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Education

2003	B.S.	Electrical Engineering, Fudan University, Shanghai, China
2006	M.S.	Physics, Fudan University, Shanghai, China
2012	Ph.D.	Applied Physics, Rice University, Houston, TX

Professional Appointments

2011.9 – 2017.8	<i>Postdoc researcher</i> , Chem. & Chem. Biol., Harvard University
2017.9 – 2023.6	<i>Assistant Professor</i> , Electrical & Computer Engineering, Institute for Applied Life Sciences, UMass Amherst
2023.6 – present	<i>Associate Professor</i> , Electrical & Computer Engineering, Institute for Applied Life Sciences, UMass Amherst
2019 – present	<i>Adjunct</i> , Department of Biomedical Engineering, UMass Amherst

Honors and Awards

- *Nanoscale* Emerging Investigator, Royal Society of Chemistry (2023)
- Alfred P. Sloan Fellowship (2022)
- NIH Trailblazer R21 Award (2022)
- Barbara H. & Joseph J. Goldstein Outstanding Junior Faculty Award, COE, UMass (2021)
- Sony Faculty Innovation Award, Sony Corporation (2021)
- Armstrong Fund for Science Award, UMass Amherst (2020)
- Manning/IALS Innovation Award, UMass Amherst (2019)
- NSF CAREER Award, National Science Foundation (2019)

Publications (“#” corresponding author)

53. Hongyan Gao, Zhien Wang, Feiyu Yang, Xiaoyu Wang, Siqi Wang, Quan Zhang, Xiaomeng Liu, Yubing Sun, Jing Kong, **Jun Yao**[#]. “Graphene-Integrated Mesh Electronics with Converged Multifunctionality for Tracking Multimodal Excitation-Contraction Dynamics in Cardiac Microtissues”. *Nature Commun.* accepted (2024)
52. Tianda Fu, Shuai Fu, Siqi Wang, **Jun Yao**[#]. “Enabling Reliable Two-terminal Memristor Network by Exploiting the Dynamic Reverse Recovery in a Diode Selector”, *Device*, accepted (2024).

51. Shuai Fu, Ji-Hoon Park, Hongyan Gao, Tianyi Zhang, Xiang Ji, Tianda Fu, Lu Sun, Jing Kong, **Jun Yao**[#]. "Two-Terminal MoS₂ Memristor and the Homogeneous Integration with a MoS₂ Transistor for Neural Networks". *Nano. Lett.* **23**, 5869-5876 (2023).
50. Xiaomeng Liu, Hongyan Gao, Lu Sun, **Jun Yao**[#]. "Generic Air-Gen Effect in Nanoporous Materials for Sustainable Energy Harvesting from Air Humidity". *Adv. Mater.* 2300748 (2023).
49. Yassir Lekbach, Toshiyuki Ueki, Xiaomeng Liu, Trevor Woodard, **Jun Yao**, Derek R. Lovley. "Microbial Nanowires with Genetically Modified Peptide Ligands to Sustainably Fabricate Electronic Sensing Devices". *Biosens. Bioelectron.* **226**, 115147 (2023).
48. Tianda Fu, Shuai Fu, **Jun Yao**[#]. (Review) "Recent Progress in Bio-voltage Memristors Working with Ultralow Voltage of Biological Amplitude". *Nanoscale*, **15**, 4669-4681 (2023).
47. **Jun Yao**[#]. "Protein Nanowire Thin Films for the Potential of Constructing Green Electronic Devices". *Proc. SPIE (Society of Photo-optical Instrumentation Engineers)*, 124770J (2023). <https://doi.org/10.1117/12.2647424>
46. Tianda Fu, Shuai Fu, Lu Sun, Hongyan Gao, **Jun Yao**[#]. "An Effective Sneak-Path Solution Based on a Transient-Relaxation Device". *Adv. Mater.* **35**, 2207133 (2023).
45. Hongyan Gao, Feiyu Yang, Kianoosh Sattari, Xian Du, Tianda Fu, Shuai Fu, Xiaomeng Liu, Jian Lin, Yubing Sun, **Jun Yao**[#]. "Bioinspired Two-in-One Nanotransistor Sensor for the Simultaneous Measurements of Electrical and Mechanical Cellular Responses". *Science Adv.* **8**, eabn2485 (2022).
44. Xiaomeng Liu, Toshiyuki Ueki, Hongyan Gao, Trevor L. Woodard, Kelly P. Nevin, Tianda Fu, Shuai Fu, Lu Sun, Derek R. Lovley[#], **Jun Yao**[#]. "Microbial Biofilms for Electricity Generation from Water Evaporation and Power to Wearables". *Nature Commun.* **13**, 4369 (2022).
43. Tianda Fu, Xiaomeng Liu, Shuai Fu, Trevor Woodard, Hongyan Gao, Derek R. Lovley, **Jun Yao**[#]. "Self-sustained Green Neuromorphic Interfaces". *Nature Commun.* **12**, 3351 (2021).
42. Derek R. Lovley, **Jun Yao**. (Review) "Intrinsically Conductive Microbial Nanowires for 'Green' Electronics with Novel Functions". *Trends Biotechnol.* **39**, 940-952 (2021).
41. Xiaomeng Liu, Tianda Fu, Joy Ward, Hongyan Gao, Bing Yin, Trevor Woodard, Derek R. Lovley, **Jun Yao**[#]. "Multifunctional Protein-Nanowire Humidity Sensors for Green Wearable Electronics". *Adv. Electron. Mater.* **6**, 2000721 (2020).
40. Jian Sun, Russell S. Deacon, Xiaochi Liu, **Jun Yao**, Koji Ishibashi. "Spin Filtering in Germanium/Silicon Core/Shell Nanowires with Pseudo-helical Gap". *Appl. Phys. Lett.* **117**, 052403 (2020).

39. Alexander Smith, Xiaomeng Liu, Trevor Woodward, Todd Emrick, Juan Jimenez, Derek R. Lovley#, **Jun Yao**#. “Bioelectronic Protein Nanowire Sensors for Ammonia Detection”. *Nano Research* **13**, 1479–1484 (2020).
38. Xiaomeng Liu, Hongyan Gao, Joy Ward, Xiaorong Liu, Bing Yin, Tianda Fu, Jianhan Chen, Derek R. Lovley, **Jun Yao**#. “Power Generation from Ambient Humidity Using Protein Nanowires”. *Nature* **578**, 550-554 (2020).
37. Tianda Fu, Xiaomeng Liu, Hongyan Gao, Joy Ward, Xiaorong Liu, Bing Yin, Zhongrui Wang, Ye Zhuo, David Walker, J. Joshua Yang, Jianhan Chen, Derek R. Lovley, **Jun Yao**#. “Bioinspired Bio-Voltage Memristors”. *Nature Commun.* **11**, 1861 (2020).
36. Masiar Sistani, Jovian Delaforce, Roman B. G. Kramer, Nicolas Roch, Minh Anh Luong, Martien I. den Hertog, Eric Robin, Jürgen Smoliner, **Jun Yao**, Charles M. Lieber, Cecile Naud, Alois Lugstein, Olivier Buisson. “Highly Transparent Contacts to the 1D Hole Gas in Ultrascaled Ge/Si Core/Shell Nanowires”. *ACS Nano* **13**, 14145-14151 (2019).
35. Hongyan Gao, Bing Yin, Siyu Wu, Xiaomeng Liu, Tianda Fu, Cheng Zhang, Jian Lin, **Jun Yao**#. “Deterministic Assembly of Three-Dimensional Suspended Nanowire Structures”, *Nano Lett.* **19**, 5647-5652 (2019).
34. Rui Wang, Russell S. Deacon, Jian Sun, **Jun Yao**, Charles M. Lieber, Koji Ishibashi, “Gate Tunable Hole Charge Qubit Formed in a Ge/Si Nanowire Double Quantum Dot Coupled to Microwave Photons”. *Nano Lett.* **19**, 1052-1060 (2019).
33. M. Sistani, M. A. Luong, M. I. den Hertog, E. Robin, M. Spies, B. Fernandez, **Jun Yao**, E. Bertagnolli, A. Lugstein. “Monolithic Axial and Radial Metal-Semiconductor Nanowire Heterostructures”. *Nano Lett.* **18**, 7692-7697 (2018).
32. Bing Yin, Xiaomeng Liu, Hongyan Gao, Tianda Fu, **Jun Yao**#. “Bioinspired and Bristled Microparticles for Ultrasensitive Pressure and Strain Sensors”. *Nature Commun.* **9**, 5161 (2018).
31. Jian Sun, Russell S. Deacon, Rui Wang, **Jun Yao**, Charles M. Lieber, Koji Ishibashi, “Helical Hole State in Multiple Conduction Modes in Ge/Si Core/Shell Nanowire”. *Nano Lett.* **18**, 6144–6149 (2018).

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30. Thomas Schuhmann*, **Jun Yao***, Guosong Hong, Tianming Fu and Charles M. Lieber, “Syringe-injectable electronics with a plug-and-play input/output interface,” *Nano Lett.* **17**, 5836–5842 (2017). (* equal contributors)
28. Yunlong Zhao*, **Jun Yao***, Lin Xu, Max Mankin, Yinbo Zhu, Heng-An Wu, Liqiang Mai, Qingjie Zhang, Charles M. Lieber, “Shape-controlled deterministic assembly of nanowire”, *Nano Lett.* **16**, 2644-2650 (2016) (*equal contributors).

29. **Jun Yao**, Hao Yan, Shamik Das, James Klemic, James Ellenbogen, and Charles M. Lieber, "Nanowire nanocomputer as a finite-state machine", *Proc. Natl. Acad. Sci. USA* 111, 1259-1264 (2014).
27. Wooyoung Shim*, **Jun Yao***, and Charles M. Lieber, "Programmable resistive-switch nanowire transistor logic circuits", *Nano Lett.* 14, 5430-5436 (2014) (*equal contributors).
26. Andrew P. Higginbotham, F. Kuemmeth, T. W. Larsen, **Jun Yao**, Hao Yan, Charles M. Lieber, and Charles M. Marcus, "Antilocalization of coulomb blockage in a Ge/Si nanowire", *Phys. Rev. Lett.* 112, 216806 (2014).
25. Andrew P. Higginbotham, T. W. Larsen, **Jun Yao**, Hao Yan, Charles M. Lieber, and Charles M. Marcus, "Hole spin coherence in a Ge/Si heterostructure nanowire", *Nano Lett.* 14, 3582-3586 (2014).
24. **Jun Yao**, Hao Yan, and Charles M. Lieber, "A nanoscale combing technique for the large-scale assembly of highly aligned nanowires", *Nature Nanotechnol.* 8, 329-335 (2013).
23. **Jun Yao***, Jian Lin*, Yanhua Dai, Gedeng Ruan, Zheng Yan, Lei Li, Zhong Lin, Douglas Natelson, and James M. Tour, "Highly transparent nonvolatile resistive memory devices from silicon oxide and graphene", *Nature Commun.* 3, 1101 (2012) (*equal contributors).
22. Lei Ren, Qi Zhang, **Jun Yao**, Zhengzong Sun, Ryosuke Kaneko, Zheng Yan, Sebastien Nanot, Zhong Jin, Iwao Kawayama, Masayoshi Tonouchi, James M. Tour, and Junichiro Kono, "Terahertz and infrared spectroscopy of gated large-area graphene", *Nano Lett.* 12, 3711-3715 (2012).
21. Zheng Yan, **Jun Yao**, Zhengzong Sun, Yu Zhu, and James M. Tour, "Controlled ambipolar-to-unipolar conversion in graphene field-effect transistor through surface coating with poly(ethylene imine)/poly(ethylene glycol) films", *Small* 8, 59-62 (2012).
20. **Jun Yao**, Lin Zhong, Douglas Natelson, and James M. Tour, "In situ probing of the conducting filament in a silicon oxide resistive switch", *Sci. Rep.* 2, 242 (2012).
19. Zhengzong Sun, Cary L. Pint, Daniela C. Marcano, Chenguang Zhang, **Jun Yao**, Gedeng Ruan, Zheng Yan, Yu Zhu, Robert H. Hauge, and James M. Tour, "Toward hybrid superlattices in graphene", *Nature Commun.* 2, 559 (2011).
18. Zheng Yan, Zhiwei Peng, Zhengzong Sun, **Jun Yao**, Yu Zhu, Zheng Liu, Pulickel M. Ajayan, and James M. Tour, "Growth of bilayer graphene on insulating substrates", *ACS Nano* 5, 8187-8192 (2011) .
17. **Jun Yao**, Lin Zhong, Douglas Natelson, and James M. Tour, "Silicon oxide: a non-innocent surface for molecular electronics and nanoelectronics", *J. Am. Chem. Soc.* 133, 941-948, 2011.
16. Zhong Jin, **Jun Yao**, Carter Kittrell, and James M. Tour, "Large-Scale growth and characterizations of nitrogen-doped monolayer graphene sheets", *ACS Nano* 5, 4112-4117, (2011).

15. Zheng Yan, Zhengzong Sun, Wei Lu, **Jun Yao**, Yu Zhu, and James M. Tour, "Controlled modulation of electronic properties of graphene by self-assembled monolayers on SiO₂ substrates", *ACS Nano* 5, 1535-1540, 2011.
14. **Jun Yao**, Lin Zhong, Douglas Natelson, and James M. Tour, "Intrinsic resistive switching and memory effects in silicon oxide", *Appl. Phys. A* 102, 835-839, 2011.
13. Yu Zhu, Wei Lu, Zhengzong Sun, Dmitry V. Kosynkin, **Jun Yao**, and James M. Tour, "High throughput preparation of large area transparent electrodes using non-functionalized graphene nanoribbons", *Chem. Mater.* 23, 935-939, 2011.
12. **Jun Yao**, Lin Zhong, Douglas Natelson, and James M. Tour, "Making memory out of silicon oxide filaments", *EE Times Europe*, December 2010, p 11 (magazine article).
11. Zhengzong Sun, Zheng Yan, **Jun Yao**, Elvira Beitler, Yu Zhu, and James M. Tour, "Growth of graphene from solid carbon source", *Nature* 468, 549-552, 2010.
10. **Jun Yao**, Zhengzong Sun, Lin Zhong, Douglas Natelson, and James M. Tour, "Resistive switches from silicon oxide", *Nano Lett.* 10, 4105-4110, 2010.
9. Zhengzong Sun, Everett C. Salas, **Jun Yao**, James M. Tour, and Andreas Lüttge, "Microbially mediated transformation of graphene oxide", *GeoChimica et Cosmochimica Acta* 74, A1009, 2010.
8. Noe T. Alvarez, Christopher E. Hamilton, Cary L. Pint, Alvin Orbaek, **Jun Yao**, Andrew L. Frosinini, Andrew R. Barron, James M. Tour, and Robert H. Hauge, "Wet catalyst-support films for production of vertical aligned carbon nanotubes", *ACS Appl. Mater. Interfaces* 2, 1851-1856, 2010.
7. **Jun Yao**, Zhong Jin, Lin Zhong, Douglas Natelson, and James M. Tour, "Two-terminal nonvolatile memories from single-walled carbon nanotubes", *ACS Nano* 12, 4122-4126, 2009.
6. **Jun Yao**, Lin Zhong, Zengxing Zhang, Tao He, Patrick J. Wheeler, Douglas Natelson, and James M. Tour, "Resistive switching in nanogap systems on SiO₂ substrates", *Small* 24, 2910-2915, 2009.
5. Zengxing Zhang, Zhengzong Sun, **Jun Yao**, and James M. Tour, "Transforming carbon nanotube devices into nanoribbon devices", *J. Am. Chem. Soc.* 131, 13460-13463, 2009.
4. **Jun Yao**, Lin Zhong, Douglas Natelson, and James M. Tour, "Etching-dependent reproducible memory switching in vertical SiO₂ structures", *Appl. Phys. Lett.* 93, 253101, 2008.
3. Tao He, Meng Lu, **Jun Yao**, and James M. Tour, "Reversible modulation of conductance in silicon device via UV/Visible-light irradiation", *Adv. Mater.* 20, 4541-4546, 2008.
2. **Jun Yao** and Zhongqin Yang, "Spin accumulation in a ballistic Rashba bar", *Phys. Rev. B* 73, 033314, 2006.

1. **Jun Yao**, Yu-Chang Chen, Massimiliano Di Ventra, and Zhongqin Yang, “Effect of atomic geometry on shot noise in aluminum quantum point contacts”, *Phys. Rev. B* 73, 233407, 2006.

Patents

- 12 **Jun Yao**, Hongyan Gao, “3D sensors for simultaneous detection of bioelectronic and biomechanical signals in tissue”, application **63/334,426** filed Apr. 26, 2022.
- 11 **Jun Yao**, Xiaomeng Liu, “Devices and methods for energy harvesting from air humidity”, application **63/363,515** filed Apr. 25, 2022.
- 10 **Jun Yao**, Derek R. Lovley, Xiaomeng Liu, “Electric power generation from ambient humidity using protein nanowires”, application **62,738,320** filed Sep. 28, 2018, and **62,835,023** filed Apr 17, 2019.
- 9 **Jun Yao**, Derek R. Lovley, Tianda Fu, “Memristor device comprising protein nanowires”, application **63,007,136**, filed Apr. 8, 2020.
- 8 **Jun Yao**, Derek R. Lovley, Alexander Smith, Xiaomeng Liu, “Sensors comprising electrically-conductive protein nanowires”, application **63,014,043**, filed Apr. 22, 2020.

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- 7 Charles M. Lieber, Thomas G. Schuhmann, **Jun Yao**, Guosong Hong, Tian-ming Fu, Jungmin Lee, Hong-Gyu Park “Interfaces for syringe-injectable electronics”, US Patent application **15,977,710**, filed May 11, 2018.
- 6 James M. Tour, **Jun Yao**, Jian Lin, Gunuk Wang, Krishna Palem, “Addressable SiO_x memory array with incorporated diodes”, US Patent **9,385,163**, issued Jul. 5, 2016.
- 5 James M. Tour, **Jun Yao**, Douglas Natelson, Lin Zhong, Tao He, “Electronic devices containing switchable conductive silicon oxide as a switching element and methods for production and use thereof”, US Patent **9,129,676**, issued Sep. 8, 2015.
- 4 James M. Tour, Yubao Li, Alexander Sinitskii, Lin Zhong, Mian Dong, **Jun Yao**, “Vertically-stacked electronic devices having conductive carbon films”, US Patent **8,395,901**, issued Mar. 12, 2013.
- 3 Zvi Or-Bach, James M. Tour, **Jun Yao**, Brian Cronquist, “Method for fabrication of a semiconductor element and structure thereof”, US Patent **7,973,559**, issued Jul. 5, 2011
- 2 James M. Tour, **Jun Yao**, “Invisible/transparent nonvolatile memory”, US Patent Application **13/985,956**, filed Feb. 16, 2012.
- 1 James M. Tour, **Jun Yao**, Burt Fowler, Glenn Mortland, “SiO_x-based nonvolatile memory architecture”, US Patent Application **13/821,632**, filed Sep. 8, 2011.