

# Ruitao Su

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## Work

### Zhengzhou University

School of Mech. and Power Eng. Associate Professor 2022 – Now

### Massachusetts Institute of Technology

Comp. Sci. and Artif. Intellig. Lab Postdoctoral Associate 2021 – 2022

## Education

**University of Minnesota** Ph.D. in Mechanical Engineering Oct. 2020

*Minneapolis, MN, US*

➤ Best Dissertation Award: 3D Printing Multifunctional Optoelectronic and Microfluidic Devices

**University of Cincinnati** M.S. in Mechanical Engineering July 2015

*Cincinnati, OH, US*

**Huazhong University of Sci. and Tech.** B.S. in Mechanical Engineering July 2013

*Wuhan, Hubei, China*

## Research

**Massachusetts Institute of Technology** Postdoctoral Researcher 2021 – 2022

*Professor Wojciech Matusik*

Computational Design & Fabrication

➤ Applied computational design and optimization methods to camera systems, including lens and image sensors, which were embodied by 3D printing. This was the first end-to-end pipeline that reduced aberration and increased field-of-view of imaging systems via the incorporation of hardware feedback.

**University of Minnesota** Graduate & Postdoctoral Researcher 2015 – 2021

*Professor Michael C. McAlpine*

3D Printing Functional Devices

➤ First demonstrated the methodology of fabricating OLED displays entirely on 3D printers via novel organic-inorganic junction design and printing modalities. The multi-modal printing approach improved pixel brightness and created individually addressable pixel arrays.

➤ Investigated the yield-stress behavior of viscoelastic inks which was leveraged to print self-supporting microfluidic structures. Created the methodologies of printing functional components, including mixers, valves, and pumps. Demonstrated the first microfluidic networks that were printed on micro sensors and curvilinear surfaces.

➤ Investigated the methodologies of 3D printing organic and inorganic optoelectronic devices. Demonstrated the first fully 3D printed polymer photodetectors with a commercial-level quantum efficiency of 25.3%. First incorporated silicon nanocrystals as the bandgap emission material for 3D printed red-IR LEDs.

**University of Cincinnati** Graduate Researcher 2013 – 2015

*Professor Mark J. Schulz*

Nanoscience & Technology

➤ Investigated the synthesis of carbon nanotubes (CNTs) via floating catalyst chemical vapor deposition (CVD), for which the precursor composition and convective flow were discovered to largely affect the electrical and mechanical properties of CNT products.

**Huazhong University of Sci. and Tech.** Undergraduate Researcher 2012

*Professor Bao Song*

Numerical Control

- Assisted in making a position control board for the Numerical Control Field Bus. Programmed the position control board utilizing the Field Programmable Gate Array (FPGA) language.

## Publications

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### Peer-Reviewed Articles

- **R. Su**, F. Wang, M. C. McAlpine, 3D Printed Microfluidics: Advances in Strategies, Integration, and Applications, *Lab on a Chip* **23**, 1279-1299 (2023)
- **R. Su**, S. H. Park, X. Ouyang, S. I. Ahn, M. C. McAlpine, 3D Printed Flexible Organic Light-Emitting Diode Displays, *Science Advances* **8**, eabl8798 (2022)
  - Highlighted: *Nature* (2022). DOI: 10.1038/d41586-022-00043-4
- X. Ouyang, **R. Su**, G. Han, D. W. H. Ng, D. R. Pearson, M. C. McAlpine, 3D Printed Skin-Interfaced UV-Visible Photodetectors, *Advanced Science* **9**, 2201275 (2022)
- **R. Su**, J. Wen, Q. Su, M. S. Wiederoder, S. J. Koester, J. R. Uzarski, M. C. McAlpine, 3D Printed Self-Supporting Elastomeric Structures for Multifunctional Microfluidics, *Science Advances* **6**, eabc9846 (2020)
- S. H. Park\* (co-first), **R. Su\*** (co-first), J. Jeong, S.-Z. Guo, K. Qiu, D. Joung, F. Meng, M. C. McAlpine, 3D Printed Polymer Photodetectors. *Advanced Materials* **30**, 1803980 (2018)
  - Highlighted: *Nature* (2018). DOI: 10.1038/d41586-018-06193-8
- K. Qiu, Z. Zhao, G. Haghiashtiani, S.-Z. Guo, M. He, **R. Su**, Z. Zhu, D. Bhuiyan, P. Murugan, F. Meng, S. H. Park, C.-C. Chu, B. M. Ogle, D. A. Saltzman, B. R. Konety, R. M. Sweet, M. C. McAlpine, 3D Printed Organ Models with Physical Properties of Tissue and Integrated Sensors. *Advanced Materials Technologies* **3**, 1700235 (2017)
- G. Hou, D. Chauhan, V. Ng, C. Xu, Z. Yin, M. Paine, **R. Su**, V. Shanov, D. Mast, M. Schulz, Y. Liu, Gas Phase Pyrolysis Synthesis of Carbon Nanotubes at High Temperature. *Materials and Design* **132**, 112-118 (2017)
- G. Hou, **R. Su**, A. Wang, V. Ng, W. Li, Y. Song, L. Zhang, M. Sundaram, V. Shanov, D. Mast, D. Lashmore, M. Mark, Y. Liu, The effect of a convection vortex on sock formation in the floating catalyst method for carbon nanotube synthesis. *Carbon* **102**, 513–519, (2016)

### Book Chapter

- **R. Su**, S. H. Park, Z. Li, M. C. McAlpine, “3D Printed Electronic Materials and Devices,” in *Robotic Systems and Autonomous Platforms: Advances in Materials and Manufacturing*. Eds: S. M. Walsh, M. S. Strano. CH 13 (Woodhead, Cambridge, 2019)

### Conference Proceeding

- J. R. Uzarski, M. S. Wiederoder, C. Luckhardt, R. Paffenroth, **R. Su**, M. C. McAlpine, Novel data science driven chemical and biological agent sensors: towards better discrimination in complex environments, *18th International Meeting on Chemical Sensors*, Montreal, Canada (2020)

## Patents

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- M. C. McAlpine, X. Ouyang, D. Pearson, **R. Su**, “Photodetectors for Measuring Real-Time Optical Irradiance,” US Provisional Patent Application 63/366,299. International Patent Application: 1008-333WO01.
- M. C. McAlpine, **R. Su**, S. H. Park, “Organic Light-Emitting Diode (OLED) Display and Methods of Fabrication Using a Multimodal Three-Dimensional (3D) Printing Technique,” US Provisional Patent Application 63/247,358. International Patent Application PCT/US22/44322.
- M. C. McAlpine, **R. Su**, S. J. Koester, J. R. Uzarski, “Additively Manufactured Self-Supporting Microfluidics,” U.S. Patent US 11,820,061 B2. International Patent Application PCT/US2020/061072.
- E. Crist, D. K. Wood, **R. Su**, M. C. McAlpine, “Three-Dimensional Microfluidic Metastasis Array,” U.S. Patent Application 18/556,529. International Patent Application PCT/US22/71843.

## Presentations

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### Invited

- “3D Printing Multifunctional Microfluidics” Sep. 2022  
*Invited talk in the Qiu’s Research Group at Washington State University*
- “3D Printing Optoelectronic Materials and Devices” Mar. 2022  
*Invited talk on the KLA Instruments Display Materials Technology Asia Symposium*
- “3D Printed Microfluidics with Applications in Drug Screening and Oncology Research” Sep. 2021  
*Invited talk on the “6<sup>th</sup> Annual 3D Tissue Models Summit” (Boston, MA)*
- “3D Printed Self-Supporting Elastomeric Microfluidics with Yield-Stress Polymers” May 2021  
*Invited seminar presentation at Korea Institute of Industrial Technology (Online)*

### Talks

- “3D Printed Flexible Organic Light Emitting Diode Displays” Dec. 2021  
*Presentation in Materials Research Society (Boston, MA)*
- “3D Printed Self-Supporting Elastomeric Structures for Multifunctional Microfluidics” Nov. 2020  
*Presentation in Materials Research Society (Online)*
- “3D Printed Polymer Photodetector” Nov. 2018  
*Presentation in Materials Research Society (Boston, MA)*

### Posters

- “3D Printed LED and Photodetectors” July 2019  
*Poster on Purdue Mi-Bio Summit on Flexible and Stretchable Bioelectronics (West Lafayette, IN)*
- “3D Printed Silicon Nanocrystal LED” Mar. 2017  
*Poster on NSF MnDRIVE Symposium (Minneapolis, MN)*

## Awards

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- Pui Best Dissertation Award** Sep. 2022  
University of Minnesota
- Best Dissertation Award** Apr. 2021  
Department of Mechanical Engineering of UMN
- MRS Best Presentation Award** Dec. 2020  
Material Research Society, Additive Manufacturing Symposium
- MRS Graduate Student Silver Award** Nov. 2018  
Material Research Society (<https://www.mrs.org/gsa-past>)
- Outstanding Research Award** July 2015  
Nanoworld Lab at the University of Cincinnati
- National Encouragement Scholarship** Oct. 2010  
Ministry of Education of the People's Republic of China
- Excellent Freshman Study Scholarship** Apr. 2010  
Mechanical School of HUST

## Academic Services

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- **Journal editorial boards:** *Micromachines* (Topic Editor, since 2021)
- **Journal reviewer:** *Nature Communications, MRS Advances, Journal of Materials Chemistry C, ACS Applied Materials & Interfaces, npj Flexible Electronics, PLOS ONE*

## Teaching & Leadership

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- **Mentorship:** 2017 Summer NSF MRSEC undergrad researcher: Nicholas Fuhr
- **Guest lecturer:** Introduction to Nanoscience (2021 Fall, Virginia Commonwealth University), Biofabrication (2021 Spring, University of Nebraska-Lincoln), Introduction to Nanotechnology (2019 Fall, University of Minnesota)
- **Teaching assistant:** Vibration Engineering (University of Minnesota), Kinematics and Kinetics of Machines, Structural Mechanics, Engineering Economics (University of Cincinnati)
- **Lab safety officer** of the McAlpine Research Lab at University of Minnesota (2017 – 2020)
- **Secretary** of ME Grad Student Council, University of Minnesota (2017 – 2019)
- **Volunteer supervisor** of environmental protection nonprofit – Great River Greening (2017)

## **Press Report**

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- “Print job completed: a bendable image display,” *Nature Research Highlight*, Jan. 2022
- “How microfluidics can automate drug discovery and development,” *Drug Target Review*, May 2021
- “3D printing microfluidic channels for medical testing,” *National Academy of Engineering Frontier of Engineering*, Jan. 2021
- “Eyes, wasps and asteroid dust — August’s best science images,” *Nature News*, Sep. 2018
- “12 innovations that will revolutionize the future of medicine,” *National Geographic*, Dec. 2018