# Jiaoyan Li, Ph.D.

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Department of Mechanical and Aerospace Engineering
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## Expertise

**Solid Mechanics and Material Science (10+ years)**

- Theories: Continuum theory; Micro-continuum Field theories; Nonlocal theory
- Areas: Fracture Mechanics; Nanomechanics; Biomechanics

**Multiscale Modeling and Simulation (8+ years)**

- Nanoscale: Molecular Dynamics (MD); Monte Carlo (MC) Method
- Mesoscale: Dissipative Particle Dynamics (DPD)
- Macroscale: Finite Element & Finite Volume Method (FEM & FV); Discrete Element Method (DEM)

**Parallel and Distributed High-Performance Computing (5+ years)**

- Language: C/C++; Fortran; MPI; Adaptive MPI; CUDA; OpenACC; MATLAB
- Skills: Code profiling & debugging

## Professional Experience

**Assistant Professor**, Sep. 2020 – Present

Dept. of Mechanical and Aerospace Engineering, University at Buffalo, Buffalo, NY

**Postdoctoral Associate**, Apr. 2018 – Aug. 2020

Energy and Environment Sci. & Technology, Idaho National Laboratory, Idaho Falls, ID

**Hibbitt Engineering (Postdoctoral) Fellow**, Jul. 2015 – Mar. 2018

School of Engineering, Brown University, Providence, RI

**Lecturer** Jan. 2013 –– May 2015

Dept. of Mechanical Engineering, George Washington University, Washington DC

# Education

**Ph.D., Solid Mechanics and Material Science, May 2015**

George Washington University, Washington DC, USA

Advisor: Dr. James D. Lee

Dissertation Title: "Multiscale Modeling of Multiphysics: From Atoms to Continuum"

**M.S., Solid Mechanics, May 2009**

Xi'an Jiaotong University, Xi'an, China

Advisor: Dr. Tiejun Wang

Thesis Title: "Bending, Buckling and Free Vibration of Functionally Graded Metallic Foam"

**B.S., Engineering Mechanics, May 2006**

Dalian University of Technology, Dalian, China

Advisor: Dr. Haoran Chen

Thesis Title: "Vibrational Behaviors of Multi-layer Composite Plate with Delaminations"

# Honors and Awards

- **ICTAM Early Career Travel Fellowship**, **National Academy of Science**, 24th International Congress of Theoretical and Applied Mechanics (ICTAM 2016), Montreal, Canada, August 22-26, 2016
- **The Best Poster Award**, 12th U.S. National Congress on Computational Mechanic (USNCCM 12), Raleigh, North Carolina, July 22-25, 2013
- **First Prize Winner**, SEAS R&D showcase in the George Washington University, 2013
- **First Prize Winner**, The George Washington University Research Day, Engineering and Applied Science Category, 2013
- **Grant Support**, National Science Foundation Summer Institute on Nano Mechanics and Materials, Boston, 2012

## Publications (Google Scholar profile)

### Book

**25.** James D. Lee, Jiaoyan Li, "Advanced Continuum Theories and Finite Element Analyses", World Scientific, 2020, ISBN-13: 978-9811201486.

### Book Chapters

**24.** Teng Zhang, Bo Ni, Jiaoyan Li, Xiaoyan Li, and Huajian Gao*, "Topological Design in Graphene" in "Handbook of Graphene: Physics, Chemistry, and Biology", Wiley-Scrivener, 2018, ISBN-13: 978-1119469599.

**23.** James D. Lee*, Jiaoyan Li, Zhen Zhang, and Leyu Wang, "Sequential and Concurrent Multiscale Modeling of Multiphysics: From Atoms to Continuum" in "Micromechanics and Nanomechanics of Composite Solid", Springer, 2018, ISBN-13: 978-3319527932.

**22.** Kerlin P. Robert, Jiaoyan Li, and James D. Lee*, "Multiscale Modeling of 2D Materials MoS2 from Molecular Dynamics to Continuum Mechanics" in "Generalized Models and Non-classical Approaches in Complex Materials 2", Springer, 2018, ISBN-13: 978-3319775036.

**21.** James D. Lee*, Jiaoyan Li, Zhen Zhang, and Kerlin P. Robert, "Multiphysics in Molecular Dynamics Simulation" in "Numerical Methods in Mechanics of Materials: with Applications from Nano to Macro Scale", CRC Press, 2017, ISBN-13: 978-1138719163.

**20.** James D. Lee*, Jiaoyan Li, Zhen Zhang, and Kerlin P. Robert, "Multiscale Modeling from Atoms to Genuine Continuum" in "Numerical Methods in Mechanics of Materials: with Applications from Nano to Macro Scale", CRC Press, 2017, ISBN-13: 978-1138719163.

**19.** Xianqiao Wang, Jiaoyan Li, James D. Lee*, and Azim Eskandarian, "A Multiscale Modeling of Multiphysics" in "Handbook of Micromechanics and Nanomechanics", Pan Stanford Publishing, 2013, ISBN-13: 978-9814411233.

**18.** Lijie Grace Zhang*, Jiaoyan Li, and James D. Lee, "Nanotechnology for Cartilage and Bone Regeneration" in "Nanomedicine: Technologies and Applications", Woodhead Publishing, 2012, ISBN-13: 978-0857092335.

**Referred Journal Articles**

**17.** Qi Rao*, Yidong Xia*, Jiaoyan Li, Milind Deo, and Zhen Li*, “Flow Reduction of Hydrocarbon Liquid in Silica Nanochannel: Insight from many-body dissipative particle dynamics simulations”, Journal of Molecular Liquids, Vol 344, Pages 117673:1-23, 2021.

**16.** Qi Rao, Yidong Xia*, Jiaoyan Li, Zhen Li*, Joshua McConnell, and James Sutherland, “A modified many-body dissipative particle dynamics model for mesoscopic fluid simulation: methodology, calibration, and application for hydrocarbon and water”, Molecular Simulation, Vol 47(4), Pages 363-375, 2020.

**15.** Jiaoyan Li, Qi Rao, Yidong Xia*, Michael Hoepfner, and Milind Deo, “Confinement-Mediated Phase Behavior of Hydrocarbon Fluids: Insights from Monte Carlo Simulations”, Langmuir, Vol 36(26), Pages 7277-7288, 2020.

**14.** Jiaoyan Li, Kerlin P. Robert, and James D. Lee*, “Micromorphic Theory and Its Finite Element Formulation”, Acta Mechanica, Vol 231(4), Pages 1253-1284, 2020.

**13.** Hao Sun, Timothy Eswothy, Kerlin P. Robert, Jiaoyan Li, Lijie Grace Zhang, and James D. Lee*, “Experimental and Theoretical Studies of Tumor Growth”, Journal of Micromechanics and Molecular Physics, Vol 4(3), Pages 1950004:1-22, 2019.

**12.** Jiaoyan Li, Bo Ni, Teng Zhang, and Huajian Gao*, “Phase Field Crystal Modeling of Grain Boundary Structure and Formation in Graphene”, Journal of the Mechanics and Physics of Solids, Vol 120, Pages 36-48, 2018.

**11.** Kerlin P. Robert, Jiaoyan Li, and James D. Lee*, “Simulation of Tumor Growth”, International Journal of Terraspace Science and Engineering, Vol 9(1), Pages 13-20, 2017

**10.** Kerlin P. Robert, Jiaoyan Li, and James D. Lee*, “Finite Element Analysis of 4D Printing”, International Journal of Terraspace Science and Engineering, Vol 9(1), Pages 35-39, 2017.

**9.** Leyu Wang, Jiaoyan Li, and James D. Lee*, “Work Conjugate Strain of Virial Stress”, International Journal of Smart and Nano Materials, Vol 7(1), Pages 39-51, 2016.

**8.** James D. Lee*, Jiaoyan Li, and Zhen Zhang, “Material Force in Micromorphic Plasticity”, Archive of Applied Mechanics, Vol 84 (9), Pages 1453-1464, 2014.

**7.** Benjamin Holmes, Wei Zhu, Jiaoyan Li, James D. Lee, and Lijie Grace Zhang*, "Development of Novel Three-dimensional Printed Scaffolds for Osteochondral Regeneration", Tissue Engineering Part A, Vol 21(1-2), Pages 403-415, 2014.

**6.** Jiaoyan Li*, and James D. Lee, "Reformulation of Nosé-Hoover Thermostat for Heat Conduction Simulation at Nanoscale", Acta Mechanica, Vol 225(4), Pages 1223-1233, 2014.

**5.** Jiaoyan Li*, and James D. Lee, "A Stiffness-Based Coarse-Grained Molecular Dynamics", Journal of Nanomechanics and Micromechanics, Vol 4(3), Pages B4013002-1/6, 2013.

**4.** Jiaoyan Li, Xianqiao Wang, and James D. Lee*, "Multiple Time Scale Algorithm for Multiscale Material Modeling", Computer Modeling in Engineering and Sciences, Vol 85(5), Pages 463-480, 2012.

**3.** Jiaoyan Li, James D. Lee*, and Ken P. Chong, "Multiscale Analysis of Composite Material Reinforced by Randomly-Dispersed Particles", International Journal of Smart and Nano Material, Vol 3(1), Pages 2-13, 2012.

**2.** Zhen Zhang*, Xianqiao Wang, and Jiaoyan Li, "Simulation of Collisions of Buckyballs and Graphene Sheets", International Journal of Smart and Nano Material, Vol 3(1), Pages 14-22, 2012.

**1.** Guixiu Ji, Jiaoyan Li, and Haoran Chen*, "Effect of Multiple Delamination on Free Vibration Characteristic for Composite Laminates", Acta Materiae Compositae Sinica, Vol 24(4), Pages 161-165, 2007.

## Technical Presentations

**10.** (Keynote) Jiaoyan Li and James D. Lee, "Micromorphic Theory (MMT): An Overview and Recent Development to Electromagnetic Materials", 16th U.S. National Congress on Computational Mechanics (USNCCM16), July 28, 2021, A Virtual Event.

**9.** Jiaoyan Li, Yidong Xia, and Hai Huang, "The Coupled DEM-FVM Method for Complex Fracturing of Tight Rocks under Thermal and Hydraulic Stimulations", 2019 Engineering Mechanics Institute and Geo Institute Specialty Conference, June 18-21, 2019, California Institute of Technology, CA, USA.

**8.** Jiaoyan Li, Yidong Xia, Sam White, and Laxmikant Kale, “Adaptive MPI for LAMMPS”, The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC18), November 14th, 2018, Dallas, Texas, USA

**7.** (invited talk) Jiaoyan Li, “Multiscale Modeling of Multi-physics for Nano/Bio/Smart Materials”, February 26, 2015, University of Nevada, Reno, NV, USA.

**6.** (invited talk) Jiaoyan Li, “Multiscale Modeling of Multi-physics for Nano/Bio/Smart Materials”, January 22, 2015, University of Massachusetts, Dartmouth, MA, USA.

**5.** Jiaoyan Li, Bo Ni, and Huajian Gao, “Topological Design of Graphene with Enhanced Fracture Toughness”, 24rd International Congress of Theoretical and Applied Mechanics, August 21-26, 2016, Montreal, Canada.

**4.** Jiaoyan Li, and James D. Lee, “Application of Nonlocal Theories to Dispersion of Wave Propagation”, 22nd International Workshop on Computational Mechanics of Materials, September 24-26, 2012, Baltimore, MD, USA.

**3.** Jiaoyan Li, and James D. Lee, “Micropolar Theory and its Application to Nematic Liquid Crystal”, 23rd International Congress of Theoretical and Applied Mechanics, August 19-24, 2012, Beijing, China.

**2.** Jiaoyan Li, Xianqiao Wang and James D. Lee. "Multiple Length/Time Scale Modeling from Atoms to Continua", 2011 ASME International Mechanical Engineering Congress & Exposition, Nov 11-17, 2011, Denver, USA.

**1.** Jiaoyan Li, James D. Lee and Ken P. Chong. "Mechanics of Composite Material Reinforced by Randomly-Dispersed Particles", Proceedings of 11th US National Congress on Computational Mechanics, July 25-29, 2011, Minnesota, USA.

## Professional Activities

### Leadership

- Guest editor, Special Issue on Professor Eringen’s Centennial Anniversary, Journal of Micromechanics and Molecular Physics, 2021.

### Conferences

- Co-organizer, Minisymposia “Multiscale Methods and Mechanics of Soft Matter and Hierarchical Materials”, 19th U.S. National Congress on Theoretical and Applied Mechanics (USNCTAM2022), June 19-24, 2022.
- Co-organizer, Minisymposia “Multiphysics and Multiscale Modeling in Mechanics of Materials”, 18th U.S. National Congress for Theoretical and Applied Mechanics (USNCTAM2018), June 4-9, 2018.
- Co-organizer, Minisymposia “Multiscale Modeling and Characterization of Multiphysics for Nano, Bio and Smart Materials” at 13th U.S. National Congress on Computational Mechanics (USNCCM13), 2015.

**Invited Reviewer of Peer-reviewed Journals (in alphabetical order)**

- Acta Mechanica
- Applied Mathematics and Mechanics
- Archives of Mechanics
- Computational Material Science
- Computers and Fluids
- Continuum Mechanics and Thermodynamics
- Engineering Computations
- Engineering Fracture Mechanics
- International Journal of Damage Mechanics
- International Journal of Fracture
- Journal of Applied Mechanical Engineering
- Journal of Geology and Geophysics
- Journal of Materials Research
- Journal of Material Science
- Journal of the Mechanics and Physics of Solids
- Journal of Nanomechanics and Micromechanics
- Journal of Nanoengineering and Nanosystem

**Membership in Professional and Honor Societies**

- U.S. Association of Computational Mechanics, Member
- Society of Engineering Science, Member

**University Service**

- MAE Department:
    - Student Advising (6 undergraduate students), Jan. 2021 -- Present
- SEAS School Committees:
    - Scholarship Review Committee (87 applications), Sep. 2021 -- Present