Jiawei Yang

Assistant Professor

Department of Mechanical and Materials Engineering, Department of Biomedical Engineering, Worcester Polytechnic Institute

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EDUCATION

2019	**Ph.D**., Engineering Sciences, **Harvard University**, Cambridge, MA Advisor: Prof. Zhigang Suo
2016	**M.S.**, Engineering Sciences, **Harvard University**, Cambridge, MA
2015	**D.Eng.**, Engineering Mechanics, **Tongji University**, Shanghai, China
2009	**B.E.**, Engineering Mechanics, **Tongji University**, Shanghai, China

RESEARCH EXPERIENCE

01/2024 – **Assistant Professor**
Department of Mechanical and Materials Engineering
Department of Biomedical Engineering
Worcester Polytechnic Institute

The Yang lab develops the next-generation integrated soft material implantable systems for deep-tissue therapeutics and biosensing. Current research pursues three tracks:

- Modular design of bioadhesives for long-term implantation and regenerative medicine
- Developing an eel-skin-inspired heterogeneous coating with long-lasting biofouling resistance and mechanical durability
- Deep-tissue bioelectronics.

07/2019 – 12/2023 **Postdoctoral researcher**
Department of Chemical Engineering and Koch Institute
Massachusetts Institute of Technology
(Advisors: Prof. Daniel Anderson and Prof. Robert Langer)

- Developed a hydrogel implant modular design platform by multiscale polymer brush coating to enable independent control of bioadhesion, fibrosis, and mechanical properties, addressing two longstanding challenges in the field—tissue-bioadhesive mechanical mismatch and stress-driven foreign body response.
- Co-led a review article examining the chemical, mechanical, and biological design, in vivo material behaviors, and biological responses of medical implants.
- Collaborated on three projects: (i) an emergency particulate drug delivery system using in vivo wireless devices, (ii) a silicone-hydrogel composite living cell device to enhance cell survival and implant longevity, and (iii) hydrogel fibers with high extensibility and strength.

09/2014 – 05/2019 **Graduate researcher**
School of Engineering and Applied Sciences, **Harvard University**
(Advisor: Prof. Zhigang Suo)

- Discovered molecular topologies as an important design parameter in adhesion and elucidated the unified principles for wet adhesion and new characterization methods.
- Pioneered *molecular sutures* for universally bonding hydrogels and biological tissues, and developed the *first tough tissue adhesives*, which have been licensed to a medical company, Amend Surgical, Inc., for commercializing dental surgery applications. These bioadhesion technologies can replace traditional surgical sutures.
- Illustrated the effect of the complex rheology of hydrogels and elastomers on their fracture and fatigue behaviors.

09/2009 – 08/2014 **Graduate researcher**
School of Aerospace Engineering and Applied Mechanics
Tongji University
(Advisor: Prof. Guohua Nie)

- Developed theoretical models and simulations to investigate the effect of elasticity, plasticity, and viscoelasticity on the buckling, wrinkling, and creasing instabilities in materials and structures (joint projects with Prof. Zhigang Suo at Harvard University).
- Developed new experimental methods to characterize creasing instabilities.

SELECTED HONORS AND AWARDS

2025	NSF CAREER Award
2025	James Nichols Heald Research Award, *Worcester Polytechnic Institute*
2024 – 2027	James Nichols Heald Startup Award, *Worcester Polytechnic Institute*
2015 – 2016	Robert L. Wallace Prize Fellowship, *Harvard University*
2015	Excellence in Teaching, Derek Bok Center, *Harvard University*
2011 – 2013	China Scholarship Council Fellowship, *China Scholarship Council*
2009 – 2015	Tongji University Fellowship, *Tongji University*

JOURNAL PUBLICATIONS AND PREPRINTS

31. Sun, J., Liu, Q. and **Yang, J.**, 2025. Mixing polymers and polymer networks for topological adhesion. Journal of the Mechanics and Physics of Solids, p.106321.

30. **Yang, J.**, 2025. Swelling and large deformation of polymer brushes. International Journal of Solids and Structures, p.113587.

29. **Yang, J.**, Zhao, Y., Jeang, W.J., Pabel, S., Wong, B., Manan, R., Nahrendorf, M., Langer, R. and Anderson, D.G., 2025. A modular hydrogel system with independent control of bioadhesion, fibrosis, and stiffness, submitted.

28. Krishnan, S.R., O'Keeffe, L., Rudra, A., Gumustop, D., Khatib, N., Liu, C., **Yang, J.**, Wang, A., Bochenek, M.A., Lu, Y.C. and Bose, S., Reed, K., Langer, R. and Anderson, D.G., 2025.

Emergency delivery of particulate drugs by active ejection using in vivo wireless devices. Nature Biomedical Engineering, pp.1-17.

27. Jeang, W.J., Bochenek, M.A., Bose, S., Zhao, Y., Wong, B.M., **Yang, J.**, Jiang, A.L., Langer, R. and Anderson, D.G., 2024. Silicone cryogel skeletons enhance the survival and mechanical integrity of hydrogel-encapsulated cell therapies. Science Advances, 10(14), p.eadk5949.

26. Yang, X., Steck, J., **Yang, J.**, Wang, Y. and Suo, Z., 2021. Degradable plastics are vulnerable to cracks. Engineering, 7(5), pp.624-629.

25. Chu, C.K., Joseph, A.J., Limjoco, M.D., **Yang, J.**, Bose, S., Thapa, L.S., Langer, R., and Anderson, D.G., 2020. Chemical Tuning of Fibers Drawn from Extensible Hyaluronic Acid Networks. Journal of the American Chemical Society, 142(46), pp.19715-19721.

24. **Yang, J.**, Illeperuma, W. and Suo, Z., 2020. Inelasticity increases the critical strain for the onset of creases on hydrogels. Extreme Mechanics Letters, p.100966.

23. **Yang, J.**, Steck, J. and Suo, Z., 2020. Gelation kinetics of alginate chains through covalent bonds. Extreme Mechanics Letters, p.100898.

22. **Yang, J.**, Steck, J., Bai, R., and Suo, Z., 2020. Topological adhesion II. Stretchable adhesion. Extreme Mechanics Letters, p100891.

21. Steck, J., Kim, J., **Yang, J.**, Hassan, S. and Suo, Z., 2020. Topological adhesion. I. Rapid and strong topohesives. Extreme Mechanics Letters, p.100803.

20. Mu, R., **Yang, J.**, Wang, Y., Wang, Z., Chen, P., Sheng, H. and Suo, Z., 2020. Polymer-filled macroporous hydrogel for low friction. Extreme Mechanics Letters, p.100742.

19. **Yang, J.**, Bai, R., Li, J., Yang, C., Yao, X., Liu, Q., Vlassak, J.J., Mooney, D.J. and Suo, Z., 2019. Design molecular topology for wet-dry adhesion. ACS Applied Materials & Interfaces, 11(27), pp.24802-24811.

18. **Yang, J.**, Bai, R., Chen, B. and Suo, Z., 2019. Hydrogel Adhesion: A Supramolecular Synergy of Chemistry, Topology, and Mechanics. Advanced Functional Materials, p.1901693.

17. **Yang, J.**, Jin, L., Hutchinson, J.W. and Suo, Z., 2019. Plasticity retards the formation of creases. Journal of the Mechanics and Physics of Solids, 123, pp.305-314.

16. Yang, X.#, **Yang, J.#**, Chen, L. and Suo, Z., 2019. Hydrolytic crack in a rubbery network. Extreme Mechanics Letters, p.100531.

15. Wang, Y., Jia, K., Xiang, C., **Yang, J.**, Yao, X. and Suo, Z., 2019. Instant, tough, noncovalent adhesion. ACS Applied Materials & Interfaces, 11(43), pp.40749-40757

14. Chen, B., **Yang, J.**, Bai, R. and Suo, Z., 2019. Molecular Staples for Tough and Stretchable Adhesion in Integrated Soft Materials. Advanced Healthcare Materials, p.1900810.

13. Steck, J., **Yang, J.** and Suo, Z., 2019. Covalent Topological Adhesion. ACS Macro Letters, 8, pp.754-758.

12. Bai, R., **Yang, J.**, Morelle, X.P. and Suo, Z., 2019. Flaw-Insensitive Hydrogels under Static

and Cyclic Loads. Macromolecular Rapid Communications, 40(8), p.1800883.

11. Bai, R., Chen, B., **Yang, J.** and Suo, Z., 2019. Tearing a hydrogel of complex rheology. Journal of the Mechanics and Physics of Solids, 125, pp.749-761.

10. Bai, R., **Yang, J.** and Suo, Z., 2019. Fatigue of hydrogels. European Journal of Mechanics-A/Solids, 74, pp.337-370.

9. **Yang, J.** 2019. Hydrogel Adhesion. Doctoral dissertation, Harvard University, Graduate School of Arts & Sciences.

8. **Yang, J.**, Bai, R., and Suo, Z., 2018. Topological Adhesion of Wet Materials. Advanced Materials, p.1800671.

7. Ouchi, T.#, **Yang, J.#**, Suo, Z. and Hayward, R.C., 2018. Effects of Stiff Film Pattern Geometry on Surface Buckling Instabilities of Elastic Bilayers. ACS Applied Materials & Interfaces, 10(27), pp.23406-23413.

6. Bai, R., **Yang, J.**, Morelle, X.P., Yang, C. and Suo, Z., 2018. Fatigue Fracture of Self-Recovery Hydrogels. ACS Macro Letters, 7(3), pp.312-317.

5. Auguste, A., **Yang, J.**, Jin, L., Chen, D., Suo, Z. and Hayward, R.C., 2018. Formation of high aspect ratio wrinkles and ridges on elastic bilayers with small thickness contrast. Soft Matter, *14, 8545-8551*.

4. Li, J., Celiz, A.D.#, **Yang, J.#**, Yang, Q., Wamala, I., Whyte, W., Seo, B.R., Vasilyev, N.V., Vlassak, J.J., Suo, Z. and Mooney, D.J., 2017. Tough adhesives for diverse wet surfaces. Science, 357(6349), pp.378-381.

3. Huang, J.#, **Yang, J.#**, Jin, L., Clarke, D.R. and Suo, Z., 2016. Pattern Formation in Plastic Liquid Films on Elastomers by Ratcheting. Soft Matter, 12(16), pp.3820-3827.

2. **Yang, J.** and Nie, G., 2014. Analysis of Sinusoidal Interfacial Wrinkling of an Anisotropic Film Sandwiched Between Two Compliant Layers. Journal of Applied Mechanics, 81(9), p.091013.

1. Yu, A., **Yang, J.**, Nie, G. and Yang, X., 2011. An improved model for naturally curved and twisted composite beams with closed thin-walled sections. Composite Structures, 93(9), pp.2322-2329.

BOOK (CHAPTERS)

1. **Yang, J.** and Bai, R., 2024. Mechanics of Wet Adhesion. Mechanics of Flexible and Stretchable Electronics, pp.345-372.

PATENTS

3. **Yang, J.**, Ruobing, B., and Suo, Z., Harvard College, 2021. *Topological adhesion of materials*. U.S. Patent Application 17/048,803.

2. Kun Jia, Zhigang Suo, Yecheng Wang, Chunping Xiang, **Jiawei Yang,** and Xi Yao, *Instant and tough adhesion*. U.S. Patent, 62/848, 088, filed May 15, 2019.

1. Crystal Chu, Alby Joseph, Matthew Limjoco, Lavanya Thapa, **Jiawei Yang**, Robert Langer, Daniel Anderson, *Extensible, dynamic hyaluronic acid networks produce mechanically*

tunable bioinspired fibers, Application No.: 62914344, filed October 11, 2019.

INVITED TALKS AND PRESENTATIONS

12/2024 "Modular design of hydrogel adhesives for strong tissue adhesion and mechanical compatibility", Worcester Polytechnic Institute, Worcester, MA

10/2023 "Large deformation and swelling of polymer brushes", Society of Engineering Sciences, Minnesota, MN

04/2023 "Biointerfaces by design: from wet adhesion to implantation", Worcester Polytechnic Institute, Worcester, MA

10/2022 "Design molecular topologies for wet tough adhesion", the Dow Chemical Company, Midland, MI

04/2022 "Molecular topology design of wet adhesion for merging human-machine interface", Texas A&M University, College Station, TX

02/2022 "Wet adhesion technology for merging human-machine interface", University of Cincinnati, webinar

12/2021 "Wet adhesion technology for merging human-machine interface", Pennsylvania State University, State College, PA

11/2021 "Wet, tough adhesion for merging human-machine interface", Syracuse University, Syracuse, NY

09/2021 "Wet, Tough adhesion for merging human-machine interface", Case Western Reserve University, webinar

03/2021 "Can crease form in metals", Engineering and Applied Science (EAS) Forum, webinar

09/2018 "Molecular stitching of wet materials", New England Workshop on the Mechanics of Materials and Structures, Brown University, Providence, RI

06/2018 "Topological adhesion of wet materials", 18th National Congress for Theoretical and Applied Mechanics (USNC-TAM), Chicago, IL

05/2018 "Topological adhesion of wet materials", NSF Harvard MRSEC site visit, Harvard University, Cambridge, MA

07/2017 Gordon Research Conference on Adhesion, South Hadley, MA

05/2017 "Tough adhesives for diverse wet surfaces", New England Workshop on the Mechanics of Materials and Structures, Massachusetts Institute of Technology, Cambridge, MA

TEACHING

Every Fall Instructor, ME 5380 *Foundations of Elasticity*, Worcester Polytechnic Institute

Every Spring Instructor, ME 591 *Graduate Seminars*, Worcester Polytechnic Institute

Every Spring Instructor, ES 2502 *Stress Analysis*, Worcester Polytechnic Institute

Spring 2016 Teaching Fellow, ES 180 *Engineering Thermodynamics*, Harvard University

PROFESSIONAL SERVICES AND OUTREACH

06/2025 – 08/2025	Host of Early Research Experience Program for undergraduate students
04/2025	NSF review panelist
08/2024 –	Department Graduate Committee: student recruitment, course offerings, seminar organization, website update, judge for student research projects showcase, and M.S. and PhD qualifying exams and thesis defenses
01/2024 – 02/2024	Organizer of departmental seminar series
10/2024 –	Annual service to the Central Massachusetts STEM Ecosystem to educate grade 4-12 students on hydrogels and their biomedical applications.
2024 –	Members: American Chemical Society (ACS), American Society of Mechanical Engineers (ASME), Sigma Xi Society
2014 –	Journal reviewer: *Science Advances, Physical Review Letters, Journal of the Mechanics and Physics of Solids; ACS Nano; ACS Macro Letters; Macromolecules; Journal of Materials Chemistry B; RSC Advances; Soft Matter; Experimental Mechanics; Cellulose; Journal of Applied Mechanics; Extreme Mechanics Letters; Experimental Mechanics; NPG Asia Materials; Acta Biomaterialia; Applied Physics Letters.*

ACADEMIC ADVISING

PhD students

08/2024 –	Jiatai Sun. Projects: bioadhesives for implantation
08/2025 –	Yu Wang. Projects: eel-skin-like anti-biofouling coatings

Master students

10/2024 – 05/2025	Farhan Seliya. Project: develop an adhesion fatigue testing apparatus

Undergraduate students

10/2024 –	Johanna Castillo. WPI Early Research Experience Program
06/2025 – 08/2025	Jessica Amuasi. WPI Summer Research Experience Program

M.S. and Ph.D. Committees

12/2025	Omid Mahdavi, PhD qualifying exam
06/2025	Hamed Jafarishad, PhD defense
04/2025	Amanda Smith, PhD qualifying exam
12/2024	William Francis Chissoe V, Master's defense
09/2024	Haozhe Yu, PhD qualifying exam
09/2024	Gary DeVilbiss, PhD qualifying exam

RESEARCH SUPPORT

02/15/2025 – 01/31/2030	Single PI, NSF CAREER: Modular Design of Bioadhesives for Implantation.
01/02/2024 – 01/31/2027	Single PI, James Nichols Heald Startup Award, Worcester Polytechnic Institute