

Sunandita Sarker, Ph.D.

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EDUCATION AND ACADEMIC POSITIONS

POSTDOCTORAL ASSOCIATE

University of Maryland, College Park, Department of Mechanical Engineering

MARYLAND ROBOTIC CENTER POSTDOCTORAL FELLOW

Advisor: Ryan D. Sochol

November 2021 – Present

PH.D. IN MECHANICAL ENGINEERING AND APPLIED MECHANICS

University of Nebraska-Lincoln | Lincoln, Nebraska

Dissertation topic: *Noninvasive or minimally invasive methods of biological drug delivery.*

Advisor: Benjamin S. Terry

August 2021

B.S. IN MECHANICAL ENGINEERING

Bangladesh University of Engineering and Technology | Dhaka, Bangladesh

Senior Design: "Self-balanced Autonomous Bicycle" ([Link](#))

Advisor: Md. Zahurul Haq

September 2015

FELLOWSHIPS, AWARDS, AND PATENTS

- 2023 Rising Stars in Mechanical Engineering Workshop Travel Award
- 2023 University of Wisconsin Madison, WiscProf Future Faculty in Engineering Workshop Travel Award
- 2022 NextProf Nexus Workshop Travel Award
- 2022 Maryland Robotic Center Postdoctoral Fellowship
- 2022 Springer Nature Best Paper Award Runner Up
- 2022 U.S. Provisional Patent Filed: "Method for additive manufacturing of fluidic structures directly atop additively manufactured capillaries"
- 2020 U.S. Patent, US20200179643A1: "Catheter for atraumatic fluid delivery"
- 2014 The Grace Hopper Celebration India Best Poster Award

PEER-REVIEWED JOURNAL ARTICLES

- [1] **Sunandita Sarker**, Adira Colton, Ziteng Wen, Xin Xu, Metecan Erdi, Anthony Jones, Peter Kofinas, Eleonora Tubaldi, Piotr Walczak, Mirosław Janowski, Yajie Liang, and Ryan D. Sochol, "3D-Printed Microinjection Needle Arrays via a Hybrid DLP-Direct Laser Writing Strategy," *Adv. Mater. Technol.*, Vol 8(5), p. 2370021, Mar. 2023, doi: 10.1002/admt.202370021. ([Link](#)) (**Inside Cover Article**)
- [2] Musharrat Mustaree Mau, **Sunandita Sarker**, Seth P. Harris, and Benjamin S. Terry, "Design and Testing of a Superelastic Nitinol Tissue Attachment Mechanism for Long-term Gastrointestinal Device Retention," *J. Med. Devices.*, p. 1-32, Mar. 2023, doi: 10.1115/1.4057058. ([Link](#))
- [3] **Sunandita Sarker**, Ben Wankum, Trevor Perey, Jeff Shimizu, Ryan Jones, and Benjamin S. Terry, "A Novel Capsule-Delivered Enteric Drug-Injection Device for Delivery of Systemic Biologics: A Pilot Study in a Porcine Model," *IEEE Trans. Biomed. Eng.*, Vol 69(6), p. 1870 - 1879, Nov. 2021, doi: 10.1109/TBME.2021.3129653. ([Link](#)) (**Cover Article**)
- [4] **Sunandita Sarker**, Ben Wankum, Jeff Shimizu, Ryan Jones, and Benjamin S. Terry, "A Factorial Approach for Optimizing the Design Parameters of a Tissue Attachment Mechanism for Drug Delivery," *IEEE Trans. Biomed. Eng.*, Vol 69(1), p. 32-41, June 2021, doi: 10.1109/TBME.2021.3086975. ([Link](#)) (**Cover Article**)



- [5] Musharrat Mustaree Mau, **Sunandita Sarker**, and Benjamin S. Terry, "Ingestible Devices for Long-term Gastrointestinal Residency: A Review," *Prog. Biomed. Eng.*, Jul 2021, doi: 10.1088/2516-1091/ac1731. ([Link](#))
- [6] Lavinia Barducci, Joseph C. Norton, **Sunandita Sarker**, Sayeed Mohammed, Ryan Jones, Pietro Valdastrì, and Benjamin S. Terry "Fundamentals of the Gut for Capsule Engineers," *Prog. Biomed. Eng.*, vol. 2, 4, p. 042002, September 2020, doi:10.1088/2516-1091/abab4c. ([Link](#))
- [7] **Sunandita Sarker**, Yiannis S. Chatzizisis, and Benjamin S. Terry, "Computational Optimization of a Novel Atraumatic Catheter for Local Drug delivery in Coronary Atherosclerotic Plaques," *Medical Engineering and Physics*, vol. 79, p. 26-32, Mar 2020, doi: 10.1016/j.medengphy.2020.03.003. ([Link](#))

CURRENT/UPCOMING JOURNAL ARTICLE SUBMISSIONS

- [8] **Sunandita Sarker**, Ziteng Wen, Anthony Jones, DoHwan Park, Eleonora Tubaldi, Rachel Brewster, Kinneret Rand-Yadin, and Ryan D. Sochol, "3D Microprinting-Enabled Anti-Clogging Microinjection Needles." (*Submitting to Nature Biomedical Engineering*)
- [9] Gregory Hirst, **Sunandita Sarker**, and Benjamin S. Terry, "Differences in the Mechanical Properties of Intestinal Tissue Based on Preservation Freezing Duration and Temperature." (*Under Review in Journal of the Mechanical Behavior of Biomedical Materials*)
- [10] Olivia M. Young, Xin Xu, **Sunandita Sarker**, and Ryan D. Sochol, "Recent Trends for 3D-Printed Bio-microfluidic Systems Using Two-Photon Direct Laser Writing," *Biomicrofluidics*, 2023. (*In Press*)
- [11] Olivia M. Young, Xin Xu, **Sunandita Sarker**, and Ryan D. Sochol, "Direct Laser Writing-Enabled 3D Printing Strategies for Microfluidic Applications." (*Under Review in Lab on a Chip*)

PEER-REVIEWED CONFERENCE PROCEEDINGS AND ORAL PRESENTATIONS

- [12] **Sunandita Sarker**, Adira Colton, Ziteng Wen, Xin Xu, Piotr Walczak, Mirosław Janowski, Yajie Liang, and Ryan D. Sochol, "A Hybrid 3D Micro-Nanoprinting Approach for Biomedical Microinjection Needle Arrays," in Hilton Head Workshop 2022: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, USA June 2022. (**Best Paper Award Runner Up**) ([Presentation Video](#)) ([Press Release](#))
- [13] **Sunandita Sarker**, Ryan Jones, Gabriel Chow, and Benjamin S. Terry, "Design of a Soft, Self-uncoiling Stent for Extended Retention of Drug Delivery in the Small Intestine," in 2021 Design of Medical Devices Conference, Minneapolis, MN, USA, April 2021, doi: 10.1115/DMD2021-1063. (**Three-in-Five Competition Finalist**) ([Link](#))
- [14] **Sunandita Sarker**, Yiannis S. Chatzizisis, Srivatsan Kidambi, and Benjamin S. Terry, "Design and Development of a Novel Drug Delivery Catheter for Atherosclerosis," in 2018 Design of Medical Devices Conference, Minneapolis, MN, USA, April 2018, doi: 10.1115/DMD2018-6869. (**Three-in-Five Competition Finalist**) ([Link](#))
- [15] Maitraye Das, **Sunandita Sarker**, and Syeda Lammim Ahad, "A Novel Health Support System with Biometric Data Acquisition Device," in the 19th IEEE International Conference on Computer and Information Technology (ICCIT), Dhaka, Bangladesh, December 2016, doi: 10.1109/ICCITECHN.2016.7860195. ([Link](#))
- [16] **Sunandita Sarker**, "Wizard Chess: An Autonomous Chess-playing Robot," in IEEE International WIE Conference on Electrical and Computer Engineering, Dhaka, Bangladesh, December 2015, doi: 10.1109/WIECON-ECE.2015.7443971. ([Link](#))

CURRENT/UPCOMING CONFERENCE SUBMISSIONS

- [17] **Sunandita Sarker**, Kimia Forghani, Ziteng Wen, Ryan Halli, Stephen W. Hoag, Sharon Flank, and Ryan D. Sochol, "Toward Controlled-Release Drug Delivery Microcarriers Enabled by Direct Laser Writing 3D Printing." (*Submitted to IEEE MEMS 2024*)

- [18] **Sunandita Sarker**, Jinghui Wang, Shrey A. Shah, Christopher M. Jewell, Kinneret Rand-Yadin, Piotr Walczak, Mirosław Janowski, Yajie Liang, and Ryan D. Sochol, "Geometric Determinants of Cell Viability for 3D-Printed Hollow Microneedle-Array-Mediated Delivery." (*Submitted to IEEE MEMS 2024*)
- [19] Adira Colton, **Sunandita Sarker**, Joshua A. Levy, Reza Ghodssi, Kinneret Rand-Yadin and Ryan D. Sochol, "POSS-Enabled Mechanical Enhancement for 3D-Nanoprinted High-Aspect-Ratio Microinjection Needles." (*Submitted to IEEE MEMS 2024*)
- [20] Bailey M. Felix, Olivia M. Young, **Sunandita Sarker**, Jordi Andreou, Mark D. Fuge, Christopher Bailey, and Ryan D. Sochol, "Fabrication of Multi-Lumen Microfluidic Tubing for Ex Situ Direct Laser Writing." (*Submitted to IEEE MEMS 2024*)

INVITED TALKS

- [1] "Soft Robots with Integrated Fluidic Circuitry for Marine Application," *The Maryland Robotics Center Research Symposium May 2022*, University of Maryland College Park, College Park, MD 2022.
- [2] "Swallowable Capsule for Systemic Delivery of Biologics," *Engineering Graduate Student Symposium 2021*, College of Engineering, University of Nebraska Lincoln, Lincoln, NE, February 2021.
- [3] "Design and Development of a Swallowable Capsule Robot for Drug Delivery," *MME Graduate Seminar Series*, University of Nebraska Lincoln, Lincoln, NE, September 2020.
- [4] "Design and Development of a Novel Drug Delivery Catheter for Atherosclerosis," *Advances in Cardiovascular Medical Devices*, 2018 Design of Medical Devices Conference, Minneapolis, MN, USA, April 2018.

POSTER PRESENTATIONS

- [1] **Sunandita Sarker**, Yiannis S. Chatzizisis, Srivatsan Kidambi, Benjamin S. Terry, "Design and Development of a Novel Drug Delivery Catheter for Atherosclerosis," *Poster session*, 2018 Design of Medical Devices Conference, Minneapolis, MN, USA, April 2018.
- [2] **Sunandita Sarker**, Yiannis S. Chatzizisis, Srivatsan Kidambi, Benjamin S. Terry, "A Novel Drug Delivery Catheter for Atherosclerosis," University of Nebraska-Lincoln Spring Research Fair, Lincoln, NE.
- [3] **Sunandita Sarker**, "Wizard Chess: An Autonomous Chess-playing Robot," Technical poster, IEEE International WIE Conference on Electrical and Computer Engineering, Dhaka, Bangladesh, December 2015.
- [4] Maitraye Das, **Sunandita Sarker**, and Shahina Ferdous, "SpeechAid: A Self-treatment System for Individuals with Speech Disorder via Mobile Application," Grace Hopper Celebration India (GHCI), Bangalore, India, November 2014. (**Best Poster Award**)

PROFESSIONAL DEVELOPMENT ACTIVITY

RISING STARS IN MECHANICAL ENGINEERING 2023

October 2023

- Selected among ~30 participants from more than 100 nominations.
- Workshop to support senior graduate students and postdocs who are considering careers in academia.
- Organized by MIT, Stanford, CMU, and UC Berkeley.

WISCPROF FUTURE FACULTY IN ENGINEERING WORKSHOP

June 2023

- Organized by University of Wisconsin Madison.
- Workshop to prepare future academics for faculty application and interview process.

NEXTPROF NEXUS 2022

September 2022

- Effort to strengthen and diversify the next generation of academic leaders in engineering.
- Organized by U Michigan, UC Berkeley and Georgia Tech.

2022 ASEE ANNUAL CONFERENCE & EXPOSITION

June 2022

- Participated as part of UMD College of Engineering team to engage students in UMD's engineering program.
- Demonstrated soft robotic platform.

RESEARCH EXPERIENCE

POSTDOCTORAL ASSOCIATE**November 2021 – Present**

University of Maryland, College Park, Department of Mechanical Engineering

- Introduced novel hybrid additive manufacturing strategies for micro and nano device fabrication.
- Developed first-ever 3D-printed hollow microinjection arrays for direct cell microinjections.
- Innovated microneedle array-based injection platforms for neurodegenerative stem cell treatments.
- Created 3D-printed hollow microneedles with unprecedented high aspect ratio (e.g., ≥ 40).
- Advanced two-photon-polymerization based 3D-micro/nanoprinting of custom biodegradable materials.
- Led project in 3D-printed drug microcarriers optimizing timed pharmaceutical release.

RESEARCH ASSOCIATE**April 2022 – December 2022**

SeeTrue Technology LLC

- Developed and validated 3D-printed microinjection needles designed for fertility treatment.

GRADUATE RESEARCH ASSISTANT**August 2016 - August 2021**

University of Nebraska-Lincoln, Department of Mechanical and Materials Engineering

- Introduced non-electronic-based ingestible capsule robots.
- Enhanced systemic macromolecule drug uptake methods via the oral route.
- Developed tissue attachment mechanism in the small intestine for drug delivery and biosensing.
- Created capsule robots for systemic macromolecule drug delivery via the oral route.
- Designed and built novel atraumatic drug delivery catheter for targeted treatment of coronary atherosclerosis.
- Innovated soft drug delivery device for intestinal drug delivery.

Undergraduate Research Assistant**September 2013 – June 2015**

Bangladesh University of Engineering and Technology, Department of Mechanical Engineering

- Designed control models for self-balancing autonomous bicycles.
- Developed mechatronics-based autonomous chess playing robot.
- Developed low-cost biometric data acquisition devices and healthcare mobile applications.

TECHNICAL EXPERIENCE

EQUIPMENT MANAGER**May 2017- August 2020**

Nano-Engineering Research Core Facility, University of Nebraska-Lincoln

Stratasys Objet 500 Connex3 3D printer

- Trained over 300 new students and 10 groups of professionals to use the printer.
- Introduced the equipment and presented its capability to industries and other facilities.

TEACHING EXPERIENCE**GUEST LECTURER****Fall 2022, Spring 2023***ENME416: Additive Manufacturing*

University of Maryland, College Park, Department of Mechanical Engineering

- Delivered lectures on state-of-the-art light-based additive manufacturing strategies.
- Showcased additive manufacturing techniques used in medical device research.

COURSE INSTRUCTOR**Fall 2020, Spring 2021***MECH 488 Kinematics and Machine Design Laboratory (Senior undergraduate major required course)*

University of Nebraska-Lincoln Department of Mechanical and Materials Engineering

- Designed, prepared, and delivered course structure, syllabus, and class lectures for about 120 students.

GRADUATE TEACHING ASSISTANT**Fall 2016***MECH 373 Engineering Dynamics*

University of Nebraska-Lincoln Department of Mechanical and Materials Engineering

- Prepared and delivered recitation classes.
- Designed and graded homework assignments.
- Organized and graded exams.

MENTORING AND ADVISING EXPERIENCE

UNIVERSITY OF MARYLAND, COLLEGE PARK

November 2021 – Present

I am leading and mentoring a highly motivated group of student researchers gaining experience in:

- Designing 3D microstructural models using CAD engineering software.
- Fabricating microdevices and fluidic circuitry using light-based additive manufacturing strategies.
- Simulating flow behavior and microscale mechanics using COMSOL Multiphysics software.
- Performing microfluidic experiments with fluidic circuitry and microdevices.
- Analyzing experimental data, using MATLAB and ImageJ for data acquisition.

Current/Former Students (16 in Total)

- | | |
|--------------------------------------|--|
| • Nathan Hill (BS/MS Student) | • Jacob Rose (UG Senior Year) |
| • Ryan Halli (BS/MS Student) | • Jared Gresen (UG Senior Year) |
| • Declan Fitzgerald (BS/MS Student) | • Heather Fettke von Koeckritz (UG Senior Year) |
| • Zosia Massey (UG Senior Year) | • Kerdeem Nurse Farrell (UG Senior Year) |
| • Nathan Ravnitzky (UG Junior Year) | • Elena Encinas Vargas (Visiting Scholar) |
| • Adithya Kidambi (UG Freshman Year) | • Juan Grano de Oro Fernandez (Visiting Scholar) |
| • Theresa Sheehan (UG Senior Year) | • Marina Crespo Aguirre (Visiting Scholar) |
| • Ariana Capati (UG Senior Year) | • Roberto Invernón López (Visiting Scholar) |

Current/Former Highschool Students (6 in Total)

- | | |
|--------------------|----------------|
| • Alex Stone | • Aditya Das |
| • Joseph Rosenfeld | • Sean Li |
| • Matthew Slagle | • Andrew Szabo |

UNIVERSITY OF NEBRASKA-LINCOLN

May 2017 – August 2021

- Trained and mentored Masters' students in the lab.
- Oversaw Research Experience for Undergraduate (REU) program.

Graduated/Former Students (6 in Total)

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|-----------------------------------|--------------------------------------|
| • Sayeed Mohammed (MS Student) | • Sofia C. Perez Otero (REU Student) |
| • Musharrat Mustaree (MS Student) | • Trevor Perey (REU Student) |
| • Weiwei Zhao (MS Student) | • Andrea Fiala (REU Student) |

HIGH SCHOOL TUTOR

January 2010 – May 2016

- Tutored and mentored over 10 students in Bangladesh throughout their high school.

SERVICE AND OUTREACH

UNIVERSITY OF MARYLAND, COLLEGE PARK

Department of Mechanical Engineering

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|---|------------|
| - Participated in Blair High School Magnet program to mentor high school students | 2022, 2023 |
| - Mentored for the Louis Stokes Alliances for Minority Participation Undergraduate Research Program | 2022 |
| College of Engineering Dean's Office | 2022 |
| - Participated in engineering student recruitment activities. | |

Fischell Department of Bioengineering

- | | |
|--|------|
| - Participated in LGBTQ+ and pride awareness. (Spotlight) | 2023 |
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University of Nebraska-Lincoln

MME Graduate Student Association, Executive Officer

2018, 2019

- Organized networking events and graduate student socials.
- Communicated with the administration about graduate students' needs.

Bangladesh Student Association, Student Volunteer

2016 – 2021

- Organized cultural, social, and networking events for Bangladeshi students at UNL.
- Participated in programs to represent Bangladesh to the Lincoln and the UNL community.
- Held events to raise funds for the organization.

Professional

- Society of Women Engineers, Lincoln Chapter, Graduate School Panelist 2018, 2020
 - Held events to encourage undergraduate women to join graduate school.
 Biomedical Engineering Society, UNL' student chapter, Member and panelist 2019
 - Held events to share experiences and expectations related to biomedical research with undergraduate students.

PROFESSIONAL ORGANIZATIONS

Biomedical Engineering Society	2020 – Present
IEEE Robotics and Automation Society Membership	2020 – Present
IEEE Women in Engineering Membership	2020 – Present
The American Society of Mechanical Engineers	2021

OTHER SKILLS**Software**

- | | | |
|-----------------------|---------------------|-------------------|
| • MATLAB | • Arduino IDE | • Adobe Photoshop |
| • Simulink | • ImageJ | • Minitab |
| • LabVIEW | • SolidWorks | • GraphPad |
| • COMSOL Multiphysics | • AutoCAD Inventor | • Prism |
| • ANSYS Fluent | • Adobe Illustrator | • BioRender |

Instrumentation and Machinery

- | | |
|--|--------------------------------------|
| • Nanoscribe Photonic Professional GT2 | • Scanning Electron Microscopy (SEM) |
| • Stratasys Objet 500 Connex3 3D printer | • High-Speed Camera and Video |
| • Formlabs Form 3B | • Microscopy and image analysis |
| • Makerbot Replicator | • CNC Machining Laser Cutter |
| • Keyence Laser Scanning Microscopy | • PCB Building and Soldering. |
| • Zeiss Fluorescence Microscopy | |

Language

Fluent in English, Hindi, and Bangla