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Education:

Massachusetts Institute of Technology	Civil and Environmental Engineering	Ph.D. in Structures and Materials, 2013, thesis “Structural and mechanical properties of intermediate filaments under extreme conditions and disease”
Tsinghua University	Engineering Mechanics	M.Eng., 2008
Tsinghua University	Engineering Mechanics	B. Eng., 2006

Professional Experience:

2019-present	Assistant Professor, Civil and Environmental Engineering, Syracuse University
2013-2019	Research Scientist, Civil and Environmental Engineering, MIT
2013	Postdoctoral Teaching Fellow for class 3.021J/1.021J/10.333J/18.361J/22.00J “Introduction to Modeling and Simulation”, Civil and Environmental Engineering, MIT
2013	Postdoctoral Associate, Laboratory for Atomistic and Molecular Mechanics, Department of Civil and Environmental Engineering, MIT
2008-2013	Research Assistant, Laboratory for Atomistic and Molecular Mechanics, Department of Civil and Environmental Engineering, MIT
2005-2008	Research Assistant, Laboratory of Failure Mechanics in Engineering Mechanics, Tsinghua University
2004-2005	Graduate Research Assistant, Laboratory of Turbulence in Engineering Mechanics, Tsinghua University

Publications ([Google Scholar](#) link, total citation: 2471, H-index: 30)

1. Jinrong Wu, **Zhao Qin** (Corresponding author), Liangliang Qu, Hao Zhang, Fei Deng, Ming Guo, Natural hydrogel in American lobster: a soft armour with high toughness and strength, *Acta Biomaterialia*, Vol 88, pp. [102-110](#)
2. Isabelle Su, **Zhao Qin** (co-first author), Toma’s Saraceno, Adrian Krell, Roland Muhlethaler, Ally Bisshop and Markus J. Buehler (2018), Imaging and analysis of a three-dimensional spider web architecture, *Journal of the Royal Society Interface*, [DOI: 10.1098/rsif.2018.0193](#)
3. Yimo Han, Ming-Yang Li, Gang-Seob Jung, Mark A. Marsalis, **Zhao Qin**, Markus J. Buehler, Lain-Jong Li, David A. Muller (2018), Sub-Nanometer Channels Embedded in Two-Dimensional Materials, *Nature Materials*, Vol. 17, pp [129-133](#)
4. **Zhao Qin**, Markus Buehler (2018), Hierarchical nanostructures for functional materials

- (editorial), *Nanotechnology*, Vol. 29, paper #: [280201](#)
5. Enlai Gao, Shao-Zhen Lin, **Zhao Qin**, Markus J Buehler, Xi-Qiao Feng, Zhiping Xu (2018), Mechanical exfoliation of two-dimensional materials, *Journal of the Mechanics and Physics of Solids*, Vol. 115, pp. [248-262](#)
 6. **Zhao Qin**, Gang Seob Jung, Min Jeong Kang, Markus J. Buehler (2017), The mechanics and design of light-weight three-dimensional graphene assembly, *Science Advances*, Vol. 3, paper #: [e1601536](#)
 7. Shengjie Ling, **Zhao Qin** (co-first author), Wenwen Huang, Sufeng Chao, David L. Kaplan, Markus J. Buehler (2017), Biomimetic multilayer water purification membranes, *Science Advances*, Vol. 3, paper #: [e1601939](#)
 8. Weinan Xu, **Zhao Qin**, Chun-Teh Chen, Hye Rin Kwag, Qinli Ma, Anjishnu Sarkar, Markus J. Buehler, David H. Gracias (2017), Ultra-thin thermo-responsive self-folding 3D graphene, *Science Advances*, Vol. 3, paper #: [e1701084](#)
 9. Chia-Ching Chou, Francisco J. Martin-Martinez, **Zhao Qin**, Patrick B. Dennis, Maneesh K. Gupta, Rajesh R. Naik , and Markus J. Buehler (2017), Ion Effect and Metal-Coordinated Cross-Linking for Multiscale Design of Nereis Jaw Inspired Mechanomutable Materials, *ACS Nano*, Vol. 11, pp [1858–1868](#)
 10. Jared L. Zitnay, Yang Li, **Zhao Qin**, Boi-Hoa San, Baptiste Depalle, Shawn P. Reese, Markus J. Buehler, S. Michael Yu, and Jeffrey A. Weiss (2017), Molecular Level Detection and Localization of Mechanical Damage in Collagen Enabled by Collagen Hybridizing Peptides, *Nature Communications*, Vol 8, paper #: [14913](#)
 11. Cheng Zhang, Bo Li, Jing-Ying Tang, Xiao-Ling Wang, Zhao Qin and Xi-Qiao Feng (2017), Experimental and theoretical studies on the morphogenesis of bacterial biofilms, *Soft Matter*, Vol. 13, pp [7389-7397](#)
 12. Shengjie Ling, **Zhao Qin**, Chunmei Li, Wenwen Huang, David L. Kaplan, Markus J. Buehler (2017), Polymorphic, hierarchical, regenerated silk fibers assembled through bioinspired spinning, *Nature Communications*, Vol. 8, paper #: [1387](#)
 13. Yanlei Wang, **Zhao Qin** (Corresponding author), Markus J. Buehler, Zhiping Xu (2016), Intercalated Water Layers Promote Thermal Dissipation at Bio-Nano Interfaces, *Nature Communications*, Vol 7, paper #: [12854](#)
 14. Shanshan Wang, **Zhao Qin** (co-first author), Gang Seob Jung, Francisco J. Martin-Martinez, Kristine Zhang, Markus J. Buehler, Jamie H. Warner (2016), Atomically Sharp Crack Tip Propagation in Monolayer MoS₂, *ACS Nano*, Vol 10, pp. 9831–9839
 15. Shengjie Ling, Qiang Zhang, David L. Kaplan, Fiorenzo Omenetto, Markus J. Buehler and **Zhao Qin** (Corresponding author) (2016), Printing of stretchable silk membranes for strain measurements, *Lab on a Chip*, Vol 16, pp. [2459-2466](#)
 16. Grace X. Gu, Leon Dimas, **Zhao Qin**, Markus J. Buehler (2016), Optimization of composite fracture properties: method, validation, and applications, *Journal of Applied Mechanics*, Vol 83, paper #: [071006](#)
 17. Marta Pappalardo, Markus Buehler, Alessandro Chelli, Luca Cironi, Federica Pannacciulli and **Zhao Qin** (2016), Quantitative Estimates of Bio-Remodeling on Coastal Rock Surfaces, *Journal of Marine Science and Engineering*, Vol 4, paper #: [37](#)
 18. Flavia Libonati, Grace X. Gu, **Zhao Qin**, Laura Vergani, Markus J. Buehler (2016), Bone-inspired composite: Design, 3D printing and Testing, *Advanced Engineering*

- Materials*, Vol 18, pp. [1354-1363](#)
19. Grace Xiang Gu, Isabelle Su, Shruti Sharma, Jamie L Voros, **Zhao Qin**, Markus Buehler (2016), 3D-printing of bio-inspired composites, *JBME*, Vol 138, paper #: [021006](#)
 20. Patrick D. Boyer, Sairaam Ganesh, **Zhao Qin**, Brian D Holt, Markus J Buehler, Mohammad F Islam, Kris Noel Dahl (2016), Delivering Single-Walled Carbon Nanotubes to the Nucleus Using Engineered Nuclear Protein Domains, *ACS Appl. Mater. Interfaces*, Vol 8, pp. [3524-3534](#)
 21. Baptiste Depalle, **Zhao Qin**, Sandra J. Shefelbine and Markus J. Buehler (2016), Large Deformation Mechanisms, Plasticity and Failure of an Individual Collagen Fibril with Different Mineral Content, *Journal of Bone and Mineral Research*, Vol 31, pp. [380-390](#)
 22. **Zhao Qin**, Kai Jin, Markus J Buehler (2016), Molecular Modeling and Mechanics of Acrylic Adhesives on a Graphene Substrate with Roughness, *BioNanoScience*, Vol 6, pp. [177-184](#)
 23. **Zhao Qin**, Brett Compton, Jennifer A. Lewis and Markus J. Buehler (2015), Structural optimization of 3D-printed synthetic spider webs for high strength, *Nature Communications*, Vol 6, paper #: [7038](#)
 24. **Zhao Qin** (Corresponding author) and Markus J. Buehler (2015), Nonlinear Viscous Water at Nanoporous Two-Dimensional Interfaces Resists High-Speed Flow through Cooperativity, *Nano Letters*, Vol 15, pp [3939-3944](#)
 25. GangSeob Jung, **Zhao Qin**, Markus J. Buehler (2015), Mechanical Properties and Failure of Biopolymers: Atomistic Reactions to Macroscale Response, *Topics in Current Chemistry*, Vol 369, pp. [317-343](#)
 26. Talal Al-Mulla, **Zhao Qin** and Markus J Buehler (2015), Crumpling deformation regimes of monolayer graphene on substrate: a molecular mechanics study, *Journal of Physics: Condensed Matter*, Vol 27, paper #: [345401](#)
 27. **Zhao Qin**, Zhiping Xu and Markus J. Buehler (2015), Peeling Silicene from an Interface with Silver Substrates, *Journal of Applied Mechanics*, Vol 82, paper #: [101003](#)
 28. Sairaam Ganesh, **Zhao Qin**, Stephen T. Spagnol, Matthew T. Biegler, Kelli A. Coffey, Agnieszka Kalinowski, Markus J. Buehler, Kris Noel Dahl (2015), The tail domain of lamin B1 is more strongly modulated by divalent cations than lamin A, *Nucleus*, Vol 6, pp. [203-11](#)
 29. GangSeob Jung, **Zhao Qin**, Markus J. Buehler (2015), Molecular mechanics of polycrystalline graphene with enhanced fracture toughness, *Extreme Mechanics Letters*, Vol 2, pp. [52-59](#)
 30. Reza Mirzaeifar, Leon Dimas, **Zhao Qin**, Markus J. Buehler (2015), Defect-tolerant Bioinspired Hierarchical Composites: Simulation and Experiment, *ACS Biomaterials*, Vol 1, pp. [295-304](#)
 31. Reza Mirzaeifar, **Zhao Qin**, Markus J. Buehler (2015), Mesoscale Mechanics of Twisting Carbon Nanotube Yarns, *Nanoscale*, Vol 7, pp. [5435-5445](#)
 32. Baptiste Depalle, **Zhao Qin**, Sandra Shefelbine, Markus J. Buehler (2015), Influence of cross-links in the mesoscale deformation mechanisms of collagen fibrils, *JMBBM*, Vol 52, pp. [1-13](#)
 33. **Zhao Qin**, Michael Taylor, Mary Hwang, Katia Bertoldi and Markus J. Buehler (2014), Effect of wrinkles on the surface area of graphene: toward the design of nanoelectronics,

- Nano Letters*, Vol 14, pp. [6520–6525](#)
34. **Zhao Qin**, and Markus J. Buehler (2014), Molecular mechanics of mussel adhesion proteins, *Journal of the Mechanics and Physics of Solids*, Vol 62, pp. [19-30](#)
 35. Wen Yang, Vincent Sherman, Bernd Gludovatz, Mason Mackey, Elizabeth A. Zimmermann, Edwin H. Chang, Eric Schaible, **Zhao Qin**, Markus J. Buehler, Robert O. Ritchie, Marc A. Meyers (2014), Protective Role of Arapaima Scales: Structure and Mechanical Behavior, *Acta Biomaterialia*, Vol 10, pp. [3599-3614](#)
 36. Kai Jin, **Zhao Qin**, and Markus J. Buehler (2014), Molecular deformation mechanisms of the wood cell wall material, *JMBBM*, Vol 42, pp. [198–206](#)
 37. Reza Mirzaeifar, **Zhao Qin** and Markus J Buehler (2014), Tensile strength of carbyne chains in varied chemical environments and structural lengths, *Nanotechnology*, Vol 25, paper #: [371001](#)
 38. **Zhao Qin**, Nicola M. Pugno and Markus J. Buehler (2014), Mechanics of fragmentation of crocodile skin and other thin films, *Scientific Reports*, Vol 4, paper #: [4966](#)
 39. Max Solar, **Zhao Qin**, Markus J. Buehler (2014), Molecular Dynamics Simulations of Crosslinked Amorphous Polymer Adhesives, *Journal of Materials Research*. Vol 29, pp. [1077-1085](#)
 40. **Zhao Qin**, Leon Dimas, David Adler, Graham Bratzel, Markus J. Buehler (2014), Biological materials by design, *J. Phys.: Condens. Matter*, Vol 26, paper #: [073101](#)
 41. Agnieszka Kalinowski, Peter N. Yaron, **Zhao Qin**, Siddharth Shenoy, Markus J. Buehler, Mathias Lösche, Kris N. Dahl (2014), Interfacial binding and aggregation of lamin A tail domains associated with Hutchinson-Gilford progeria syndrome, *Biophysical Chemistry*, Vol 195, pp. [43–48](#)
 42. **Zhao Qin**, and Markus J. Buehler (2013), Impact tolerance in mussel thread networks by heterogeneous material distribution, *Nature Communications*, Vol 4, paper #: [2187](#)
 43. **Zhao Qin**, and Markus J. Buehler (2013), Webs measure up, *Nature Materials*, Vol 12 (3), pp. [185-187](#)
 44. Graham Bratzel, **Zhao Qin** and Markus J. Buehler (2013), Viscoelastic relaxation time and structural evolution during length contraction of spider silk protein nanostructures, *MRS Communications*, Vol 3, pp. [185-190](#)
 45. Agnieszka Kalinowski, **Zhao Qin**, Kelli Coffe, Ravi Kodali, Markus J. Buehler, Mathias Lösche, Kris Noel Dahl (2013), Calcium causes a conformational change in lamin A tail domain that promotes farnesylmediated membrane association, *Biophysical Journal*, Vol 104 (10), pp. [2246-2253](#)
 46. **Zhao Qin**, and Markus J. Buehler (2013), Bio-inspired graphene nano-gut, *Journal of Applied Mechanics*, Vol 80, paper #: [061009](#) (Best paper award of the year, ASME)
 47. **Zhao Qin**, Andrea Fabre and Markus J. Buehler (2013), Structure and mechanism of maximum stability of alpha helical protein domains at a critical length scale, *The European Physical Journal E*, Vol 36, paper #: [53](#).
 48. Greta Gronau, **Zhao Qin**, Markus J. Buehler (2013), Effect of sodium chloride on the structure and stability of spider silk's N-terminal protein domain, *Biomaterials Science*, Vol 1 (3), pp. [276-284](#) (Cover article)
 49. **Zhao Qin**, Alfonso Gautieri, Arun K. Nair, Hadass inbar, and Markus J. Buehler (2012), The thickness of hydroxyapatite nanocrystal controls the mechanical property of

- collagen-hydroxyapatite interface, *Langmuir*, Vol. 28 (4), pp. [1982-1992](#)
50. **Zhao Qin**, and Markus J. Buehler (2012), Cooperativity governs the size and structure of biological interfaces, *Journal of Biomechanics*, Vol 45 (16), pp. [2778-2783](#).
 51. **Zhao Qin**, and Markus J. Buehler (2012), Carbon dioxide enhances fragility of ice crystals, *Journal of Physics D: Applied Physics*, Vol. **45** (44), paper #: [445302](#)
 52. **Zhao Qin**, and Markus J. Buehler (2012), Computational and theoretical modeling of intermediate filament networks: structure, mechanics and related disease, *Acta Mechanica Sinica*, Vol. 28 (4), pp. [941-950](#)
 53. **Zhao Qin**, Markus J. Buehler (2012). Molecular mechanics of dihydroxyphenylalanine at a silica interface. *Applied Physics Letters*, Vol. 101 (8), paper #: [083702](#)
 54. Arun K. Nair, **Zhao Qin**, and Markus J. Buehler (2012), Cooperative deformation of carboxyl groups in functionalized carbon nanotubes, *International Journal of Solids and Structures*, Vol. 49 (18), pp. [2418-2423](#).
 55. **Zhao Qin**, and Markus J. Buehler (2012), Bioinspired design of functionalised graphene, *Molecular Simulation*, Vol. 38 (8), pp. [695-703](#)
 56. **Zhao Qin**, and Markus J. Buehler (2012), Mechanical property of crosslink controls the failure mechanism of intermediate filament network under tension, *Theoretical & Applied Mechanics Letters*, Vol. 2(1), paper #: [014005](#)
 57. **Zhao Qin**, Agnieszka Kalinowski, Kris Noel Dahl, Markus J. Buehler (2011), Structure and stability of the lamin A tail domain and HGPS mutant, *Journal of Structural Biology*, Vol. 175(3), pp. [425-433](#)
 58. **Zhao Qin** and Markus J. Buehler (2011). Flaw tolerance of nuclear intermediate filament lamina under extreme mechanical deformation, *ACS Nano*, Vol. 5(4), pp. [3034-3042](#)
 59. **Zhao Qin** and Markus J. Buehler (2011). Dynamic failure of a nuclear lamina meshwork under extreme mechanical deformation, *BioNanoScience*, Vol. 1(1), pp. [14-23](#)
 60. Melis Arslan, **Zhao Qin** and Markus J. Buehler (2011). Coiled-coil intermediate filament stutter instability and molecular unfolding, *Computational Methods in Biomechanics and Biomedical Engineering*, Vol. 14(5), pp. [483-489](#)
 61. **Zhao Qin**, Markus J. Buehler (2011). Structure and dynamics of human vimentin intermediate filament dimer and tetramer: Comparison between explicit and implicit solvent molecular dynamics, *Journal of Molecular Modeling*, Vol. 17(1), pp. [37-48](#)
 62. **Zhao Qin**, Markus J. Buehler (2010). Molecular Dynamics Simulation of the alpha-Helix to beta-Sheet Transition in Coiled Protein Filaments: Evidence for a Critical Filament Length Scale, *Physical Review Letters*, Vol. 104(19), paper #: [198304](#)
 63. **Zhao Qin**, Markus J. Buehler (2010). Cooperative deformation of hydrogen bonds in beta-strands and beta-sheet nanocrystals, *Physical Review E*, Vol. 82(6), paper #: [061906](#)
 64. Robert Kirmse, **Zhao Qin**, Carl M. Weinert, Andreas Hoenger, Markus J. Buehler, Laurent Kreplak (2010). Plasticity of Intermediate Filament Subunits, *PLoS ONE*, Vol. 5(8), paper #: [e12115](#)
 65. Jérémie Bertaud, **Zhao Qin** and Markus J. Buehler (2010). Intermediate filament-deficient cells are mechanically softer at large deformation: a multi-scale simulation study, *Acta Biomaterialia*, Vol. 6(7), pp. [2457-2466](#)
 66. **Zhao Qin**, Markus J. Buehler, Laurent Kreplak (2010). A multi-scale approach to understand the mechanobiology of intermediate filaments, *Journal of Biomechanics*, Vol.

43(1), pp. [15-22](#)

67. **Zhao Qin**, Laurent Kreplak, Markus J. Buehler (2009). Hierarchical Structure Controls Nanomechanical Properties of Vimentin Intermediate Filaments. *PLoS ONE*, Vol. 4(10), paper #: [e7294 Nano Werk](#)
68. **Zhao Qin**, Laurent Kreplak, Markus J. Buehler (2009). Nanomechanical properties of vimentin intermediate filament dimers, *Nanotechnology*, Vol. 20(42), paper #: [425101 Nanotech web](#),
69. Jérémie Bertaud, **Zhao Qin** and Markus J. Buehler (2009). Atomistically Informed Mesoscale Model of Alpha-Helical Protein Domains, *International Journal for Multiscale Computational Engineering*, Vol. 7(3), pp. [237-250](#)
70. Jérémie Bertaud, **Zhao Qin** and Markus J. Buehler (2009). Amino acid sequence dependence of nanoscale deformation mechanisms in alpha-helical protein filaments. *Journal of Strain Analysis*, Vol. 44(7), pp. [517-531](#)
71. **Zhao Qin**, Steven Cranford, Theodor Ackbarow, Markus J. Buehler (2009) Robustness-strength performance of hierarchical alpha-helical protein filaments, *International Journal of Applied Mechanics*, Vol. 1(1), pp. [85-112 \(Cover Article and Best paper of the year\) Nanotech-Now](#)
72. **Zhao Qin**, Xi-Qiao Feng, Jian Zou and Yajun Yin (2008). Molecular dynamics simulations of deformation and rupture of super carbon nanotubes under tension. *Journal of Nanoscience and Nanotechnology*, Vol. 8(12), pp. [6274-6282](#)
73. **Zhao Qin**, Jian Zou and Xi-Qiao Feng (2008), Influence of Water on the Frequency of Carbon Nanotube Oscillators, *Journal of Computational and Theoretical Nanoscience*, Vol. 5(7), pp. [1403-1407 \(Cover Article\)](#)
74. **Zhao Qin**, Qing-Hua Qin, Xi-Qiao Feng (2008), Mechanical property of carbon nanotubes with intramolecular junctions: Molecular dynamics simulations, *Physics Letters A*, Vol. 372(44), pp. [6661-6666](#)
75. **Zhao Qin**, Xi-Qiao Feng, Jian Zou, Yajun Yin and Shou-Wen Yu (2007). Superior flexibility of super carbon nanotubes: Molecular dynamics simulations. *Applied Physics Letters*, Vol. 91(4), paper #: [043108](#)

Book Chapters:

1. **Zhao Qin**, Chia-Ching Chou, Laurent Kreplak and Markus J. Buehler (2011). Structural mechanics and functional properties of intermediate filaments from the atomistic to the cellular scales. Chapter 4 in *Advances in Cell Mechanics*, Springer-Verlag.
2. Arun K. Nair, Flavia Libonati, **Zhao Qin**, Leon S. Dimas, and Markus J. Buehler (2014), "Mechanical and interface properties of biominerals: Atomistic to coarse grained modeling," Chapter 4 in *Biomineralization Handbook: Characterization of biomineral and biomimetic materials*, CRC Press.

Honors and Awards

- Best paper award in Journal of Applied Mechanics (ASME) for the paper "Bioinspired Graphene Nanogut" among papers published during 2012~2013.
- Outstanding Paper Award, ASME Global Congress on Nano Engineering for Medicine and Biology, Boston, MA, 2013
- Chinese Government Award For Outstanding Self-Financed Students Abroad, 2011, NY, 2011

- Scholarship, BioNanotechnology Summer Institute, UIUC, IL, 2011
- Finalist, Student Award “Y. C. Fung student paper on biomechanics, biophysics and biomateriomics”, EMI Annual Conference, Northeastern University, MA, 2011
- Best Paper Award, International Journal of Applied Mechanics (Imperial College Press) 2010
- NSF fellowship, short course “Mechanics of Soft Materials”, Chicago, IL, 2010
- Schoettler Graduate Fellowship, Civil and Environmental Engineering, MIT, 2010
- SAMSUNG Scholarship, Tsinghua University, China, 2007
- 2nd Rank National Scholarship, Tsinghua University, China, 2003

Grants as Co-PI

- MIT-Italy grant (\$20,000, Co-PI, ‘Development of Nanocomposite Piezoelectric Materials for Cochlear Sensory-Neural Stimulation’)
- MIT-CHINA grant (\$34,100, Co-PI, ‘Interfacial Engineering For Thermal Management in Nanoelectronics and Biological Materials’)
- MIT-Italy grant (\$19,250, Co-PI, ‘Assessing the Effect of Biota on Coastal Rock Surfaces: a Quantitative Approach’)
- Multidisciplinary University Research Initiative 2015 (\$378,277 MURI, FA95501510514, ‘Foldable and Adaptive Two Dimensional Electronics’, contribute to proposal design and writing)
- Defense University Research Instrumentation Program 2014 (\$354,500, DURIP, PAAFOSR20130001, ‘Merger of Computational Optimization and Additive Manufacturing for Functional Material Design’, contribute to proposal design and writing)
- NSF XSEDE supercomputing grant 2015 (Equivalent value \$269,425, Co-PI, ‘Bottom-up Materiomics Study of Hierarchical Protein Materials’)
- NSF XSEDE supercomputing grant 2014 (Equivalent value \$85,749, Co-PI, ‘Bottom-up Materiomics Study of Hierarchical Protein Materials’)

Teaching and Mentoring

Courses taught:

- Spring 2019, 1.013 “Senior Civil and Environmental Engineering Design (CAPSTONE)”.
- Spring 2019, 1.102 “Introduction to Civil and Environmental Engineering Design II”.
- Spring 2018, 1.102 “Introduction to Civil and Environmental Engineering Design II”.
- Spring 2017, 1.102 “Introduction to Civil and Environmental Engineering Design II”.
- Spring 2013, 3.021J/1.021J/10.333J/18.361J/22.00J “Introduction to Modeling and Simulation”.

Research mentorship: (2 Master’s students; 9 undergraduate students including 3 senior students for a capstone project; several K-12 students)

- Summer 2018, Research Mentor: MIT Summer Research Program (MSRP) senior student Jemaris Martes Villalobos
Project: “3D-Printed Graphene-like Structures”
Published in: a paper under preparation

- Summer 2016, Research Mentor: MIT-Concord Middle School four K-12 students and their teacher Douglas Shattuck
Project: “Complex web construction: a possible clue to mechanical properties”
Published in: “Complex Web Construction: Additional Clues to Mechanical Properties—An Investigation by Middle School Students in Collaboration with MIT and JEOL, USA”, *Microscopy and Microanalysis*, 2016, Vol 22, pp. 2090-2091

- Spring 2016, Thesis co-advisor: MIT Civil and Environmental Engineering Master of Engineering student, Min Jeong Kang
Master thesis: “High Performance Curtain Wall Mullion Section Design with Various Densities of Gyroid”
Published in: “The mechanics and design of light-weight three-dimensional graphene assembly”, *Science Advances*, 2017, Vol 3, paper #: e1601536

- Fall 2015, Research Mentor: MIT Undergraduate Research Opportunities Program (UROP) freshman student Jacob J Higgins
Project: “Automatic 3D scanning of 3D spider web”
Published in: “Imaging and analysis of a three-dimensional spider web architecture”, *Journal of the Royal Society Interface*, 2018, DOI: 10.1098/rsif.2018.0193

- Summer 2015, Research Mentor: MIT Undergraduate Research Opportunities Program (UROP) student Shruti Sharma and Jamie L Voros
Project: “3D printing of hydroxyapatite”
Published in: “3D-printing of bio-inspired composites”, *J Biomech Eng.*, 2016, Vol 138, pp. 0210061–02100616

- Summer 2015, Research Mentor: high school student Ersin Arioglu
Project: “Silk mechanics under ultralow temperature”
Published in: “Polymorphic, hierarchical, regenerated silk fibers assembled through bioinspired spinning”, *Nature Communications*, 2017 Vol. 8, paper #: 1387

- Summer 2015, Research Mentor for Research Scholar Institute (RSI): high school student Kristine Zhang
Project: “Fracture Mechanics of Monolayer MoS₂ using Molecular Dynamics” won top 10 award (10 out of 70)
Published in: “Atomically Sharp Crack Tip Propagation in Monolayer MoS₂”, *ACS Nano*, 2016, Vol 10, pp. 9831–9839

- Spring 2015, Research Mentor: MIT Civil and Environmental Engineering senior undergraduate students Santé Nyambo, Yvonne Wangare and Billy Ndengeyingoma
Project: senior CAPSTONE project “3D spider web scanning”
Published in: Final CAPSTONE report “Spider Web Investigation Digitalization Modeling and Simulation”

- Summer 2014, Research Mentor for RSI: high school student Phillip Yu and Berfin Gögercin
Project: “Modeling of the mechanics of spider web and its application to water filtering”
- Spring 2014, Thesis co-advisor: MIT Civil and Environmental Engineering Master of Engineering student, Bogdan Demian
Project: “3D spider web modeling and simulation”
- Spring 2014, Research Mentor: MIT Undergraduate Research Opportunities Program student Mary Hwang
Project: the wrinkling of graphene as a think membrane

Published in: “Effect of wrinkles on the surface area of graphene: toward the design of nanoelectronics”, *Nano Letters*, 2014, Vol 14, pp. 6520–6525
- Summer 2011, Research Mentor for RSI: high school student Hadass Inbar,
Project: “Atomistic model of the interface of collagen/hydroxyapatite in bone” won top 10 award (10 out of 70)
Published in: “The thickness of hydroxyapatite nanocrystal controls the mechanical property of collagen-hydroxyapatite interface”, *Langmuir*, 2012, Vol 28, pp. 1982-1992
- 2010-2011, Research Mentor: MIT Undergraduate Research Opportunities Program student Andrea Fabre
Project: “The crucial length of alpha helix with maximized mechanical stability”
Published in: “Structure and mechanism of maximum stability of alpha helical protein domains at a critical length scale”, *The European Physical Journal E*, 2013, Vol 36, paper #: 53

Selected Media Highlights

- “Image of the day: Scientists photograph a spider web in micron-scale glory”, [The Scientist](#), Sept. 19, 2018
- “Researchers design one of the strongest, lightest materials known”, [MIT NEWS](#), highlighted by [CNN](#), Jan. 6, 2017
- “Vacancy defects toughen up 2D materials”, [Nanotechweb](#), Oct. 18, 2016
- “How to power up graphene implants without frying cells”, [MIT NEWS](#), Sep. 23, 2016
- “Translating thought to print”, [MIT NEWS](#), highlighted by [Nature](#), May 15, 2015
- “Super-strong mussel fibers could inspire earthquake-proof buildings”, [MIT NEWS](#), highlighted by [Nature](#), July 23, 2013

Professional Service:

Recent conference organization:

- Scientific Committee of 1st International Conference on Materials, Mimicking, Manufacturing from and for Bio Application, Milan, Italy, June, 23, 2018
- Guest Editors of a topical issue of Nanotechnology (IOP, UK) focused on Hierarchical

Nanostructures, 2016-2017

- Symposium Chair, 7th World Congress of Biomechanics (WCB), Boston, July 6, 2014
- Session Organizer, ASME Global Congress on Nano Engineering for Medicine and Biology: Track 7: Natural, Biomimetic and Bioinspired Materials and Structures, Boston, MA, Feb. 6, 2013
- Chair, Engineering Mechanics Institute (EMI) Annual Conference: Symposium 5: Mechanics of Biological and Biologically Inspired Materials, Northeastern University, Boston, MA, June 2, 2011

Ad hoc reviewer for:

- *Applied Physics Letters*
- *ACS Applied Materials & Interfaces*
- *Acta Mechanica Sinica*
- *Advanced Engineering Materials*
- *Biophysical Journal*
- *BioNanoScience*
- *Carbon*
- *International Journal of Applied Mechanics*
- *J Am Chem Soc*
- *Journal of Applied Mechanics*
- *Journal of Applied Physics*
- *Journal of Materials Research*
- *Journal of the Mechanical Behavior of Biomedical Materials*
- *Journal of the Mechanics and Physics of Solids*
- *Nano Letters*
- *Nanotechnology*
- *Nature Communications*
- *Proceedings of the National Academy of Sciences USA*
- *Polymer*
- *PLoS One*
- *RSC Advances*
- *Scientific Reports*
- *Soft Matter*
- *Theoretical and Applied Mechanics Letters*

Academic Presentations

1. Selected Invited Talks:

- “Multiscale Computational Modeling of Functional Biological Materials: from characterization to design and synthesis”, Tsinghua University, Sept. 1, 2017
- “Multiscale Computational Modeling of Functional Biological Materials: from characterization to design and synthesis”, City University of Hong Kong, July 11, 2017
- “Multiscale Computational Modeling of Functional Biological Materials: from characterization to design and synthesis”, Universita Di Pisa, June 14, 2017
- “Multiscale Computational Modeling of Functional Biological Materials: from characterization to design and synthesis”, Politecnico Milano, June 6, 2017

- “Multiscale Computational Modeling of Fibrous Materials: design, manufacture and optimization, Squishy Physics Seminar Series”, Harvard University, May 13, 2015
- “Multiscale Computational Optimization and Additive Manufacturing for Functional Material Design”, Radcliffe Institute for Advanced Study, Harvard University, June 6, 2014
- “Bottom-up Design of the Structure and Mechanics of Interfacial Materials”, 2014 AmeriMech Symposium, Virginia Tech, May 15, 2014;
- “Multi-scale Modeling of Protein Materials and Their Mechanics”, Interdisciplinary Symposium on Advanced Nano/Biosystems, University of Illinois at Urbana-Champaign, Sept. 25, 2013

2. Recent Conference and Presentations

- Presentation, “Data-driven ultrafast prediction of the protein’s natural frequency spectrum by machine learning”, MRS, Boston, Nov. 27, 2018
- Presentation, “Computational design of lightweight structural materials with triply periodic minimal surfaces”, MRS, Boston, Nov. 29, 2018
- Presentation, “Molecular-dynamics study of the mechanical property of 2D materials with defects and grain boundaries”, ChinaNano, Beijing, China, Aug. 29, 2017
- Presentation, “Mechanics and fracture of 2D materials with defects and grain boundaries”, International Conference on Fracture, Rhodes, Greece, June 18, 2017.
- Presentation, “Multiscale computational design of bio-inspired materials with advanced mechanical functions”, U.S. National Congress on Computational Mechanics, Montreal, Canada, July 17, 2017.
- Presentation, “Multiscale computational design of flexible composite materials with reversible folding”, Society of Engineering Science, Boston, MA, July 25, 2017.
- Presentation, “Bioinspired materials achieved by design, optimization and manufacturing”, International Conference on Mechanics of Biomaterials and Tissues, Waikoloa, HI, Dec. 10, 2015.
- Presentation, “Multiscale modelling of structure-mechanics relationships of biological fibrous materials”, International Conference on Mechanics of Biomaterials and Tissues, Waikoloa, HI, Dec. 10, 2015
- Presentation, “Designs of Nanoporous Materials for High-Speed Water Filtration by Considering Nonlinear Viscosity of Water at Interfaces”, Materials Research Society, Boston, Dec. 10, 2015
- Presentation, “Multiscale computational modeling of collagen fibrils”, TERMIS World Congress, Boston, Sept. 9, 2015