Solids
- Meccanica
- Mechanics Research Communications
- Nature Scientific Reports
- Soil Dynamics and Earthquake Engineering
- the Geological Society of America Bulletin

Reviewer for the conferences and professional meeting

- 51th US Rock Mechanics/Geomechanics Symposium, San Francisco, 2017.
- Engineering Mechanics Institute International Conference, Hong Kong, 2015.
- Engineering Mechanics Institute Conference, Stanford, California, 2015.
- ASCE GeoFlorida 2010: Advances in Analysis, Modeling and Design, Florida, 2010.

Reviewer of grant proposals for the following agencies (as ad-hoc reviewers or panel members)

- U.S. Army Corps of Engineers
- U.S. Army Research Laboratories
- US Army Research Office
- U.S. National Science Foundation (Division of Civil, Mechanical and Manufacturing Innovation, Division of Earth Sciences)
- U.S. Department of Energy
- Columbia University
- Hong Kong Research Council
- Germany Research Foundation (Deutsche Forschungsgemeinschaft)
- European Union Liaison Office (Cellule Europe)

Organizer or co-organizer of domestic and international conferences and professional meetings

- Lead organizer ,Mini-symposium on Computational Geomechanics, 15th US National Congress on Computational Mechanics, Austin, Texas (2019).
- Co-organizer ,Mini-symposium on Crystalline and Anisotropic Rock Mechanics, Engineering Mechanics Institute Conference, Caltech, Pasadena (2019).
- Co-organizer, Mini-symposium on Computational Geomechanics, Engineering Mechanics Institute Conference, Caltech, Pasadena (2019).
- Co-organizer, Mini-symposium on Additive Manufacturing and Digital Rock Physics for Granular and Fractured Materials, 20th International Conference on Fluid Flow Problems (FEF-2019), Northwestern University, Evanston (2019).
- Member, Organizing Committee, 5th Rock Mechanics/Geomechanics Symposium, New York City (2019).
- Member, Organizing Committee, 5th International Workshop on Rock Physics, Hong Kong (2019).
- Co-organizer, Damage Mechanics Challenge Workshop, Purdue University (2019).
- Member, Scientific Organizing Committee, 15th US National Congress on Computational Mechanics, Austin, Texas (2019).
- Member, Scientific Organizing Committee, Engineering Mechanics Institute Conference, Caltech, Pasadena (2019).
- Co-chair, Geomechanics and Geomaterials Track, Engineering Mechanics Institute Conference, Caltech, Pasadena (2019).
- Chair, Planning Team, Workshop on Verification and Validation of Computational Models Associated with the Mechanics of Materials, the Minerals, Metals and Materials Society (2018).
- Chair, Local organization committee of World Congress of Computational Mechanics, New York (2018).
- Lead organizer, Minisymposium on Computational Geomechanics, Computational Geomechanics Mini-symposium at Engineering Mechanics Institute Conference, Boston (2018).
- Lead organizer, Computational Geomechanics Mini-symposium at 18th US National Congress of Theoretical and Applied Mechanics, Northwestern University (2018).
- Co-organizer, International Symposium on Multiscale Computational Analysis of Complex Materials, Copenhagen/Lyngby, Denmark (2017).
- Primary convener, Data-driven and theoretical approaches for modeling, prediction, analysis of thermo-hydro-mechanical behaviors of frozen soil and rocks, AGU Fall Meeting 2017 (2017).
- Lead organizer, Computational Geomechanics Mini-symposium at 14th US National Congress on Computational Mechanics, Montreal, Canada (2017).

- Lead organizer, Computational Geomechanics Mini-symposium at Engineering Mechanics Institute Conference, San Diego (2017).
- Co-organizer, Mini-symposium on Fluid- and chemical-driven fractures of porous media, AGU Fall Meeting, San Francisco (2016).
- Lead Organizer, Failure and instabilities in soft materials and geomaterials Mini-symposium at the 7th International Conference on Computational Methods, Berkeley (2016).
- Co-organizer, Mini-symposium on Multiscale multiphysical process in fractured rock and modeling of coupled transport phenomena in fracture networks, AGU Fall Meeting, San Francisco (2016).
- Co-organizer,Symposium on Computational Mechanics of Materials and Structures, University of Maryland, College Part Marriott Hotel and Conference Center (2016).
- Lead organizer, Computational Geomechanics Mini-symposium at Engineering Mechanics Institute Conference, Vanderbilt University, Nashile (2016).
- Lead organizer, Digital Rock and Granular Physics, Engineering Mechanics Institute Conference, Stanford University (2015).
- Lead organizer, Multiscale Modeling of Granular Materials, 13th US National Congress on Computational Mechanics, San Diego (2015).
- Lead organizer, Multiphysical Modeling of Geomaterials, 13th US National Congress on Computational Mechanics, San Diego (2015).
- International scientific committee member of the Engineering Mechanics Institute International Conference at Hong Kong Polytechnic University (2015).
- Lead organizer, Digital Rock Physics, 3D printing and More, Mineral and Rock Physics Sessions, AGU 2014 Fall Meeting, San Francisco (2014).
- Lead organizer, Computational Geomechanics Mini-symposium at United States National Congress of Theoretical and Applied Mechanics at Michigan State University (2014).

Thesis Defense and Examination Committees

- PhD graduate candidate at Columbia University (as primary advisor)
  - Yang Liu, Civil Engineering and Engineering Mechanics, August 2015.
  - SeonHong Na, Civil Engineering and Engineering Mechanics, July 2018.
  - Kun Wang, Civil Engineering and Engineering Mechanics, October 2018.
- PhD graduate candidate at Columbia University (not served as primary advisor)
  - Daniel Marasco, Civil Engineering and Engineering Mechanics, May 2014.
  - Abdulhamit Sarac, Mechanical Engineering, May 2014.
  - Lingqi Yang, Civil Engineering and Engineering Mechanics, December 2014.
  - Shuoshuo Han, Earth and Environmental Science, January, 2015.
  - Raha Hakimdavar, Civil Engineering and Engineering Mechanics, January 2016.
  - Zifeng Yuan, Civil Engineering and Engineering Mechanics, January 2016.
  - Po-Chieh Liu, Civil Engineering and Engineering Mechanics, June 2016.
  - Nan Lu, Civil Engineering and Engineering Mechanics, August 2016.
  - Mostafa Mobasher, Civil Engineering and Engineering Mechanics, May, 2017.
  - Dimitrios Fafalis, Civil Engineering and Engineering Mechanics, September 2017.
  - Lei Xu, Civil Engineering and Engineering Mechanics, November 2017.
  - Nandan Hara Shetty, Civil Engineering and Engineering Mechanics, November 2017.
  - Yang Jiao, Civil Engineering and Engineering Mechanics, January 2018.
  - Breannan Smith, Computer Science, February 2018.
  - Yunzhe Tao, Applied Mathematics, November, 2018.
  - Siyan Wang, Civil Engineering and Engineering Mechanics, 2018.

- Thesis Committee and External Reader
  - Ritesh Gupta, experimental investigation on 3D printed particles to study grain geometry effect on mechanical response (MS Thesis), Universit'e Grenoble Alpes, June 2016.
  - Ines Wollny, ALE formulation of inelastic temperature-dependent and fluid-infiltrated layered pavement structures at loading by steady state rolling tires, January 2018.

Department Committee and Service to University

- Member, Faculty Search Committee, Department of Civil Engineering and Engineering Mechanics, 2016.
- Member, Graduate Admission Committee, Department of Civil Engineering and Engineering Mechanics, 2016-current.
- Academic Advisor, Master Students in Civil Engineering and Construction Management Concentrations, Department of Civil Engineering and Engineering Mechanics, 2014-current.
- Guest Lecturer, Inside Engineering Lab Visits (for Academy of the Holy Angels from New Jersey), 2017.

Professional and Honor Society Membership

Member, GAMM Gesellschaft für Angewandte Mathematik und Mechanik, 2016-current

Member, Engineering Mechanics Institute, 2014-current

Member, American Society of Civil Engineers, 2014-current

Member, American Society of Mechanical Engineers, 2014-current

Member, International Society of Porous Media, 2014-current

Member, Sigma Xi the scientific research society, 2013-current

Member, American Geophysical Union, 2010-current

Member, UC Davis Chapter, the Honor Society of Phi Kappa Phi, since 2003

Member, California Lambda Chapter, Tau Beta Pi Engineering Honor Society, since 2003

Member, UCAD Chapter, Golden Key International Honor Society, since 2003

Technical Skills

Programming language: Proficient in C++, FORTRAN, MATLAB and Python.

Operation system: UNIX, Red Hat Enterprise, Fedora, Windows and Macintosh.

Software: ABAQUS, ANSYS, ImageJ, OpenSees, SHAKE and MATLAB.

Language: Chinese and American English.

Code development experience: mixed finite element method, constitutive modeling of geomaterials, lattice Boltzmann simulation, discrete element method and multiscale modeling, written in C, C++ and FORTRAN.

Collaborators and other affiliations

Collaborators, Co-editors or Organizers of Symposium: Jose E. Andrade (Caltech), Ronaldo I. Borja (Stanford), Qiushi Chen (Clemson University), George Deodatis (Columbia University), Thomas Dewers (Sandia National Laboratories), Peter Eichhubl (UT Austin), James W. Foulk (Sandia National Laboratories), Jacob Fish (Columbia University), Craig Foster (University of Illinois at Chicago), Mathew Ingraham (Sandia National Laboratories), Boris Jeremic (UC Davis), Peter Kelemen (Columbia University), Matthew Kuhn (University of Portland), Hoe I. Ling (Columbia), Moo Lee (Sandia National Laboratories), Nicolas Lenoir (Université Paris-Est, France), Kevin N. Long (Sandia National Laboratories), Mario J. Martinez (Sandia National Laboratories), Alejandro Mota (Sandia National Laboratories), Jakob T. Ostien (Sandia National Laboratories), Roger Buck (Columbia University), John W. Rudnicki (Northwestern), Simon Salager (Université de Joseph Fourier), Andrew G. Salinger (Sandia National Laboratories), Marcelo Sanchez (Texas A&M University), Heather Savage (Columbia), Marc Spiegelman (Columbia), Claudio Tamagnini (University of Perugia, Italy), Cian Wilson (Columbia), Ines Wollney (Technical University of Dresden), Teng-fong Wong (Chinese University of Hong Kong, Hong Kong), Honghku, Yoon (Sandia National Laboratories), Huiming Yin (Columbia University), Yin Lu Young (University of Michigan, Ann Arbor). Jidong Zhao (Hong Kong University of Science & Technology).

Postdoctoral and PhD advisers: Jose Andrade (Northwestern, now Caltech), John Rudnicki (Northwestern), James W. Foulk (Sandia), Jakob Ostien (Sandia), Alejandro Mota (Sandia)

Former postdocotoral and PhD advisees: Yang Liu (Northeastern), SeonHong Na (McMaster), Jinhyun Choo (University of Hong Kong)