

Ruitao Su

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Education

PhD in Mechanical Engineering , University of Minnesota	Oct. 30, 2020
MS in Mechanical Engineering , University of Cincinnati	2015
BS in Mechanical Engineering , Huazhong University of Science and Technology	2013

Postdoctoral Training

Postdoc in Computer Science and Artificial Intelligence Lab , MIT	2021 - Present
○ Advisor: Wojciech Matusik	
Postdoc in Mechanical Engineering , University of Minnesota	2020 - 2021
○ Advisor: Michael C. McAlpine	

Publications

Journal Articles

- **R. Su**, G. Haghighashtiani, M. C. McAlpine, Advances in Materials, Integration, and Functionalities of 3D Printed Microfluidics, *Lab on a Chip* (2022) [Review paper under preparation]
- **R. Su*** (co-first), S. H. Park* (co-first), X. Ouyang, S. I. Ahn, M. C. McAlpine, 3D Printed Flexible Organic Light-Emitting Diode Displays, *Science Advances* **8**, eabl8798 (2022) [Accepted]
- **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. Haghighashtiani, 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 Chapters

- **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 Proceedings

- 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)

Press Articles

- “How microfluidics can automate drug discovery and development”, *Drug Target and Review*, May 2021

- “3D printing and the path to next generation optoelectronics”, *Queen Elizabeth Prize for Engineering*, June 2019

Patents

- 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.
- M. C. McAlpine, **R. Su**, S. J. Koester, J. R. Uzarski, “Additively Manufactured Self-Supporting Microfluidics,” U.S. Patent Application 16/951,794. International Patent Application PCT/US2020/061072.
- E. Crist, D. K. Wood, **R. Su**, M. C. McAlpine, “Three-Dimensional Microfluidic Metastasis Array,” U.S. Provisional Patent Application 63/201,276.

Presentations

Talks

- “3D Printed Flexible Organic Light Emitting Diode Displays” **Dec. 2021**
Presentation in Materials Research Society (Boston, MA)
- “3D Printed Microfluidics with Applications in Drug Screening and Oncology Research” **Sep. 2021**
Invited talk on the “6th 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)
- “3D Printing Functional Materials for the Next-Generation Optoelectronic & Microfluidic Devices” **Dec. 2020**
Invited talk at the 9th East Lake International Forum for Outstanding Overseas Young Scholars (Online)
- “3D Printed Multifunctional Devices for Biomedical Applications” **Nov. 2020**
Lightning/flash live talk in Materials Research Society (Online)
- “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

- 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>)
- University of Minnesota Graduate Fellowship** **2015 - 2016**
Department of Mechanical Engineering of UMN
- Outstanding Research Award** **July 2015**
Nanoworld Lab of UC
- University Graduate Scholarship** **Sept. 2013 - Apr. 2015**
University of Cincinnati

Excellent Study Scholarship Mechanical School of HUST	Dec. 2011
National Encouragement Scholarship Ministry of Education of the People's Republic of China	Oct. 2010
Excellent Freshman Study Scholarship Mechanical School of HUST	Apr. 2010

Mentoring & Teaching

- **Student mentorship**
 - 2017 Summer NSF MRSEC undergrad research program: Nicholas Fuhr (PhD, Boston University)
- **Guest lecturer**
 - PHYS 491: Introduction to Nanoscience (2021 Fall, Virginia Commonwealth University)
 - MECH 492/892-012: Biofabrication (2021 Spring, University of Nebraska-Lincoln)
 - ME 8255: Introduction to Nanotechnology (2019 Fall, University of Minnesota)
- **Teaching assistant**
 - Vibration Engineering (University of Minnesota)
 - Kinematics and Kinetics of Machines (University of Cincinnati), Structural Mechanics (University of Cincinnati), Engineering Economics (University of Cincinnati)

Academic Services

- **Journal editorial boards**
 - *Micromachines*, Topic Editor
- **Grant reviewer**
 - Conference travel grants, Grad Student Council of University of Minnesota (May 2020)
- **Journal reviewer**
 - *Nature Communications*, *MRS Advances*, *Journal of Materials Chemistry C*, *ACS Applied Materials & Interfaces*, *npj Flexible Electronics*, *PLOS ONE*

Leadership

- **Lab safety officer** of the McAlpine Research Lab **2017 – 2020**
 - Coordinated execution of research protocols for lab safety
 - Conducted annual lab-specific safety training
- **Secretary** of ME Grad Student Council, University of Minnesota **2017 – 2019**
 - Assisted in departmental recruitment visiting of graduate students
- **Volunteer supervisor** of Great River Greening **Mar. - Aug. 2017**
 - Mentored monthly on-site work for natural habitats improvement, studied ecological conditions of rivers & forests

Research

McAlpine Research Group (University of Minnesota) **Sept. 2015 – Present**

Advisor: Michael C. McAlpine

- **Multimodal 3D printed light emitting diode (LED) displays**
 - Designed a multimodal and multi-material method to fully 3D print individually-addressable LED displays
 - Realized cathode and interconnects printing at room temperature utilizing mechanical reconfiguration of liquid metal
 - Improved pixel brightness and lifetime by optimizing emissive layer uniformity with spray printing
- **3D printed self-supporting and elastomeric microfluidics**
 - Invented a strategy to print self-supporting microfluidic structures by extruding yield-stress viscoelastic inks

- Created the methods to print multifunctional components, including mixers, valves, and pumps
- Created the methodology to directly print microfluidic networks on micro sensors and curvilinear surfaces
- **3D printed polymer photodetectors (PDs)**
 - Optimized thickness of 3D printed photoactive film, achieving a commercial-level quantum efficiency of 25.3%
 - Integrated PD arrays on curvilinear surfaces for spherical image sensing and bionic eyes
 - Created a method to print multifunctional optoelectronic circuits by integrating PD & LED in a side-by-side layout
- **Red-IR LEDs printed with silicon nanocrystals (SiNCs)**
 - Printed biocompatible nano particles, SiNCs, as the emissive layer of LEDs and acquired RED-IR electroluminescence

Nanoworld Lab (University of Cincinnati)

Dec. 2013 - July 2015

Advisor: Mark J. Schulz

- **Carbon nanotube (CNT) synthesis via floating catalyst chemical vapor deposition (CVD)**
 - Investigated precursor compositions to improve the electrical and mechanical properties of CNTs
 - Created methods to on-the-fly spin CNT yarns and sheets from the as-synthesized CNT aerogel assembly

National Numerical Control Research Center

May - Sept. 2012

Advisor: Bao Song

- **Position control board for Numerical Control Field Bus**
 - Programmed the position control board utilizing Field Programmable Gate Array (FPGA) language

Technical Skills

- Characterization: **Confocal microscope, SEM, AFM, Raman Spectroscopy**
- Finite element analysis (FEA): **COMSOL, Ansys**
- Computer aided design (CAD): **Solidworks, Auto CAD**
- Programming and data science: **Matlab, Python & C++**

Press Report

- “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
- “Researchers 3D print unique micro-scale fluid channels used for medical testing,” Tech. Networks, Oct. 2020
- “Interview: how the US Army’s scientists are 3D printing cyberpunk-style biological sensors,” 3D Printing Industry, Nov. 2020
- “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