

SMITHA M. N. RAO
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CAREER PROFILE

An engineering faculty with ten years of dedicated experience in tissue engineering, nanofabrication, MEMS, bioelectrical engineering and biomechanics, and an innate ability to invigorate minds through instruction. A proven track record in Micro- and Nano systems engineering, project design, development and leadership; and mentoring students on the high school, collegiate, and graduate levels. Experienced in cross-team and cross-institute collaboration, leading teams from multiple organizations in research and project creation.

AREAS OF STRENGTH AND EXPERTISE

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| <ul style="list-style-type: none">▪ Undergrad/Grad Instruction▪ Tissue Engineering▪ Student Mentorship▪ Project Development | <ul style="list-style-type: none">▪ Micro-Electromechanical systems▪ Biomedical Devices and Applications▪ IEEE and BMES Member | <ul style="list-style-type: none">▪ Bioelectrical/Biomechanics▪ Bio-Nanotechnology▪ Microfluidics▪ Cross-Team Leadership |
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PROFESSIONAL EXPERIENCE

Department of Biomedical Engineering, Michigan Technological University (MTU) August 2015 – Present
Assistant Professor

- Introduced a new technical elective titled “Micro- and Nano-technologies” aimed at introducing biomedical engineers to the recent trends in miniaturization
- Instructor for the third year undergraduate course Biomedical Instrumentation
- Established a fully functional BSL-2 laboratory with adjoining space dedicated to circuit design and testing
- Established a climate controlled electro-spinning station with gas inlets and venting for tissue scaffold applications
- Setting up a dedicated nanoparticle synthesis station in the lab
- Directing two senior design teams developing a walking assist device for patients with Parkinson’s disease and a transcatheter ventricle device
- Directed a senior design team in the development of a pressure-volume loop catheter for use in pediatric patients to eliminate the need for imaging to locate the probe. Sponsor: Spectrum Health/DeVos Childrens Hospital
- Serving on the departmental graduate program committee and graduate admissions committee
- Serving as faculty advisor for BMES student chapter at MTU
- Initiating an IP filing for a nanostructure tissue scaffold composite for cardiac applications

Department of Electrical Engineering, The University of Texas at Arlington (UTA) July 2012 – August 2015
Faculty Associate – Research and Lecturer

Responsible for teaching the graduate level class *Advanced MEMS (EE6345)*, and mentoring high school, collegiate, and graduate students. Conducts research projects and oversees development of the following:

- Developing a MEMS-based micro-windmill for energy harvesting – featured in national and international media including National Geographic Magazine, KERA (NPR Radio), Innovation nation with Mo Rocca on CBS
- Instructor for First Year Experience for Undergraduates course in College of Engineering (Fall 2014)
- Mentoring two graduate, five undergraduate, two medical, six high school students in research (Summer 2014)
- Studying cell transformations using protein assays and immuno - staining techniques to understand cell migration for wound healing, plaque formation in arteries and cancer metastasis
- Designing and characterizing microfluidic devices for biomedical applications such as personalized chemotherapies, lab-on-chip cancer detection systems
- Collaborating on a novel method to develop microelectrodes for pH sensing
- Developing a wireless flexible strain sensor for use in biomimetic systems and prosthetics
- Developing a wireless batteryless flexible gastro-stimulator
- Leading a team in nanoparticle research with applications in cancer treatment and imaging

- Developing an electrospinning system for creating biocompatible and biodegradable nanofibers using non-toxic materials
- Developing collaborative teams spanning several institutions including UT Southwestern medical center, University of Mississippi Medical Center, UNT Health Sciences, University of Auckland
- Established a fully functional tissue engineering facility (Biosafety level 2)

Department of Electrical Engineering, The University of Texas at Arlington (UTA) January 2010 – June 2015

Adjunct Faculty, Electrical Engineering (UTA)

Provided instruction to the graduate level advanced class Advanced MEMS (EE6345). Served as Instructor for the freshman class MAVS1000 aimed at increasing retention and help students assimilate into the university life and culture. Assisted the University with ad hoc research projects as requested.

Med-Worx (Research Project)

January 2010 – June 2012

Principal Scientist / Team Lead

Leadership activities included development of a battery-less, wireless, implantable gastroesophageal reflux disease (GERD) sensor, device development and system integration for medical and biological instrumentation, as well as coordination of laboratorial, animal and clinical studies, and development of a multichannel platform for telemetric acquisition of Electrocardiograms (ECG) and Electrogastrograms (EGG). Awarded an NSF SBIR Phase I and IB grants.

Department of Electrical Engineering, UTA (Research)

June – December 2009

Graduate Research Associate

Developed a microfluidic device to test with prostate cancer patient sera to assess its potential to prognosticate prostate cancer metastasis, supervised experimental characterization of the microfluidic device with breast cancer cells, worked on determining the role of vascular smooth muscle cell migration in plaque formation in the arteries using a novel multi-well polymer-based device, investigated smooth muscle cell response towards stretch stimuli, and trained undergraduate students in tissue culture techniques, soft lithography and experiment techniques.

Department of Electrical Engineering, UTA (Research)

June 2007 – May 2009

STEM Graduate Research Associate

Research included different designs of microfluidic devices to assess the interaction between cells and chemokine gradients. Filed a Patent Disclosure with UTA based on the microfluidic platform for cell migration analysis.

Automation and Robotics Research Institute, UTA (Research)

September 2005 – May 2007

STEM Graduate Research Assistant

Responsible for providing training, scheduling and maintenance of Veeco Wyko NT1100 DMEMS optical profiler and motion analyzer and Laurier M-9A die bonder. Experimentally characterized (dynamic and static) Silicon-on-Insulator (SOI) based thermal micropump for prostate cancer drug delivery applications using Veeco Wyko NT1100. Experimented on anodic bonding of Silicon with glass and Silicon-on-Insulator with glass. Characterized fluid flow and temperature profiles of SOI-based thermal actuator micropump. Trained on Veeco Wyko NT1100 DMEMS optical profiler and motion analyzer, Laurier M-9A die bonder, K&S 1415 automatic ball wire bonder.

Department of Electrical Engineering, UTA

September 2004 – May 2005

Graduate Teaching Associate I

Instructed graduate students on use of MEMS scanning mirrors using a bi-directional scratch drive actuator, and responsible for testing and release of POLYMUMPS MEMS devices. Created a POLYMUMPS rule checker, design instruction manual, and MEMS die release protocol for use with the devices designed in the iMEMS lab. Developed a cantilever-based optical scanning system for use in Optical Coherence Tomography (OCT) and other biomedical applications.

EDUCATION AND TRAINING

Doctorate of Philosophy, Electrical Engineering December 2009

The University of Texas at Arlington, Arlington, TX
Dissertation: Microfluidic platform to study cell migration

Masters of Science, Electrical Engineering May 2004

The University of Texas at Arlington, Arlington, TX
Thesis: A miniature fiber optic pressure sensor for biomedical applications

Bachelors in Engineering, Telecommunications December 2000

Bangalore Institute of Technology, Bangalore, India

ACTIVITIES AND AFFILIATIONS

- Guest Editor Special Issue "Electrospun Fibers for Scaffold and Electrical Sensing", *Fibers*, MDPI
- Organizer (Special Track), IEEE Computer-Based Medical Systems 2018, Karlstad University, Karlstad, June 18-21, 2018
- Session co-chair at the Annual Meeting for Biomedical Engineering Society (BMES) 2014, 2015, 2017
- Member of Technical Program Committee for 10th IEEE Dallas Circuits and Systems Conference (DCAS 2014 and 2015)
- Member Technical Program Committee IEEE Texas Symposium on Wireless & Microwave Circuits & Systems 2017, 2018

REVIEWER

- Royal Society of Science
- Bioengineering
- Fibers (MDPI)
- Applied Sciences (MDPI)
- Nanomaterials (MDPI)
- PLOS ONE
- ASEE SMART (DoD)
- Society for Biomaterials
- Nanomedicine: Nanotechnology, Biology, and Medicine
- Journal of Nanoparticle Research
- International Journal of Optomechatronics
- American Journal of Biomedical Research
- Journal of Optoelectronics Engineering
- Journal of Nanotechnology in Engineering and Medicine
- Cardiovascular Engineering and Technology
- IEEE Texas Symposium on Wireless & Microwave Circuits & Systems 2017
- IEEE International Conference on Microwaves, Communications, Antennas and Electronic Systems (COMCAS) 2017.
- Annual Meeting for Biomedical Engineering Society (BMES 2014, BMES 2015, BMES 2016, BMES 2017)
- The 10th IEEE Dallas Circuits and Systems Conference (DCAS 2014)
- IEEE Transactions on Microwave Theory and Techniques
- The IEEE 2014 Biomedical Circuits and Systems Conference (BioCAS 2014)
- The International Conference on Biomedical Engineering and Biotechnology (iCBEB 2013 and iCBEB 2014)

- IEEE Microwave Theory and Techniques Society 2013 and 2014 (IEEE MTT-S)
- 2013 Symposium on Humanities, Science and Engineering Research (SHUSER 2013)
- 2012 IEEE Colloquium on Humanities, Science & Engineering Research (CHUSER 2012)
- 2013 IEEE Student Conference on Research and Development (SCORED 2013)
- The International Conference on Communications and Electronics (ICCE'12)

OTHER ACTIVITIES

- Judge MTU Graduate Student Government symposium, 2018.
- Judge and Chair for the Materials and Bioengineering Div I category at 2015 Fort Worth Regional Science and Engineering Fair
- Member of the First Year Experience search committee at UT Arlington
- Invited speaker at 2014 IEEE Medical Devices Symposium (Dallas, November 7, 2014)
- Volunteer in the organizing committee for Women in BME luncheon BMES 2014
- Featured on CBS Televisions' "Innovation Nation with Mo Rocca" (Season 1, Episode 1: Microscopic Windmills, Aired September 27, 2014)
- Delivered a talk at TedxUTA held on March 22, 2014
- Chaired the Materials and Bioengineering Div II category at the 2014 Fort Worth Regional Science and Engineering Fair
- Delivered a video lecture for Kurukshetra!14 at College of Engineering Guindy, Anna University, India
- Mentioned in several national and international media including National Geographic Magazine, Forbes, Time, Wired, Washington Post, Houston Chronicle, Huffington Post (UK), KERA (NPR Radio), Discovery Daily Planet (Canada), Canada Ontario AM 1290 CJBK and over 300 online articles regarding work on Micro-windmills
- Co-authored a textbook chapter for "Medical and Biological Microwave Sensors and Systems," Cambridge University Press, UK (2015 release)
- Co-authored an article "Body Electric," IEEE Microwave Magazine (March 2015 issue)
- Co-authored an invited review paper for WAMICON 2011 which was judged second best paper
- Co-authored a paper on pH sensors that was among the 25 most downloaded papers in IEEE Sensors Journal in the month of February in 2012
- Co-authored a paper on bidirectional telemetry which was a featured news article in SCOPE magazines' December 2012 issue, titled "A Miniature bidirectional telemetry system: in vivo gastric slow wave recordings"
- Cited in the textbook "Essentials of Electronic Packaging: A Multidisciplinary Approach," (Electronic Packaging Book Series) for a PolyMUMPS device I designed
- Featured in the UTA Research magazine article, titled "Building tiny robots to deliver drugs to patients"
- Awarded the Best student Award from UTARI (formerly Automation and Robotic Research Institute) at University of Texas at Arlington
- Received the STEM doctoral research fellowship for 4 years from University of Texas at Arlington
- Authored a paper that was awarded Best Paper in TexMEMS international (Texas and Mexico) conference
- **Professional Memberships:** IEEE, IEEE-WIE, BMES

PATENTS

- Strain Sensors (U.S Patent 9752861)
- Miniature tissue stimulator for treatment of Gastroparesis
- Fabrication of sol-gel-based miniature pH sensors within microfluidic devices
- Micro-windmills for energy harvesting

PUBLICATIONS

1. "Self-Assembly of 3D Nanostructures in Electrospun Polycaprolactone-Polyaniline Fibers and their Application as Scaffolds for Tissue Engineering," Samerender Nagam Hanumantharao,Carolynn Que, Smitha Rao, *Materialia*, Vol. 6, 100296, 2019. <https://doi.org/10.1016/j.mtla.2019.100296>.
2. "Fructose Analog Containing 3-D Scaffolds to Isolate and Study Breast Cancer Cell Metabolism by Mimicking Tumor Microenvironment" Carolynn Que, Samerender Nagam Hanumantharao, Emily Nelson, Marina Tanasova, Smitha Rao, Sixth Annual Meeting of Michigan Physiological Society, June 27-28, Mount Pleasant, MI, 2019. **Poster presentation**
3. "Design and Fabrication of Customized Wound Healing Patches for Tissues," Samerender Nagam Hanumantharao, Carolynn Que, Emily Nelson, Smitha Rao, Sixth Annual Meeting of Michigan Physiological Society, June 27-28, Mount Pleasant, MI, 2019. **Oral presentation**
4. "Fructose analog containing 3-D scaffolds to isolate and study breast cancer cell metabolism by mimicking tumor microenvironment," Carolynn Que, Samerender Nagam Hanumantharao, Stephanie Bule, Emily Nelson, Kristine Fink, Marina Tanasova, Smitha Rao, 50th ACS Central Regional Meeting (CERM), June 4-8, Midland, MI, 2019. **Oral presentation**
5. "Nanotopographical cues for fabrication of efficient wound healing patches using electrospinning," Samerender Nagam Hanumantharao, Carolynn Que, Smitha Rao, 50th ACS Central Regional Meeting (CERM), June 4-8, Midland, MI, 2019. **Oral presentation**
6. "Piezoelectric scaffolds containing Tricalcium phosphate for bone tissue engineering," Samerender Nagam Hanumantharao, Carolynn Que, Emily Nelson, Smitha Rao, 50th ACS Central Regional Meeting (CERM), June 4-8, Midland, MI, 2019. **Poster presentation**
7. "Fabrication of honeycomb structured scaffolds using electrospinning for use as wound healing patches," Samerender Nagam Hanumantharao, Carolynn Que, Smitha Rao, ACS Upper Peninsula Local Section Student Research Symposium, March 23, 2019. **Poster presentation**
8. "Isolation and study of metabolic cues in breast cancer using fructose analog containing 3D scaffolds as controllable microenvironments," Carolynn Que, Srinivas Kannan, Samerender Nagam Hanumantharao, Ryan Bancroft, Kristine Fink, Marina Tanasova, Smitha Rao, ACS Upper Peninsula Local Section Student Research Symposium, March 23, 2019. **Poster presentation**
9. "Investigative Study on Nitric Oxide Production in Human Dermal Fibroblast Cells Under Normal and High Glucose Conditions," Maria P. Kwesiga, Emily Cook, Jennifer Hannon, Sarah Wayward, Caroline Gwaltney, Smitha Rao, Megan Frost, *Med. Sci.* 2018, 6(4), 99; <https://doi.org/10.3390/medsci6040099>
10. "Fructose Analog Containing 3D Scaffolds as Controllable Microenvironments to Isolate and Study Metabolic Cues in Breast Cancer," Srinivas Kannan, Samerender Nagam Hanumantharao, Kristine Fink, Carolynn Que, Marina Tanasova, Smitha Rao, *Annual Meeting of BMES 2018*, Atlanta, GA, Oct 17-20, 2018. (Poster with extended abstract).
11. "Real-Time Monitoring of Fructose Uptake Modulation Outcomes in Breast Cancer Cells," Avik Ghosh, Smitha Rao, Marina Tanasova, *Annual Meeting of BMES 2018*, Atlanta, GA, Oct 17-20, 2018. (Poster with extended abstract).
12. "Investigative Study on Nitric Oxide Production in Human Dermal Fibroblast Cells Under Normal and High Glucose Conditions," Maria Kwesiga, Jennifer Hannon, Emily Cook, Sarah Wayward, Caroline Gwaltney, Smitha Rao, Megan C. Frost, *Annual Meeting of BMES 2018*, Atlanta, GA, October 17-20, 2018. (Poster with extended abstract).
13. "Multicolor GLUT5-permeable fluorescent probes for fructose transport analysis," Vagarshak. V. Begoyan, Łukasz. J. Weseliński, Shuai Xia, Joseph Fedie, S. Kannan, Alexis Ferrier, Smitha Rao, Marina Tanasova, *Chemical Communications*, 2018; 54 (31): 3855 DOI: [10.1039/c7cc09809j](https://doi.org/10.1039/c7cc09809j)
14. "Metabolism-Driven High-Throughput Cancer Identification with GLUT5-Specific Molecular Probes," Srinivas Kannan, Vagarshak Begoyan, Joseph Fedie, Shuai Xia, Łukasz Weseliński, Marina Tanasova, Smitha Rao, *Biosensors*, 2018; 8 (2): 39 DOI: [10.3390/bios8020039](https://doi.org/10.3390/bios8020039)
15. "In Situ Tissue Regeneration Using Acellular Electroactive Scaffolds," Samerender Nagam Hanumantharao, Srinivas Kannan, Meghan Friske, Smitha Rao, *2017 Annual Meeting of BMES, Phoenix, Arizona, October 11-14 2017*.
16. "In Situ Tissue Regeneration Using Acellular Electroactive Scaffolds," Samerender Nagam Hanumantharao, Srinivas Kannan, Meghan Friske, Smitha Rao, *2017 Annual Meeting of BMES, Phoenix, Arizona, October 11-14 2017*

17. Characterization of Electrospun Nanofiber Scaffold for Wound Healing Applications,” Meghan Friske, Samerender Nagam Hanumantharao, Smitha Rao, *2017 Annual Meeting of BMES, Phoenix, Arizona, October 11-14 2017*.
18. “Electrospun Conductive PANI/PVDF Blends for Scaffold Engineering,” S. N. Hanumantharao, N. Alinezhad, S. Kannan, S. Rao, *Annual BMES Meeting 2016, October 5 – 8, Minneapolis, MN*.
19. “Multiple Inputs and Multiple Outputs Wireless Power Combining and Delivering Systems,” M. Q. Nguyen, Y. Chou, D. Plesa, S. Rao, J.-C. Chiao, *IEEE Transactions on Power Electronics*, Vol. 30, No. 11, pp. 6254-6263, November 2015.
20. “Wireless Sensor Nodes for Environmental Monitoring in Internet of Things,” C. M. Nguyen, J. Mays, D. Plesa, S. Rao, M. Nguyen, J.-C. Chiao, *IEEE International Microwave Symposium 2015, May 17-22, 2015, Phoenix, Arizona*
21. “Sol-gel Deposition of Iridium Oxide for Biomedical Micro-Devices,” Cuong Nguyen, Smitha Rao, Xuesong Yang, Souvik Dubey, Jeffery Mays, Hung Cao, Jung-Chih Chiao, *Sensors*, Vol 5, No. 2, pp. 4212-4228, February 2015.
22. “A Wearable System for Highly Selective L-glutamate Neurotransmitter Sensing,” Cuong M. Nguyen, Jeffrey Mays, Hung Cao, Haydn Allard, Smitha Rao, J.-C. Chiao, *2015 IEEE Radio and Wireless Week (RWW 2015)*, 26-28 January, 2015, **Best Paper, 2nd Place**
23. “Development of a Laser Micro-Machined Interdigitated Capacitive Strain Sensor for Structural Health Monitoring Applications,” Hung Cao, Chokri Jebali and Ammar B. Kouki, Shreyas Thakar, Cuong M. Nguyen, Smitha Rao, J.-C. Chiao, *IEEE Sensors 2014*, 2-5 Nov. 2014.
24. “Micro pH Sensors Based on IrOx Nanotubes,” Cuong M. Nguyen, Smitha Rao, Young-sik Seo, Yaowu Hao, J.-C.Chiao, *IEEE Transactions on Nanotechnology*, Vol. 13, No. 5, pp. 945-953, September 2014.
25. “A Study of Coil Orientations to Enhance the Transfer Efficiency of a Multi-Repeater Wireless Power Transmission System,” M. Q. Nguyen, D. Khoroshansky, S. Luce, O. Osasona, N. Joshi, S. Rao, J. C. Chiao, *2014 Asia-Pacific Microwave Conference APMC 2014, November 7 – 10, 2014, Sendai, Japan*.
26. “Stiffness Enhancement of Ultra-flexible Implantable Microsensor Array with Biodegradable Materials,” Cuong Nguyen, Lyndon Lee, Smitha Rao, J.-C. Chiao, *Annual BMES Meeting 2014, October 22 – 25, San Antonio, TX, Reviewer Choice Award (Poster)*
27. “MEMS flexible strain sensors for arthritis diagnosis,” K. Shinde, JeVaughn Julius, S. Rao, and J-C. Chiao, *Annual BMES Meeting 2014, October 22 – 25, San Antonio, TX*.
28. “Facile fabrication and hydrophilic/hydrophobic patterning of an electrospun poly(methyl methacrylate) cellular filter,” Lyndon Lee, Cecile Nguyen, Akash Sharma, Ben Taussig, Smitha Rao, Victor Lin, Jung-Chih Chiao, *Annual BMES Meeting 2014, October 22 – 25, San Antonio, TX*.
29. “A poly(dimethyl siloxane) Microfluidic Device for in situ Imaging of Cellular Migration and Invasion in Response to Chemical Signaling,” Lyndon Lee, Smitha Rao, Victor Lin, Jung-Chih Chiao, *Annual BMES Meeting 2014, October 22 – 25, San Antonio, TX*.
30. “The Organ-Specific Migratory Response of Prostate Cancer,” Lyndon Lee, Steven Bean, Sylvia Loh, Smitha Rao, Victor Lin, J.-C. Chiao, *Annual BMES Meeting 2014, October 22 – 25, San Antonio, TX*.
31. “Investigation of Wireless Power Transfer via Air and Building Materials Using Multiple Repeaters,” Minh Nguyen, Souvik Dubey, Smitha Rao, J.-C. Chiao, *2014 Texas Symposium on Wireless and Microwave Circuits and Systems, April 3-4, 2014, Waco Texas*.
32. “A Mutual Inductance Approach for Optimization of Wireless Energy Transmission,” Minh Nguyen, Zachariah Hughes, Peter Woods, Young-sik Seo, Smitha Rao, J.-C.Chiao, *2014 Texas Symposium on Wireless and Microwave Circuits and Systems, April 3-4, 2014, Waco Texas*.
33. “Wireless Gastric Stimulators,” Smitha Rao, Sanchali Deb, Shou-jiang Tang, Thomas Abell, Wen-Ding Huang, Christopher Lahr, Hung Cao, Souvik Dubey, J.-C. Chiao, *2014 Texas Symposium on Wireless and Microwave Circuits and Systems, April 3-4, 2014, Waco Texas*.
34. “A Multi-Input and Multi-Output Wireless Energy Transfer System”, M. Q. Nguyen, D. Plesa, S. Rao, J. C. Chiao, *International Microwave Symposium IMS 2014, June 1-6, 2014, Tampa Bay, Florida*.
35. “Field Distribution Models of Spiral Coil for Misalignment Analysis in Wireless Power Transfer Systems,” Minh Nguyen, Zachariah Hughes, Peter Woods, Young-sik Seo, Smitha Rao, J.-C. Chiao, *Microwave Theory and Techniques, IEEE Transactions on 62(4)*, pp. 920-930. 2014. DOI: 10.1109/TMTT.2014.2302738.

36. "Migration of cancer cells in gradually varying chemical gradients and mechanical constraints," Smitha M. N. Rao, Uday Tata, Victor K. Lin, Jung-Chih Chiao, *Special issue on Lab-on-Chip, Micromachines* 2014, 5(1), 13-26.
37. "Evaluation of Cytotoxic Effects of Porous Hollow Au Nanoparticles (PHAuNPs) on Cells," Smitha Rao, Chienwen Huang, Uday Tata, Peter Wu, Nikhil Arora, Victor K. Lin, Yaowu Hao, J.-C. Chiao, *Journal of Nanotechnology*, vol. 2014, Article ID 631248, 7 pages, 2014.
38. "Fabrication of pH-Sensing Iridium Oxide Nanotubes on Patterned Electrodes Using Anodic Aluminum Oxide Nano-Template," Cuong M. Nguyen, Indra Gurung, Hung Cao, Smitha Rao, J. C- Chiao, *IEEE Sensors 2013*, DOI: 10.1109/ICSENS.2013.6688364.
39. "Mapping Wireless Power Transfer for Implantable Stimulator Applications," Z. Hughes , Y.-S. Seo, P. Woods , P. G. Mccorkle , S. Rao , and J.-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013*.
40. "Preferential Cell Migration to Rat Organ Lysates for the Study of Chemotactic Factors in Cancer Metastases," S. Rao, U. Tata, P. Garigipati, C. Hernandez, A. Sharma, V. K. Lin, and J.-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013*.
41. "Miniaturized Implantable Wireless Gastrostimulator," G. Ravi, P. G. Mccorkle, Y.-S. Seo, S. Rao, and J.-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013*.
42. "Fabrication of Sol-gel-based Miniature pH Sensors within Microfluidic Devices," C. M. Nguyen, I. Gurung, S. Rao, and J.-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013*.
43. "A Batteryless, Implantable, Dual-sensor Capsule for Gastroesophageal Reflux Monitoring," H. Cao, S. Rao, S.-J. Tang, H.F. Tibbals, S. Spechler and J.-C. Chiao, *Gastrointestinal Endoscopy, Volume 77 , Issue 4 , 649 – 653, April 2013*.
44. "An Implantable, Batteryless and Wireless Capsule with Integrated Impedance and pH Sensors for Gastroesophageal Reflux Monitoring," H. Cao, V. Landge, U. Tata, Y.-S. Seo, S. Rao, S.-J. Tang, H.F. Tibbals, S. Spechler, and J.-C. Chiao, *IEEE Trans Biomed Eng.* 2012 Nov;59(11):3131-9. Epub 2012 Aug 22.
45. "A Sol-gel Iridium Oxide based pH Sensor Array on Flexible Polyimide Substrate," Cuong M. Nguyen, Wen-Ding Huang, Smitha Rao, Hung Cao, Uday Tata, Mu Chiao, J.-C. Chiao, *IEEE Sensors Journal, Vol 13, Issue 10, pp 3857 – 3864, October 2013 [DOI: [10.1109/JSEN.2012.2236551](https://doi.org/10.1109/JSEN.2012.2236551)]*.
46. "Wireless Power Transfer for a Miniature Gastrostimulator," Y.-S. Seo, Z. Hughes, D. Isom, M. Q. Nguyen, S. Deb, S. Rao and J.-C. Chiao, 2012 *European Microwave Conference, Amsterdam RAI, The Netherlands, Oct. 28 – Nov. 2 2012*.
47. "A Miniature Bidirectional Telemetry System for in-vivo Gastric Slow Wave Recordings," A. Farajidavar, G. O'Grady, S.M.N. Rao, L. K Cheng, T. Abell, J.-C. Chiao, *Physiol Meas.* 2012 Jun;33(6):N29-37 [DOI: 10.1088/0967-3334/33/6/N29].
48. "Investigation of Wireless Power Transfer in Through-wall Applications," Y.-S. Seo, Z. Hughes, M. Hoang, D. Isom, M. Nguyen, S. Rao, and J.-C. Chiao, *Asia-Pacific Microwave Conference, APMC2012, Kaohsiung, Taiwan, Dec. 4-7, 2012*.
49. "Remote Detection of Gastroesophageal Reflux Using an Impedance and pH Sensing Transponder," H. Cao, V. Landge, S. Thakar, S. Rao, L.-C. Hsu, S.-J. Tang, S. Spechler, H. F. Tibbals and J.-C. Chiao, 2012 *International Microwave Symposium, Montreal, Canada, June 17-22, 2012*.
50. "Wireless Power Transfer by Inductive Coupling for Implantable Batteryless Stimulators," Y.-S. Seo, M. Q. Nguyen, Z. Hughes, S. Rao and J.-C. Chiao, 2012 *International Microwave Symposium, Montreal, Canada, June 17-22, 2012*.
51. "An endoscopic wireless gastrostimulator (with video)," Sanchali Deb, Shou-Jiang Tang, Thomas L. Abell, Smitha Rao, Wen-Ding Huang, S.D. Filip To, Christopher Lahr, Jung-Chih Chiao, *Gastrointestinal Endoscopy, Vol. 75, Issue 2, pp. 411-415, 2012*.
52. "Study of Prostate Cancer Cell Line PC3-ML Chemotaxis to Epidermal Growth Factor with a BIOMEMS Device," U. Tata, S. M.N Rao, A. Sharma, K. Pabba, K. Pokhrel, V. K. Lin, H. Cao, and J.-C. Chiao, The 3rd International Workshop on Nanotechnology and Application, *IWNA2011, Vung Tau Vietnam, Nov. 10-12 2011*.

53. "Migration Characteristics of Prostate Cancer Cells in Response to Epidermal Growth Factor (EGF)," S. Rao, U. Tata, K. C. Pabba, K. Pokhrel, A. Sharma, V. Lin, and J.-C. Chiao, *BMES Biomedical Engineering Society Annual Meeting*, Hartford, Oct. 12-15, 2011.
54. "Performance of a Wirelessly Rechargeable Pacemaker for Gastric Stimulation," S. Deb, T. Abell, C. Lahr, S. J. Tang, S. Rao, and J.-C. Chiao, *BMES Biomedical Engineering Society Annual Meeting*, Hartford, Oct. 12-15, 2011.
55. "A Microfluidic Approach to Study the Effect of Growth Factors on PC3 Cell Migration," U. Tata, S. Rao, K. T. Nguyen, V. K. Lin, and J.-C. Chiao, *BMES Biomedical Engineering Society Annual Meeting*, Hartford, Oct. 12-15, 2011.
56. "A Miniature Power-Efficient Bidirectional Telemetric Platform for in-vivo Acquisition of Electrophysiological Signals," A. Farajidavar, P. G. McCorkle, T.W. Wiggins, S. M.N. Rao, C.E. Hagains, Y.B. Peng, J. L. Seifert, M. I. Romero, G. O'Grady, L.K. Cheng, S. Sparagana, M.R. Delgado, S.-J. Tang, T. Abell, and J.-C. Chiao, *2011 International Microwave Symposium*, Baltimore, June 5-10 2011.
57. "A Novel Multiwell Device to Study Vascular Smooth Muscle Cell Responses under Cyclic Strain," U. Tata, H. Xu, S. M. N. Rao, C.-J. Chuong, K. T. Nguyen, and J.-C. Chiao, *ASME Journal of Nanotechnology in Engineering and Medicine*, Vol. 2, No. 2, May 2011.
58. "A Study for the Prostate Cancer Cell Migration toward Epidermal Growth Factor (EGF)," K. C. Pabba, K. Pokhrel, A. Sharma, U. Tata, S. Rao, V. Lin, J.-C. Chiao, *The 27th Southern Biomedical Engineering Conference*, Arlington, TX, April 30-May 1, 2011.
59. "Demonstration of EMT in prostate Cancer Cells Migrating in Response to TGF-beta," S. Rao, U. Tata, V. Lin, J.-C. Chiao, *The 27th Southern Biomedical Engineering Conference*, Arlington, TX, April 30-May 1, 2011.
60. "A Microfluidic Assay to Study the Effect of Growth Factors on PC3 Cell Migration," U. Tata, S. M. N. Rao, K. Nguyen, V. K. Lin and J.-C. Chiao, *The 27th Southern Biomedical Engineering Conference*, Arlington, TX, April 30, 2011.
61. "Wireless Implants for *in vivo* Diagnosis and Closed-loop Treatment," J.-C. Chiao, A. Farajidavar, H. Cao, P. McCorkle, M. Sheth, Y.-sik Seo, T. Wiggins, S. Tharkar, S. Deb, S. M.N. Rao, Invited review paper, *12th Annual IEEE Wireless and Microwave Technology Conference WAMICON*, Clearwater, FL, April 18-19, 2011.
62. "A Passive Radio-Frequency pH-Sensing Tag for Wireless Food Quality Monitoring," W.-D. Huang, S. Deb, Y.-S. Seo, S. Rao, A. Fanajidavar, M. Chiao and J.-C. Chiao, *IEEE Sensor Journal*. Published on line Jan. 20 2011.
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78. "A Simple Wireless Batteryless Sensing Platform for Resistive and Capacitive Sensors," T. Ativanichayaphong, J. Wang, W. Huang, S. Rao, and J.-C. Chiao, *IEEE Sensors 2007 Conference*, Atlanta, Georgia, Oct. 26-28 2007.
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91. "Design and modeling of a high accuracy, three degree of freedom MEMS manipulator," Shyam Venugopal, Lun-Chen Hsu, Smitha Malalur-Nagaraja-Rao, B.P. Wang, Mu Chiao and J.-C. Chiao, *Microelectronics, MEMS, and Nanotechnology Symposium, Device And Process Technologies For Microelectronics, MEMS and Photonics Conference*, Brisbane Australia, Dec. 11-14, 2005.
92. "Modeling and Design of a Fiber Optic Pressure Sensor," Shruthika Prasanna, Smitha Malalur Nagaraja, Praveen Pandojirao-Sunkojirao and J.-C. Chiao, *2005 TexMEMS, The VII International Conference on Micro Electro Mechanical Systems*, El Paso, TX, USA and Ciudad Juárez, Mexico. Sept. 21-22, 2005.
93. "MEMS-based Implantable Drug Delivery System," Smitha M. N. Rao, Amit Mhatre, Dan O. Popa, J. - C. Chiao, Thermpoon Ativanichayaphong, Jeongsik Sin, and Harry E. Stephanou, The 1st Place in the Student Paper Contest, *2005 TexMEMS, The VII International Conference on Micro Electro Mechanical Systems*, El Paso, TX, USA and Ciudad Juárez, Mexico. Sept. 21-22, 2005.
94. "A Miniature Optical Pressure Sensor," Smitha M. N. Rao, Praveen Pandojirao-Sunkojirao, Shruthika Prasanna and J.-C. Chiao, *2005 TexMEMS, The VII International Conference on Micro Electro Mechanical Systems*, El Paso, TX, USA and Ciudad Juárez, Mexico. Sept. 21-22, 2005.

PRESENTATIONS

1. "A Microfluidic Platform to Study the Role of Cell Migration in Cancer Metastasis," Smitha Rao, *Invited Talk, 2014 IEEE Medical Device Symposium: Medical Device Innovation in 21st Century*, November 7th, 2014, Dallas, TX, USA.
2. "Wireless Gastric Stimulators," Smitha Rao, Sanchali Deb, Shou-jiang Tang, Thomas Abell, Wen-Ding Huang, Christopher Lahr, Hung Cao, Souvik Dubey, J.-C. Chiao, *2014 Texas Symposium on Wireless and Microwave Circuits and Systems, April 3-4, 2014, Waco Texas*
3. "Demonstration of EMT in prostate Cancer Cells Migrating in Response to TGF-beta," S. Rao, U. Tata, V. Lin, J.-C. Chiao, *The 27th Southern Biomedical Engineering Conference*, Arlington, TX, April 30-May 1, 2011.
4. "Progress in the Development of the MEMS Based In-plane Micropump: Experimental Motion Characterization," Smitha M.N. Rao, Saket Karajgikar, Jeongsik Sin, Dan Popa, Harry Stephanou, J.-C. Chiao, *TEXMEMS, The VIII International Conference on Micro Electro Mechanical Systems*, Oct. 9 2006.
5. "MEMS-based Implantable Drug Delivery System," Smitha M. N. Rao, Amit Mhatre, Dan O. Popa, J. - C. Chiao, Thermpoon Ativanichayaphong, Jeongsik Sin, and Harry E. Stephanou, First Place in the Student Paper Contest, *2005 TexMEMS, The VII International Conference on Micro Electro Mechanical Systems*, El Paso, TX, USA and Ciudad Juárez, Mexico. Sept. 21-22, 2005.
6. "A Miniature Optical Pressure Sensor," Smitha M.N.Rao, Praveen Pandojirao-Sunkojirao, Shruthika Prasanna and J.-C. Chiao, *2005 TexMEMS, The VII International Conference on Micro Electro Mechanical Systems*, El Paso, TX, USA and Ciudad Juárez, Mexico. Sept. 21-22, 2005.

POSTER PRESENTATIONS

1. "A Study of Coil Orientations to Enhance the Transfer Efficiency of a Multi-Repeater Wireless Power Transmission System," M. Q. Nguyen, D. Khoroshansky, S. Luce, O. Osasona, N. Joshi, S. Rao, J. C. Chiao, *2014 Asia-Pacific Microwave Conference APMC 2014, November 4 – 7, 2014, Sendai, Japan.*
2. "MEMS flexible strain sensors for arthritis diagnosis," K. Shinde, J. Julius, S. Rao, and J-C. Chiao, *Annual BMES Meeting 2014, October 22 – 25, 2014, San Antonio, USA.*
3. "Facile fabrication and hydrophilic/hydrophobic patterning of an electrospun poly(methyl methacrylate) cellular filter," Lyndon Lee, Cecile Nguyen, Akash Sharma, Ben Taussig, Smitha Rao, Victor Lin, Jung-Chih Chiao, *Annual BMES Meeting 2014, October 22 – 25, 2014, San Antonio, USA.*
4. "A poly(dimethyl siloxane) Microfluidic Device for in situ Imaging of Cellular Migration and Invasion in Response to Chemical Signaling," Lyndon Lee, Smitha Rao, Victor Lin, Jung-Chih Chiao, *Annual BMES Meeting 2014, October 22 – 25, 2014, San Antonio, USA.*
5. "The Organ-Specific Migratory Response of Prostate Cancer," Lyndon Lee, Steven Bean, Sylvia Loh, Smitha Rao, Victor Lin, J.-C. Chiao, *Annual BMES Meeting 2014, October 22 – 25, 2014, San Antonio, USA.*
6. "Investigation of Wireless Power Transfer via Air and Building Materials Using Multiple Repeaters," Minh Nguyen, Souvik Dubey, Smitha Rao, J.-C. Chiao, *2014 Texas Symposium on Wireless and Microwave Circuits and Systems, April 3-4, 2014, Waco Texas.*
7. "A Mutual Inductance Approach for Optimization of Wireless Energy Transmission," Minh Nguyen, Zachariah Hughes, Peter Woods, Young-sik Seo, Smitha Rao, J.-C.Chiao, *2014 Texas Symposium on Wireless and Microwave Circuits and Systems, April 3-4, 2014, Waco Texas.*
8. "Wireless Gastric Stimulators," Smitha Rao, Sanchali Deb, Shou-jiang Tang, Thomas Abell, Wen-Ding Huang, Christopher Lahr, Hung Cao, Souvik Dubey, J.-C. Chiao, *2014 Texas Symposium on Wireless and Microwave Circuits and Systems, April 3-4, 2014, Waco Texas.*
9. "A Multi-Input and Multi-Output Wireless Energy Transfer System", M. Q. Nguyen, D. Plesa, S. Rao, J. C. Chiao, *International Microwave Symposium IMS 2014, June 1-6, 2014, Tampa Bay, Florida.*
10. "A Multi-Input and Multi-Output Wireless Energy Transfer System", M. Q. Nguyen, D. Plesa, S. Rao, J. C. Chiao, *International Microwave Symposium IMS 2014, Accepted.*
11. "Batteryless and battery-based wireless sensors for monitoring physiological and biochemical parameters in vivo," S. Rao, J.-C. Chiao, October 28th, 2013, Simmons Cancer Center's New Challenges and Frontier in Prostate Cancer Symposium.
12. "Microfluidics: A Novel Approach to Characterize Cellular Responses," S. Rao, V. Lin, J.-C. Chiao, October 28th, 2013, Simmons Cancer Center's New Challenges and Frontier in Prostate Cancer Symposium.
13. "Nanofibers, and Nanoparticles for Drug Delivery Applications," S. Rao, V. Lin, Y. Hao, J.-C. Chiao, October 28th, 2013, Simmons Cancer Center's New Challenges and Frontier in Prostate Cancer Symposium.
14. "Mapping Wireless Power Transfer for Implantable Stimulator Applications," Z. Hughes , Y-S. Seo, P. Woods , P. G. Mccorkle , S. Rao , and J-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013.*
15. "Preferential Cell Migration to Rat Organ Lysates for the Study of Chemotactic Factors in Cancer Metastases," S. Rao, U. Tata, P. Garigipati, C. Hernandez, A. Sharma, V. K. Lin, and J-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013.*
16. "Miniaturized Implantable Wireless Gastrostimulator," G. Ravi, P. G. Mccorkle, Y-S. Seo, S. Rao, and J-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013.*
17. "Fabrication of Sol-gel-based Miniature pH Sensors within Microfluidic Devices," C. M. Nguyen, I. Gurung, S. Rao, and J-C. Chiao, 2013 *BMES Biomedical Engineering Society Annual Fall Scientific Meeting, Sept. 25-28 2013.*
18. "Study of Prostate Cancer Cell Line PC3-ML Chemotaxis to Epidermal Growth Factor with a BIOMEMS Device," U. Tata, S. M.N Rao, A. Sharma, K. Pabba, K. Pokhrel, V. K. Lin, H. Cao, and J.-C. Chiao, The 3rd International Workshop on Nanotechnology and Application, *IWNA2011, Vung Tau Vietnam, Nov. 10-12 2011.*

19. "Migration Characteristics of Prostate Cancer Cells in Response to Epidermal Growth Factor (EGF)," S. Rao, U. Tata, K. C. Pabba, K. Pokhrel, A. Sharma, V. Lin, and J.-C. Chiao, *BMES Biomedical Engineering Society Annual Meeting*, Hartford, Oct. 12-15, 2011.
20. "Performance of a Wirelessly Rechargeable Pacemaker for Gastric Stimulation," S. Deb, T. Abell, C. Lahr, S. J. Tang, S. Rao, and J.-C. Chiao, *BMES Biomedical Engineering Society Annual Meeting*, Hartford, Oct. 12-15, 2011.
21. "A Microfluidic Approach to Study the Effect of Growth Factors on PC3 Cell Migration," U. Tata, S. Rao, K. T. Nguyen, V. K. Lin, and J.-C. Chiao, *BMES Biomedical Engineering Society Annual Meeting*, Hartford, Oct. 12-15, 2011.
22. "A Miniature Power-Efficient Bidirectional Telemetric Platform for in-vivo Acquisition of Electrophysiological Signals," A. Farajidavar, P. G. McCorkle, T.W. Wiggins, S. M.N. Rao, C.E. Hagains, Y.B. Peng, J. L. Seifert, M. I. Romero, G. O'Grady, L.K. Cheng, S. Sparagana, M.R. Delgado, S.-J. Tang, T. Abell, and J.-C. Chiao, *2011 International Microwave Symposium*, Baltimore, June 5-10 2011.
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24. "A Study for the Prostate Cancer Cell Migration toward Epidermal Growth Factor (EGF)," K. C. Pabba, K. Pokhrel, A. Sharma, U. Tata, S. Rao, V. Lin, J.-C. Chiao, *The 27th Southern Biomedical Engineering Conference*, Arlington, TX, April 30-May 1, 2011.
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31. "An Optical Scanner Based on Cantilever-type Electrostatic Zipping Actuators," S.M. N. Rao, P. Pandojirao-Sunkojirao, N. Dhaubanjari, M. Chiao and J.-C. Chiao, *Photonics Asia, MEMS/MOEMS Technologies and Applications Conference*, Beijing, China, Nov. 11-15, 2007.
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48. "MEMS-based Implantable Drug Delivery System," Smitha M. N. Rao, Amit Mhatre, Dan O. Popa, J. - C. Chiao, Thermpoon Ativanichayaphong, Jeongsik Sin, and Harry E. Stephanou, *2005 TexMEMS, The VII International Conference on Micro Electro Mechanical Systems*, El Paso, TX, USA and Ciudad Juárez, Mexico. Sept. 21-22, 2005.

Pending

1. Research & Development Targeting Cancer with Transporter-Specific Carbohydrate Mimics to Explore Fructose-Cancer Connections

Dept of Health & Human Services
September 1, 2018 - August 31, 2021

\$446,987 (Co-PI), PI: Marina Tanasova

2. Targeting Breast Cancers with Fructose Transporter-Specific Sugar Mimics

US Dept of Defense

August 1, 2018 - July 31, 2021

\$555,350 (Co-PI), PI: Marina Tanasova

3. Quantitative Determination of the Dose and Duration of Nitric Oxide Production from Macrophages Fibroblasts and Keratinocytes in Diabetic Foot Ulcers to Direct the Design of Wound Dressings

US Dept of Health & Human Services

\$382,500 (Co-PI), PI: Megan C. Frost

Current

1. Departmental Start-Up Grant, Michigan Technological University 8/17/2015-7/31/2018. The purpose of this grant I to set up the PI's laboratory and fund preliminary studies needed to be competitive for extramural research support. Role: PI
\$409,453
2. Technology Transfer Talent Network (T3N). Support to develop fructose analogs for cancer detection. Role: Co-PI
\$25,000
3. Technology Transfer Talent Network (T3N). Support to develop nanofiber scaffolds for wound healing applications. Role: Co-PI
\$10,415