IMPACT-NG R.E.U.

Research Experience for Undergraduates

INDEX: IMPACT REU PRODUCTS

PATENTS

1. Harnett, Cindy K., Jasmin Beharic, **Canisha Ternival**, Sushmita Challa, and Mohammad Shafquatul Islam. "Microgrippers for Transferring Devices to Fibrous Surfaces." U.S. Patent Application 16/983,405, filed November 18, 2021.

BOOK COVERS

1. DJ Allen, **RP Accolla**, and SJ Williams. *"Isomotive dielectrophoresis (isoDEP) for parallel analysis of individual particles"*. This work will be featured on the front cover of an upcoming Electrophoresis issue. Status = ACCEPTED; Acknowledgement of Federal Support = Yes. 2016.

JOURNAL PUBLICATIONS

1. **Paul Cuillier**, Pom L. Kharel, Kasun Fernando, Francis P. Zamborini, and Bruce Alphenaar (2018). Effect of Rare-Earth Metal Oxide Nanoparticles on the Conductivity of Nanocrystalline Titanium Dioxide: An Electrical and Electrochemical Approach. *Journal of Physical Chemistry Letters*. . Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; OTHER:
2. Centner, Connor and Moore, John and Baxter, Mary and **Vinseiro Figueira, Mariana** and Long, Zachary and Belott, Clinton and Menze, Michael and Bates, Paula and Yaddanapudi, Kavitha and Kopechek, Jonathan.. (2021). Modulation of acoustofluidic parameters to assess effect on molecular loading in human T cells.. The journal of the Acoustical Society of America. 150 (4) . Status = Added in NSF-PAR Federal Government's License = Acknowledged.
3. Challa, Sushmita, **Canisha Ternival**, Shafquatul Islam, Jasmin Beharic, and Cindy K Harnett. 2019. "Transferring Microelectromechanical Devices to Breathable Fabric Carriers with Strain-Engineered Grippers." MRS Advances, February 2019, pp. 1–8.
4. Islam, M. S., S. Challa, **M. H. Yassin,** S. S. Vankayala, J. Beharic, and C. K. Harnett. "MEMS Bimorph Fiber-Gripping Actuators." In 2022 International Conference on Manipulation, Automation and Robotics at Small Scales (MARSS), pp. 1-6. IEEE, 2022.

5. **Song, Nathan**, Wei, Danming, and Harnett, C. K., “Powering Wire-Mesh Circuits through MEMS Fiber-Grippers,” Proceedings of IEEE International Conference on Flexible, Printable Sensors and Systems (FLEPS) 2023.

CONFERENCE ORAL TALKS

1. **Bailey Masingo**, Alexander Gupta, Gautam Gupta. "Understanding the Fundamentals of Hydrogen Evolution Reaction". 2017 NNCI REU Convocation, Atlanta, GA.
2. ***Brendan Noone**, Douglas Jackson, Kevin Walsh. "Exploring Strategies to Effectively Fabricate Conductors within 3D Printed Plastic Components".* 2017 NNCI REU Convocation, Atlanta, GA.
3. ***Carl Festiner**, Krishnamraju Ankireddy, Thad Druffel. "Optimizing the TiO2 Layers in Flexible Perovskite".* 2017 NNCI REU Convocation, Atlanta, GA.
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9. ***Paul Cuillier**, Pom Kharel, Bruce Alphenaar, Francis Zamborini. "Electrochemical Studies of Rare-earth Doped Nanocrystalline Titanium Dioxide".* 2017 NNCI REU Convocation, Atlanta, GA.
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19. *Morice, Sara and Sherehiy, Andriy and Wei, Danming and Popa, Dan. (2021). Characterization Of The Direct Write Inkjet Printing Process For Automated Fabrication Of Pedot: Pss Thin Films. Manufacturing science and engineering. Status = Added in NSF-PAR Federal Government's License = Acknowledged.*
20. *Ferris, Connor and Ratnayake, Dilan and Curry, Alex and Wei, Danming and Gerber, Erin and Druffel, Thad and Walsh, Kevin. (2021). Characterizing The Conductivity Of Aerosol Jet Printed Silver Traces On Glass Using Intense Pulsed Light (Ipl). Manufacturing science and engineering. Status = Added in NSF-PAR Federal Government's License = Acknowledged.*
21. *Warn, Colin and Sherehiy, Andriy and Alqatamin, Moath and Ritz, Brooke and Zhang, Ruoshi and Chowdhury, Sri and Wei, Danming and Popa, Dan. (2021). Machine Vision Tracking And Automation Of A Microrobot (Safam). Manufacturing science and engineering. Status = Added in NSF-PAR Federal Government's License = Acknowledged.*
22. *Mariana Vinseiro Figueira, Jonathan Kopechek (2021).* Assessing Molecular Delivery in a Flow Focused Acoustofluidic Device*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*
23. *Hannah Weaver, Kunal Kate, Kavish Sudan, Neetu Tyagi, Jyotirmaya Behera (2021).* Bioceramic-Based Biomaterial Products for 3D Printed Orthopedics*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*
24. *Connor Ferris, Dilan Ratnayake, Alex Curry, Erin Gerber, Thad Druffel, Kevin Walsh (2021).* Characterizing the Conductivity of Aerosol Jet Printed Silver Traces on Glass Intense Pulsed Light*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*
25. *Chloe Henson, Stuart Williams (2021).* Electrokinetic Self-Assembly of Colloids*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*

26. *Jack Spieker, Dilan Ratnayake, Thomas Berfield, and Kevin Walsh. (2021).* FEA Modeling of a Novel MEMS Bistable Actuator*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*
27. *Colin Warn (2021).* Machine Vision Tracking and Automation of a Microrobot (sAFAM)*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*
28. *Cole Dwiggins, Sean Fu (2021).* Silicon Microreactor for Analysis of Trace VOCs in Exhaled Breath*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*
29. *Katherine Xie, Shamus McNamara (2021).* Simulating a Buckled Beam MEMS Memory Cell*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.Andrew Belec, Chuang Qu, Shamus McNamara, Kevin Walsh (2021).* Simulation of Glancing Angle Deposition*. NNCI REU Convocation. . Status = ACCEPTED; Acknowledgement of Federal Support = Yes*
30. *Muhemmad H Yassin, Cindy Harnett, Mohammad Shafquatul Islam, Sushmita Challa (2021).* Textile Integrated MEMS*. 2021 NNCI REU Convocation. Virtual hosted by GATech, Atlanta, GA.*
31. *Ryan C. Chow, Xiao-An Fu (2022).* Characterization of a Silica-Packed Microreactor over Flow and Temperature*. 2022 NNCI REU Convocation. Louisville, KY.*
32. *Daniel Woodruff, Dilan Ratnayake, Kevin Walsh (2022).* Characterizing the Conductivity and Gauge Factor of PEDOT:PSS*. 2022 NNCI REU Convocation. Louisville, KY.*
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34. *Nathan Song, Danming Wei, Cindy Harnett (2022).* Electrical Characterization of MEMS Microgrippers in Circuits*. 2022 NNCI REU Convocation. Louisville, KY.*
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52. *Samantha Musante, Cindy Harnett. "Smart Connectors for Cut-and-Seam Manufacturing of Soft Electronics". 2023 NNCI Convocation, Bozeman, MT, August 2023.*
53. *Luca Caruso, Chuang Qu. Bio-inspired Surfaces: "Fabrication of Shark Skin Using Glancing Angle Deposition (GLAD)". 2023 NNCI Convocation, Bozeman, MT, August 2023.*
54. *Cobe Smart, Tom Berfield. "3D-printed Flow Battery Leveraging Advanced Materials and Microscale Featured Electrodes." 2023 NNCI Convocation, Bozeman, MT, August 2023.*
55. *Erica Guelfi, Jonathan Kopechek. "Fluidic Device for Removal of Extracellular Hemoglobin from FreezeDried Blood Products". 2023 NNCI Convocation, Bozeman, MT, August 2023.*
56. *Alejandra Rivera Ramos, Tommy Roussel. "Pushing the Limits of SLA Printed Molds". 2023 NNCI Convocation, Bozeman, MT, August 2023.*
57. *Angel Soto, Shamus McNamara. "Simulation of a bistable buckling beam using Electrostatics actuation and Lorentz force". 2023 NNCI Convocation, Bozeman, MT, August 2023.*
58. *Lauren Shackleford, Sihan Zhang, Pavan Ajjarapu, Aaron Wilson, Christopher Harness, Kunal Kate. "Structure-Property Relationships for Material Extrusion 3D-Printing of Stainless-Steel for Orthopedic Applications". 2023 NNCI Convocation, Bozeman, MT, August 2023.*

59. *Hannah Stanley, Tonoy Kumar Mondal, Hunter J. West, Stuart J. Williams." Dielectrophoretic Trapping of Nanoparticles with Carbon Nanofiber Mats". 2023 NNCI Convocation, Bozeman, MT, August 2023.*
60. *Michael Sassa, Andriy Sherehiy, Douglas Jackson, Daniel Sills, Dilan Ratnayake, Dan Popa. "Aerosol and Inkjet Printing of interconnects for Die Level Custom Electronic Packaging". 2023 NNCI Convocation, Bozeman, MT, August 2023.*
61. *Jessica Rutherford, Andriy Sherehiy, Dan Popa. "Laser-Driven Microrobots for Microscale Manipulation". 2023 NNCI Convocation, Bozeman, MT, August 2023.*

CONFERENCE POSTER PRESENTATIONS

1. *Dustin Watts, Dan Popa. "Fabrication of MEMS Microrobots". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
2. *Eduardo Perez, Dilan Ratnauyake, Prof. Kevin Walsh. "In-situ MEMS Test Structures for Evaluating Mechanical Properties of Thin Films". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
3. *Erica Walker, Delaina Amos, ph.D. "Leading the Way: Lighting for Tomorrow". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
4. *Griselda Saucedo, Douglas Jackson, Kevin Walsh. "3D Printed Piezoresistive Pressure Sensor". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
5. *Griselda Saucedo, Douglas Jackson, Kevin Walsh. "3D Printed Piezoresistive Pressure Sensor". NSF Council on Undergraduate Research REU Symposium, Washington DC. 2016.*
6. *Kennedy V. Haught, Shamus McNamara, Ph.D. "Knudsen Pump for Pneumatically Pumping Liquids Through 3D Printed Channel". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
7. *Kevin Dennis, Dr. Kunal Kate, Dr. Sundar Atre. "Material Characterization and Effects of Processing Conditions on PLA/PED Polymer Blends". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
8. *Kevin Joe, Roger Bradshaw. "Passive MEMS Sensing Peak Blast Accelerations".University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
9. *Reed Oliver, Dr. Sundar Atre, Dr. Kunal Kate. "Material Characterization and Effects of Processing Conditions on PLA/PEG Polymer Blends". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*

10. *Ben Brown, Zhenzhen Xie, Xiao An Fu. "Detecting Trace VOCs in Air via Gold Nanoparticle Sensor". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
11. *RP Accolla, DJ Allen, and SJ Williams, "Application of microfluidic techniques for an isomotive dielectrophoresis (isoDEP) platform". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 3, 2016.*
12. *RP Accolla, DJ Allen, and SJ Williams, "Application of microfluidic techniques for an isomotive dielectrophoresis (isoDEP) platform". ASME/IMECE, IMECE2016-68895, Phoenix, AZ, Nov. 11-17, 2016 (Poster).*
    Awarded first place, NSF REU Poster Competition, Track 19-2
13. *Bailey Masingo, Alexander Gupta, Gautam Gupta. "Understanding the Fundamentals of Hydrogen Evolution Reaction". University Culminating Poster Conference for Summer Undergraduate Research Programs, Louisville, KY August 4, 2017.*
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58. *Andrew Belec, Chuang Qu, Shamus McNamara, Kevin Walsh. "Simulation of Glancing Angle Deposition (GLAD)", SROP Culminating Summer Research Reception, Louisville, KY. July 30,2021.*
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70. *Jack Spieker, Dilan Ratnayake, Thomas Berfield, and Kevin Walsh."FEA Modeling of a Novel MEMS Bistable Actuator", SROP Culminating Summer Research Reception, Louisville, KY. July 30,2021.*
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72. *Katherine Xie and Shamus McNamara. "Simulating a Buckled-Beam MEMS Memory Cell", SROP Culminating Summer Research Reception, Louisville, KY. July 30,2021.*
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74. *Mariana Vinseiro Figueira and Jonathan Kopechek. "Assesing Molecular Delivery in a Flow Focused Acoustofluidic Device", SROP Culminating Summer Research Reception, Louisville, KY. July 30,2021.*
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76. *Muhemmad H Yassin, Cindy Harnett, Mohammad Shafquatul Islam, and Sushmita Challa. "Textile Integrated MEMs", SROP Culminating Summer Research Reception, Louisville, KY. July 30,2021.*
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78. *Sara Morice, Danming Wei, Andriy Sherehiy, and Dan Popa. "Characterization of the Direct Write Inkjet Printing Process for Automated Fabrication", SROP Culminating Summer Research Reception, Louisville, KY. July 30,2021.*
79. *Sara Morice, Danming Wei, Andriy Sherehiy, and Dan Popa. "Characterization of the Direct Write Inkjet Printing Process for Automated Fabrication", 2021 NNCI Virtual REU Convocation hosted by GATech.*
80. Ryan C. Chow, J.D. Morris, Zhenzhen Xie, Stephanie Mattingly,Saurin Sutaira, Xiao-An Fu.*"Characterization of a SLica Packed Microreactor over Flow and Temperature".* NNCI Nano + Additive Manufacturing Summit. August 9, 2022

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83. Daniel Woodruff, Dilan Ratnayake, Kevin Walsh.*"Characterizing the Conductivity and Gauge Factor of PEDOT:PSS"*. NNCI Nano + Additive Manufacturing Summit. August 9, 2022
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89. *Nathan Song, Danming Wei, Cindy Harnett.: "Electrical Characterization of MEMS Microgrippers in Circuits".Accepted and presented at: NNCI Nano + Additive Manufacturing Summit. August 9, 2022*
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98. *Ojas Kulkarni, Chuang Qu, Kevin Walsh, and Shamus McNamara.* "Simulation of Glancing Angle Deposition". *NNCI Nano + Additive Manufacturing Summit. August 9, 2022*
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101. *Kristopher Luck, Stuart Williams."Study of Monolayer Collapse of Droplets in Virtual Well and on Microfabricated Pedestals". NNCI Nano + Additive Manufacturing Summit. August 9, 2022*
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107. *Parisa Zalmai, Shamus McNamara."Microvalve Array for a Reconfigurable Tactile Tablet for Vision Impaired Individuals". NNCI Nano + Additive Manufacturing Summit. August 9, 2022*
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110. *Samantha Musante, Cindy Harnett. “Smart Connectors for Cut-and-Seam Manufacturing of Soft Electronics”. 2023 NNCI Nano + Additive Manufacturing Summit, Louisville, KY. July 2023.*
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113. *Luca Caruso, Chuang Qu. Bio-inspired Surfaces: "Fabrication of Shark Skin Using Glancing Angle Deposition (GLAD)". 2023 NNCI Nano + Additive Manufacturing Summit, Louisville, KY. July 2023.*
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116. *Cobe Smart, Tom Berfield. "3D-printed Flow Battery Leveraging Advanced Materials and Microscale Featured Electrodes." 2023 NNCI Nano + Additive Manufacturing Summit, Louisville, KY. July 2023.*
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119. *Erica Guelfi, Jonathan Kopechek. "Fluidic Device for Removal of Extracellular Hemoglobin from FreezeDried Blood Products". 2023 NNCI Nano + Additive Manufacturing Summit, Louisville, KY. July 2023.*
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122. *Alejandra Rivera Ramos, Tommy Roussel. "Pushing the Limits of SLA Printed Molds". 2023 NNCI Nano + Additive Manufacturing Summit, Louisville, KY. July 2023.*
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125. *Angel Soto, Shamus McNamara. "Simulation of a bistable buckling beam using Electrostatics actuation and Lorentz force". 2023 NNCI Nano + Additive Manufacturing Summit, Louisville, KY. July 2023.*
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IMPACT-NG R.E.U.

Research Experience for Undergraduates

WEBSITES

1. www.UoflNanoReu.com
2. www.Louisville.edu/reu

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1. *A concentrated 1.5 week cleanroom experience was designed in coordination with our professional staff to provide micro/nano training for all members of our REU cohort. The students successfully finished the crash course where they fabricated and tested their own solar cells. This training module contained 1 hour lectures in Diffusion, Etching Silicon Dioxide, Liftoff, Lithography, Oxidation, Solar Cell Design, and Sputtering among other micro/nano technology practices and techniques that students were taught daily before learning each hands-on fabrication step in the lab. All the presentations, learning materials, and fabrication processes for this concentrated program were placed online and made available for other programs to use.*
2. *An important component of our IMPACT REU program was the concentrated cleanroom and additive manufacturing training experience that all of our students received during the 1st week of our 10 week program. During this time, the students were trained on different manufacturing technologies for fabricating a* ***fluidic flow device.*** *This included using micro/nanotechnology processes for fabricating a microfluidic version in our $30M 10,000 sq ft class 100 MicroNano Technology Cleanroom (MNTC) and using additive manufacturing processes for fabricating a millifluidic device in our Additive Manufacturing Institute for Science and Technology (AMIST) center.*