

James H. Pikul

Assistant Professor, Department of Mechanical Engineering and Applied Mechanics
University of Pennsylvania
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EDUCATION

Doctor of Philosophy in Mechanical Engineering December 2015
University of Illinois at Urbana – Champaign

Master of Science in Mechanical Engineering May 2011
University of Illinois at Urbana – Champaign

Bachelor of Science in Mechanical Engineering May 2009
University of Illinois at Urbana – Champaign
Heoft Technology and Management, International Minor in Engineering–Japanese Studies

PROFESSIONAL EXPERIENCE

Assistant Professor May 2017 – present
Department of Mechanical Engineering and Applied Mechanics
University of Pennsylvania

Co-founder August 2020 – present
Metal Light Inc
Developing metal-air scavenging innovations to sustainably power off-grid electronics and provide utility back-up with metal fuel.

Postdoctoral Associate November 2015 – May 2017
Department of Mechanical and Aerospace Engineering and Department of Physics
Cornell University
Advisers: Professors Robert Shepherd (Mechanical Engineering) and Itai Cohen (Physics)

Co-founder May 2014 – May 2016
Petronics Inc.
Conducted product development, strategy, and fundraising for an in-home robotic platform that uses artificial intelligence and adaptive sensing. Acquired by a Fortune 100 company.

Graduate Research Assistant August 2009 – November 2015
Department of Mechanical Engineering
University of Illinois at Urbana-Champaign
Advisers: Professors William P. King (Mechanical Engineering) and Paul Braun (Materials Science)
Ph.D. dissertation title: “Design and fabrication of high power microbatteries and high specific strength cellular solids from bicontinuous microporous hierarchical materials”
M.S. thesis title: “High precision electrohydrodynamic printing of polymer onto microcantilever sensors”

National Institute for Nano-engineering Intern July – August 2010
Sandia National Laboratory (Albuquerque, New Mexico)
Demonstrated self-assembly of micelles using surface energy, surface charge functionalization, and imprint lithography.

Intern

June – August 2008

10X Technologies

- Headed the research and development for a next generation micro-razor funded by a Fortune 500 company. Managed a two person development team.

HONORS AND AWARDS

2021 The Society for Chemistry and Micro-Nano Systems (CHEMINAS) Young Researcher Poster Award at (μ TAS) conference.	October 2021
2021 3M Non-tenured Faculty Award	March 2021
2020 TMS Early Career Faculty Fellow Award	November 2020
2020 ASME Applied Mechanics Division Haythornthwaite Foundation Research Initiation Grant	October 2020
2020 Moore Inventor Fellow	September 2020
2020 Toyota Programmable System Innovation Fellowship	September 2020
Best Paper Award at The 19th International Conference on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (IEEE PowerMEMS), Krakow, 2019	December 2019
NSF CAREER award in ECCS - CCSS	November 2019
Scialog Fellow through the Research Corporation for Science Advancement – Advanced Energy Storage	October 2019
Office of Naval Research Young Investigator Award	January 2019
Materials Research Society Gold Award	December 2013
Materials Research Society Science as Art Silver Award	December 2013
Department of Energy Office of Science Graduate Fellowship	August 2011 – November 2015
College of Engineering Carver Fellowship	August 2009 – July 2011
Lisle Abbot Rose Memorial Award	May 2009
Highest Honors and Bronze Tablet	May 2009
IPENG International Engineering Fellowship	January 2007

TEACHING AND MENTORING EXPERIENCE

Assistant Professor

May 2017 – Present

MEAM 110 – Introduction to Mechanics (5 semesters)

MEAM 580 – Electrochemistry (3 semesters)

- Fostering a creative research group with diverse experiences is important for me, which is why I have mentored 11 female students and 4 underrepresented minority students. My lab is currently 40% women at the Ph.D./Post-doc level.
- Faculty lead for the Formula-SAE Penn Electric Racing Team, which placed 3rd in the nation at the last national competition.

Ph.D Students Supervised

Zhimin Jiang (MEAM), expected May '22

Zakaria Hsain (MEAM), expected May '22

Min Wang (MEAM), expected May '22

Alissa Johnson (MEAM), expected May '23

David Levine (MEAM), expected May '23

Gregory Campbell (MEAM), expected May '24

Jessica Yin (MEAM), expected May '25
Yichao Shi (MEAM), expected May '25
Yan Luo (MEAM), expected May '25
Emily Beeman (MSE), expected May '26

M.S. Students Supervised

Unnati Joshi (ChemE), May '19
Miranda Cravetz (MEAM), May '19
Jessica Grzyb (ChemE), December '19
Dileep Vadladi (MEAM), Dec '21
Maddie Magee (MEAM), Dec '21
Ryan Goethals (MEAM), expected May '22

Postdoctoral Scholars Supervised

Xiujun Yue, April '19 – Feb '21 (Currently Lead Scientist at Solid Energy Systems)
Yue Gao, Dec '19 - Dec '20 (Currently Assistant Professor at Fudan University)
Muqing Ren, July '21 - present

Undergraduate Projects Supervised at Penn

Victor Azumah
Akaash Padmanabha
Michael Sanchez
Alyssa Lu
Micah Weitzman
Matthew Yu
Rafael Gehrke
Alissa Johnson
Thomas Mulroy
Miranda Cravetz
Lisanne DeGroot
Katrina Raichle

I mentored 12 other undergraduates during my post-doc and Ph.D., several have gone on to study in Ph.D. programs at top universities, such as MIT and Cornell.

JOURNAL PUBLICATIONS

34. Yichao Shi, Zhimin Jiang, and **James H. Pikul**, “Harnessing Cascading Dominoes for Peristaltic Wave Motion”, *IEEE Robotics and Automation Letters*, 2022.
33. Rui Filipe Serra Maia, Eric Detsi, John Corsi, Min Wang, **James H. Pikul**, and Eric A. Stach, “Developing near-atomic-scale chemical analysis in liquid-phase S/TEM to study high capacity battery anodes”, *Microscopy and Microanalysis*, 27 (S1), 1036-1038.
32. Xiujun Yue, Alissa C. Johnson, Sungbong Kim, Ryan R. Kohlmeyer, Arghya Patra, Jessica Grzyb, Akaash Padmanabha, Min Wang, Zhimin Jiang, Pengcheng Sun, Chadd T. Kiggins, Mehmet N. Ates, Sonika V. Singh, Evan M. Beale, Mark Daroux, Aaron J. Blake, John B. Cook, Paul V. Braun, **James H. Pikul**, “A nearly packaging-free design paradigm for light, powerful, and energy dense primary microbatteries”, *Advanced Materials*, 2101760, 2021.

31. David Levine, Kevin Turner, and **James H. Pikul**, “Materials with electroprogrammable stiffness”, Advanced Materials, 2007952, 2021.
30. Zhimin Jiang and **James H. Pikul**. "Centimetre-scale crack-free self-assembly for ultra-high tensile strength metallic nanolattices." Nature Materials, 1-7, 2021.
29. Zakaria Hsain, Zhimin Jiang, and **James H. Pikul**, “Electrochemical healing of steel through improved room-temperature growth and adhesion of nickel”, Multifunctional Materials, vol. 4, no. 2, 024004, 2021.
28. Min Wang, Andrew C. Meng, Jintao Fu, Alexandre C. Foucher, Rui Filipe Serra Maia, Eric A. Stach, Eric Detsi, and **James H. Pikul**, “Surface Facet Engineering in Nanoporous Gold for Low-Loading Catalysts in Aluminum-Air Batteries”, ACS Applied Materials and Interfaces, 2021.
27. Min Wang, Yue Gao, and **James H. Pikul**, “Computer-free autonomous Navigation and Power Generation Using Electro-Chemotaxis”, Advanced Intelligent Systems, 2000255, 2021.
26. Kahnt, M., Sala, S., Johansson, U., Bjorling, A., Jiang, Z., Kalbfleisch, S., Lenrick, F., **Pikul, J. H.** & Thanell, K. “Firstptychographic X-ray computed tomography experiment on the NanoMAX beamline” J. Appl. Cryst., 53, 2020.
25. Zhimin Jiang, Zakaria Hsain, and **James H. Pikul**. "Thick free-standing metallic inverse opals enabled by new insights into the fracture of drying particle films" Langmuir, 2020.
24. Xiujun Yue, Jessica Grzyb, Akaash Padmanabha, and **James H. Pikul**. "A Minimal Volume Hermetic Packaging Design for High-Energy-Density Micro-Energy Systems" Energies vol. 13, no. 10, pp. 2492, 2020.
23. Min Wang, Unnati Joshi, **James H. Pikul**, “Powering electronics by scavenging energy from external metals” ACS Energy Letters, vol. 5, no.3, pp. 758-765, 2020.
22. Michael Synodis, **James Pikul**, Sue Ann Bidstrup Allen, and Mark G. Allen. "Vertically integrated high voltage Zn-Air batteries enabled by stacked multilayer electrodeposition", Journal of Power Sources, vol. 449 pp. 227566, 2020.
21. **James H. Pikul**, Jeffrey W. Long, “Architected materials for advanced electrochemical systems”, MRS Bulletin, vol. 44, no. 10, pp. 789-795, 2019. [Invited by Julia Greer and Vikram Deshpande]
20. Zakaria Hsain, **James H. Pikul**, “Low-energy Room-temperature Healing of Cellular Metals”, Advanced Functional Materials, pp. 1905631, August 2019.
19. Cameron A. Aubin, Snehashis Choudhury, Rhiannon Jerch, Lynden A. Archer, **James H. Pikul**, Robert F. Shepherd, “Electrolytic Vascular Systems for Energy Dense Robots”, Nature, vol. 571, pp.51-57, June, 2019.
18. **James H. Pikul**, Sezer Özerinç, Burigede Liu, Runyu Zhang, Paul V. Braun, Vikram S. Deshpande, William P. King, "High strength metallic wood from nanostructured nickel inverse opal materials", Scientific Reports, 9.1, 2019. **Top 100 downloaded materials science papers for Scientific Reports in 2019.**
17. Steven Ceron, Itai Cohen, Robert F. Shepherd, **James H. Pikul**, Cindy Harnett, “Fiber Embroidery of Self-Sensing Soft Actuators”, Biomimetics, vol. 3, September 2018.
16. **James H. Pikul**, Hailong Ning, “Powering the internet of things”, Joule, vol. 2, pp. 1036–1038, June 20, 2018.
15. T.J. Wallin, **James Pikul**, Robert F. Shepherd, "3D printing of soft robotic systems", Nature Reviews Materials, May 4, 2018.
14. Dean Keithly, John Whitehead, Alexandra Voinea, Diego Horna, Samantha Hollenberg, Mason Peck, **James Pikul**, Robert F. Shepherd, "A cephalopod-inspired combustion

- powered hydro-jet engine using soft actuators", Extreme Mechanics Letters, January 6, 2018.
13. **James H. Pikul**, Shuo Li, Hedan Bai, Roger T. Hanlon, Itai Cohen, Robert F. Shepherd, "Stretchable surfaces with programmable 3-D texture morphing for synthetic camouflaging skins", Science, vol. 358, pp. 210-214, October 18, 2017.
 12. T.J. Wallin, **J.H. Pikul**, S. Bodkhe, B.N. Peele, B.C. Mac Murray, D. Therriault, B.W. McEnerney, R.P. Dillon, E.P. Giannelis, R.F. Shepherd, "Click chemistry stereolithography for soft robots that self-heal", Journal of Materials Chemistry B, vol. 5, pp. 6249-6255, 2017.
 11. **James H. Pikul**, Paul V. Braun, William P. King, "Performance modeling and design of ultra-high power microbatteries", Journal of the Electrochemical Society, vol. 164.11, pp. E3122-E3131, 2017.
 10. **James H. Pikul**, Jinyun Liu, Paul V. Braun, William P. King, "Integration of high capacity materials into interdigitated mesostructured electrodes for high energy and high power density primary microbatteries", Journal of Power Sources, vol. 315, pp. 308-315, 2016.
 9. Hailong Ning, **James H. Pikul**, Runyu Zhang, Xuejiao Li, Sheng Xu, Junjie Wang, John A. Rogers, William Paul King, and Paul V. Braun, " Holographic Patterning of High Performance on-chip 3D Lithium-ion Microbatteries", Proceeding of the National Academy of Sciences, vol. 112, no. 21, pp. 6573-6578, 2015.
 8. **James H. Pikul**, Paul V. Braun, and William P. King, "Micromechanical devices with controllable stiffness fabricated from regular 3D porous materials", Journal of Micromechanics and Microengineering, vol. 24, 105006, 2014
 7. Jinyun Liu, Huigang Zhang, Junjie Wang, Jiung Cho, **James Pikul**, Eric Scott Epstein, Xingjiu Huang, Jinhuai Liu, Paul V. Braun, "Hydrothermal Fabrication of Three-Dimensional Secondary Battery Anodes", Advanced Materials, vol. 26, no. 41, pp. 7096-7101, 2014.
 6. **James H. Pikul**, Huigang Zhang, Jiung Cho, Paul V. Braun, and William P. King, "High power lithium ion micro batteries from interdigitated three-dimensional bicontinuous nanoporous electrodes", Nature Communications, vol. 4, pp. 1732, 2013
 5. Xueqiu You, **James H. Pikul**, William P. King, and James J. Pak, "Zinc oxide inverse opal enzymatic biosensor", Applied Physics Letters, vol. 102, pp. 253103-5, 2013.
 4. Elise A. Corbin, Larry J. Millet, **James H. Pikul**, Curtis L. Johnson, John G. Georgiadis, William P. King & Rashid Bashir, " Micromechanical properties of hydrogels measured with MEMS resonant sensors", Biomedical Microdevices, vol. 15, pp. 311 - 319, 2013.
 3. Paul V. Braun, Jiung Cho, **James H. Pikul**, William P. King, and Huigang Zhang, "High power rechargeable batteries", Current Opinion in Solid State & Materials Science, vol. 16, pp. 186 - 198, 2012.
 2. **James H. Pikul**, Phillip Graf, Sandipan Mishra, Kira Barton, Yong-Kwan Kim, John A. Rogers, Andrew Alleyne, Placid M. Ferreira, and William P. King, "High precision electrohydrodynamic printing of polymer onto microcantilever sensors", IEEE Sensors Journal, vol. 11, pp. 2246 - 2253, 2011.
 1. Kevin A. Arpin, **James H. Pikul**, William P. King, H. Fan, and P. V. Braun, "Template directed assembly of dynamic micellar nanoparticles", Soft Matter, vol. 7, pp. 10252-10257, 2011.

CONFERENCE PAPERS

12. Yichao Shi, Zhimin Jiang, **James Pikul**, “Harnessing cascading dominos for peristaltic motion”, IEEE International Conference on Robotics and Automation (ICRA), Philadelphia, PA, 2022.
11. Jessica Yin, Gregory Campbell, **James Pikul**, Mark Yim, “Multimodal Proximity and Visuotactile Sensing With a Selectively Transmissive Soft Membrane”, IEEE-RAS International Conference on Soft Robotics – RoboSoft, Edinburgh, Scotland, 2022.
10. Vishal Venkatesh, Qi Yang, Jingwen Zhang, **James H. Pikul**, Mark G. Allen, “Fabrication and Characterization of Evaporated Zinc Anodes for Small-Scale Zinc-Air Batteries”, The 21st International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS), Virtual Conference, 2021
9. John B. Cook, Alissa Johnson, Xiujun Yue, Ryan Kohlmeyer, Chadd Kiggins, Sungbong Kim Mehmet Nurullah Ates, Aaron Blake, Paul Braun, John D. Busbee, **James H. Pikul**, “Employing Molten Salt Electrodeposition to Produce High Energy Microbatteries for SHort-Range Independent Microrobotic Platforms (SHRIMP)”, GOMAC Tech, San Diego, 2020
8. A. Johnson, R. Kohlmeyer, M. N. Ates, C. Kiggins, A. Blake, J. B. Cook, **J. H. Pikul**, “Performance Modeling and Design of High Energy Density Microbatteries”, The 19th International Conference on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (PowerMEMS), Krakow, 2019 [**Best paper award**]
7. X. Yue, J. Grzyb, A. Padmanabha, **J. H. Pikul**, “A minimal volume hermetic packaging design for high energy density micro energy systems”, The 19th International Conference on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (PowerMEMS), Krakow, 2019
6. Michael Synodis, **James Pikul**, Sue Ann Bidstrup Allen, and Mark Allen, “Integrated fabrication of serially connected high voltage microbatteries via multilayer electrodeposition”, 20th International conference on Solid State Sensors, Actuators, and Microsystems, Berlin, 2019.
5. Hang Yuan, **James Pikul**, Cynthia Sung, “Programmable 3-D surfaces using origami tessellations”, 7th International Meeting on Origami in Science, Mathematics and Education, Oxford, 2018.
4. **James H. Pikul**, Sezer Ozerinc, Runyu Zhang, Paul V. Braun, and William P. King, “Micro architected porous material with high strength and controllable stiffness”, IEEE Micro Electro Mechanical Systems Conference 2016, Shanghai.
3. **James H. Pikul**, Huigang Zhang, Jiung Cho, Paul V. Braun, and William P. King, "High power lithium ion microbatteries with lithographically defined 3-D porous electrodes," IEEE Micro Electro Mechanical Systems Conference 2013, Taiwan.
2. **James H. Pikul**, Huigang Zhang, Jiung Cho, Tae Wan Kim, Paul V. Braun, and William P. King, "High power lithium ion microbatteries with 3D nanostructured electrodes," Technologies for Future Micro-Nano Manufacturing, Napa, California, 2011.
1. Johnny R. Felts, Patrick C. Fletcher, Suhas Somnath, **James H. Pikul**, Zenting Dai, Woo K. Lee, Paul E. Sheehan, and William P. King, "Nanofabrication using heated probe tips," Micro- and Nanotechnology Sensors, Systems, and Applications III, SPIE Proceedings Volume 8031, 2011.

CONFERENCE PRESENTATIONS

23. A. C. Johnson, A. J. Dunlop, R. R. Kohlmeyer, C. T. Kiggins, A. J. Blake, S. V. Singh, E. M. Beale, B. Zahiri, A. Patra, X. Yue, J. B. Cook, P. V. Braun, **J. H. Pikul**, “Strategies for Approaching One Hundred Percent Dense Lithium-Ion Battery Cathodes”, 241st Electrochemical Society Meeting 2022.
22. Zakaria Hsain and **James H. Pikul**, “Room-Temperature Electrochemical Healing of Difficult-to-Weld Metallic Materials”, 18th European Mechanics of Materials Conference, Oxford, UK, April 2022
21. Zhimin Jiang and **James H. Pikul**, “A Large-scale and Fast Self-assembly Method for Fabricating Strong Inverse Opal Nanolattices”, 18th European Mechanics of Materials Conference, Oxford, UK, April 2022
20. Akaash Padmanabha, Alissa Johnson, and **James H. Pikul**, “Simulating Autoconvective Flow to Improve the Rate Performance of High Energy Density Lithium-Ion Electrodes”, 240th Electrochemical Society Meeting 2021.
19. Zakaria Hsain, Zhimin Jiang, and **James H. Pikul**, “Room-temperature electrochemical healing of structural steel through pulsed plating and tailored electrolyte chemistry”, 240th Electrochemical Society Meeting 2021.
18. Zhimin Jiang, and **James H. Pikul**, “Crack-Free Colloid Self-Assembly for High-Strength Metallic Nanolattice Fabrication”, Materials Research Society Spring Meeting 2021, Virtual.
17. Zhimin Jiang, and **James H. Pikul**, “Multifunctional Metallic Nanolattices with Ultra-High Tensile Strength Enabled by cm-Scale Crack-Free Self-Assembly”, Materials Research Society Spring Meeting 2021, Virtual.
16. Xiujun Yue , Alissa C. Johnson , Zhimin Jiang , Ryan R. Kohlmeyer , Chadd T. Kiggins , John Cook , **James H. Pikul**, “Ultra-high Current Mechanical Energy Harvester Based on Lithium Cobalt Oxide”, Materials Research Society Fall Meeting 2020, Virtual.
15. Xiujun Yue, Sungbong Kim, Ryan R. Kohlmeyer, Chadd T. Kiggins, Alissa C. Johnson, Arghya Patra, Aaron J. Blake, Jessica A. Grzyb, Akaash Padmanabha, Min Wang, John Cook, Paul Braun, **James H. Pikul**, “1500 Wh/L and 580 W/L Lithium Cobalt Oxide Electrodes”, Materials Research Society Fall Meeting 2020, Virtual.
14. Min Wang, Unnati Joshi, **James H. Pikul**, “Powering Electronics by Electrochemically Scavenging Energy From External Metals”, The International Mechanical Engineering Congress and Exposition (IMECE), 2020, Virtual.
13. Zhimin Jiang, Andrew Lin, David Issadore, and **James H. Pikul**, “Tailoring Pore Size and Surface Properties of High-Strength Microporous Nickel Inverse Opals for Fast and Efficient Immunomagnetic Separation of Exosomes”, The International Mechanical Engineering Congress and Exposition (IMECE), 2020, Virtual.
12. Xiujun Yue, Alissa C. Johnson, Zhimin Jiang, **James H. Pikul**, “Ultra-High Current Mechanical Energy Harvester Based on Lithium Cobalt Oxide”, ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), 2020, Virtual.
11. Alissa C. Johnson, **James H. Pikul**, “Perfluorocarbon Emulsions for High Energy Density Synthetic Vascular Systems”, ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), 2020, Virtual.
10. Min Wang, Unnati Joshi, **James H. Pikul**, “A Metal-Air Scavenger from Hydrogel Electrolytes for Powering Robotics”, The Electrochemical Society Fall meeting, 2019, Atlanta, Ga.

9. Zakaria Hsain, **James H. Pikul**, “Electrochemical healing of cellular metals at room temperature”, ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), 2019, Louisville, Ky.
8. Zakaria Hsain, **James H. Pikul**, “Electrochemically-driven transport for room-temperature healing of metallic cellular materials with synthetic vascular systems”, Materials Research Society Spring Meeting 2019, Phoenix, Az.
7. Hang Yuan, **James Pikul**, Cynthia Sung, “Programmable 3-D surfaces using origami tessellations”, 7th International Meeting on Origami in Science, Mathematics and Education, Oxford, 2018.
6. **James H. Pikul**, Shuo Li, Itai Cohen, and Rob Shepherd, “Texture morphing camouflaging skins”, Materials Research Society Spring Meeting 2017, Phoenix, Az.
5. **James H. Pikul**, Paul V. Braun, and William P. King, "High power primary lithium ion microbatteries", Materials Research Society Fall Meeting 2013, Boston, Ma.
4. **James H. Pikul**, Paul V. Braun, and William P. King, "High power primary lithium ion microbatteries", IEEE PowerMEMS 2013, London, UK.
3. **James H. Pikul**, Huigang Zhang, Jiung Cho, Paul V. Braun, and William P. King, "High power lithium ion microbatteries with 3D nanostructured electrodes", Materials Research Society Fall Meeting 2012, Boston, Ma.
2. Kevin A. Arpin, **James H. Pikul**, Hongyu Fan, William P. King, and Paul V. Braun, "Template directed assembly of dynamic micellar nanoparticles," Materials Research Society Fall Meeting 2011, Boston.
1. **James H. Pikul**, Phillip Graf, Sandipan Mishra, Kira Barton, Yong-Kwan Kim, John A. Roger, Andrew Alleyne, Placid M. Ferreira, and William P. King, "High precision polymer deposition onto microcantilever sensors using electrohydrodynamic printing," IEEE Sensors Conference 2010, Hawaii.

INVITED TALKS

- “Room-temperature Electrochemical Healing of Difficult-to-weld Metallic Materials”, TMS Functional Materials Division, March 2022.
- “Energy dense robots with adaptable shape and stiffness”, Meta (Facebook) Reality Labs Applied Materials Seminar, March 2022.
- “Energy dense and self-healing robots that eat, breath, and bleed”, Penn State University, Mechanical Engineering Seminar Series, February 2022.
- “Robots that Eat, Breathe, and Bleed”, University of Iowa, Mechanical Engineering Seminar, Virtual, 2021.
- “Robots that Eat, Breathe, and Bleed”, University of Pennsylvania, Chemical and Biomolecular Engineering Seminar, Virtual, 2021.
- “Electrochemical Healing of Metals: A New Way to Repair Additive and Cellular Metals at Room Temperature”, TMS Society Meeting, Virtual, 2021.
- “Robots that eat, breath, and bleed”, Johns Hopkins Applied Physics Lab, Lexington Park, Maryland, 2020.
- “Electrolytic Vascular Systems for Energy Dense Soft Robots”, Soft Robotics and Robot Learning Workshop, New York City, New York, 2019
- “Self-assembly of ultra-high strength nanoporous metals for multifunctional coatings and free-standing films”, 2019 International Conference on Metallurgical Coatings and Thin Films, San Diego, CA, 2019

- “Electrochemistry for morphogenesis, energy transduction, and energy transport”, “Chemo-structural Dynamics” Army Science Planning and Strategy Meeting, Rice University, Houston, TX, 2019
- “Ultra-high strength nanoporous foams as a platform for multifunctional structural materials”, Texas A and M University Seminar, College Station, TX, 2018.
- “Performance modeling and design of ultra-high power microbatteries”, Beyond Li-ion XI, NASA Glenn Research Center, OH, 2018
- "Developing revolutionary high power lithium ion microbatteries", The Battery Show, Novi, MI, 2013
- “Soft robots: from locomotion to texture morphing skins”, Matter Design Computation Symposium, Ithaca, NY, 2017

PATENTS

Zhimin Jiang, James Pikul. June 16, 202. Multifunctional Metallic Nanolattices And Methods Of Manufacture. U.S. Provisional Application No. 63/211,164

James Pikul, Xiujun Yue, Paul Braun, and Sungbong Kim. November 2019. A high energy and power density microbattery with integrated packaging. U.S. Provisional filed Nov. 2019

James H. Pikul, Min Wang. February 12, 2019. Metal Air Scavenger – An Energy Harvesting Technology For Powering Electronics And Robotics. International No. WO/2020/167965.

James H. Pikul, Zakaria Hsain. November 6, 2018. Healing And Morphogenesis Of Structural Metal Foams and Other Matrix Materials. U.S. Provisional No. 62/756,243.

James H. Pikul, Itai Cohen, Rob Shepherd. October 13, 2017. Stretchable surfaces with programmable texture. U.S. Provisional No. 62/572,282.

William P. King, Paul V. Braun, James H. Pikul. Aug. 2, 2016. Three Dimensional (3D) Porous Electrode Architecture for a Microbattery. U.S. 9,406,938 B2.

RESEARCH FUNDING

1. Current

ONR YIP: PI

“Understanding electrochemically induced surface evolution and transport at metal-hydrogel interfaces for metal-air scavenger power sources”

- \$648,956
- 04-15-2019 to 04-14-2022

NSF EFRI: PI

“EFRI C3 SoRo: 3-D surface control for object manipulation with stretchable Materials”

- Co-PIs are Michael Posa, Mark Yim, Chris Santangelo (U. Mass – Amherst), Ryan Hayward (U. Mass – Amherst)
- Total: \$2,000,000 UPenn portion: \$1,085,000 shared between Posa and Yim and Pikul to cover two students over four years
- 01-01-2020 to 12-31-2023

NSF MRSEC SUPER SEED: Co-PI

“MRSEC: DBAN Design for Optimal Fluid-, Charge- and Wave-Matter Interactions for Advanced Energy Applications”

- Co-PI are Eric Detsi (MSE), Eric Stach (MSE), Nader Engheta (ESE), Eleni Katifori (Physics), Daeyeon Lee (CBE), Kate Stebe (CBE), Tom Mallouk (Chemistry), Arjun Yodh (Physics)
- Total: \$80k My portion: \$0
- 09-01-2020 to 08-31-2022

NSF CAREER: PI

“CAREER: Power and information transmission kinetics in multifunctional electrolytic vascular systems”

- \$500,000
- 02-01-2020 to 01-31-2025

MOORE INVENTOR: PI

“A soft robotic stomach for actively powering environmental monitoring electronics”

- \$675,000
- 10-16-2020 to 09-01-2023

3M EARLY CAREER: PI

“Functional coatings for transforming the future of soft robotics, multifunctional materials, and energy technologies

- \$45,000
- 5-1-2020 to 4-31-2023

TOYOTA: PI

“Dynamic three-dimensional shape transformation and control in soft human-machine interfaces”

- \$84,000
- 09-01-2020 to 08-31-2021

AFOSR: PI

“Room Temperature Morphogenesis of Metals”

- \$450,000
- 02-01-2022 to 01-31-2025

2. Prior

DARPA SHRIMP: PI

“Electrochemical deposition of thick and continuous electrodes for high voltage and energy density lithium metal microbatteries”

- Co-PI are Paul Braun (University of Illinois at Urbana-Champaign) and John Cook (Xerion Advanced Battery Corp.)
- Phase 1 Total: \$601,175 My Phase 1 portion: \$216,453
- 03-01-2019 to 02-28-2020

DARPA SHRIMP: co-PI

“Integrated High Voltage Battery and Magnetic Conversion Micropower Systems for Efficient Power Delivery to Microbiotic Actuators”

- PI is Mark Allen, Co-PI is Sue Bidstrup-Allen
- Phase 1 Total: \$469,326 My Phase 1 portion: \$156,442
- 03-01-2019 to 02-28-2020

NSF MRSEC SEED: PI

“MRSEC: Surface Evolution of Dealloyed Mesoporous Metals for Oxygen Metals for Oxygen Reduction Catalysts in Metal-Air Battery and Fuel Cell Electrodes”

- Co-PI are Eric Detsi (MSE) and Eric Stach (MSE)
- Total: \$100,000 My portion: \$80,000
- 09-01-2018 to 08-31-2020