A National Science Foundation Engineering Research Center, founded September 2012

SSIST

NSF NANOSYSTEMS ENGINEERING RESEARCH CENTER FOR
ADVANCED SELF-POWERED SYSTEMS OF INTEGRATED SENSORS AND TECHNOLOGIES

2017 Researcher Profiles

Dear ASSIST Industry Members,

Thank you for your continued support of the ASSIST Center and our mission to improve global health. Contained herein are research profiles and resumes of our Year 5 (2016-2017) students and faculty. As you know, one of the greatest benefits of membership and engagement with the ASSIST ecosystem is your access to our thought leaders and research and development capabilities.

Together, these individuals spend nearly $4,000,000 of federal funding in direct advancement of the ASSIST mission for ultra-low power health and environmental sensors. This ASSIST-directed funding is then further leveraged by our teams in the pursuit of additional grant opportunities related to their work in ASSIST. The ASSIST annual research expenditure thereby results in millions of additional research dollars invested in enhancing the ASSIST knowledge base and competency in embedded sensor development, integration, and design.

Your access and opportunity to influence this cumulative annual research expenditure provides considerable leverage. Through your participation in the ASSIST community you are helping to influence millions of dollars of federal and industrial funds towards outcomes that directly impact your company's business and technology development. By gaining access to the specific expertise resident in the ASSIST Center, and establishing relationships with our faculty and students, you are building a direct pipeline into the research and development leaders of this generation and future generations.

Please use this booklet as a resource when working with our teams. As an association of top-tier research universities, two of our main outputs are innovations and the students who create them. Faculty profiles are useful for architecting your engagements with ASSIST and identifying promising faculty labs for advancement of specific projects or solutions to specific problems in your roadmap. Student profiles are an excellent way to identify the already-skilled future employees to help rapidly insource the knowledge and ability to execute on those specific solutions.

Please do not hesitate to engage me for assistance connecting to these high productivity individuals. The more you engage with us, the better we can support you.

Thanks for your continued support,

Casey Boutwell, Ph.D., MBA
Director of Industry and Innovation
National Science Foundation ASSIST Engineering Research Center
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Veena Misra, Ph.D.

Current Role(s):
Center Director of ASSIST
Professor of Electrical and Computer Engineering, NCSU

Educational background:
BS, North Carolina State University, 1991
MS, North Carolina State University, 1992
PhD, North Carolina State University, 1995

E-mail: vmisra@ncsu.edu
Phone: (919) 515-7356

Interests: Metal oxide sensors, power devices, III-As and III-N based devices, atomic Layer deposition, nanoparticles for memory and energy storage, high-K and metal gates, organic photovoltaics and solar fuels.

Expertise: Dr. Veena Misra is a Distinguished Professor of Electrical Engineering at North Carolina State University and the Center Director of the National Science Foundation ASSIST Center. Dr. Misra is known internationally for her research in the field of semiconductor devices. She is recognized for contributions in the areas of complementary metal–oxide–semiconductor (CMOS) transistors, wide bandgap semiconductor devices and sensors for health and environmental monitoring, which have provided significant insights in the field.

ASSIST Project Titles:
2016 Thrust III: Design and Fabrication of Ultra low-power Sensors for Human Breath and Environmental Monitoring, Dr. Veena Misra and Dr. Bongmook Lee

2015 Thrust III: Design and Fabrication of Ultra Low-Power Gas Sensors (Continuation), Dr. Beena Misra and Dr. Bongmook Lee

2014 Thrust III: Design and Fabrication of Ultra Low-Power Gas Sensors, Dr. Beena Misra and Dr. Bongmook Lee

Services Offered:
Sponsored Research, collaborative projects, characterization techniques, fabrication, testing and evaluation services, consulting

Publication Examples: [Insert publications here but only enough to fill two total pages]
[188] A. Tanneeru, S. Mills, M. Lim, M. M. Mahmud, J. Dieffenderfer, A. Bozkurt, T. Nagle, B. Lee, V. Misra, "Room temperature sensing of VOCs by atomic layer deposition of metal oxide" SENSORS, 2016 IEEE. 2016/10/30, p1-3

[187] M. Lim, A. Malhotra, S. Mills, J. Muth, B. Lee, V. Misra, "Metal oxide gas sensing characterization by low frequency noise spectroscopy" SENSORS, 2016 IEEE. 2016/10/30

[186] J. Dieffenderfer, H. Goodell, S. Mills, M. McKnight, S. Yao, F. Lin, E. Beppler, B. Bent, B. Lee, V. Misra, Y. Zhu, O. Oralkan, J. Strohmaier, J. Muth, D. Peden, A. Bozkurt, "Low-Power Wearable Systems for Continuous Monitoring of Environment and Health for Chronic Respiratory Disease" IEEE journal of biomedical and health informatics. 2016/9 10/5 p 1251-1264.

[185] B. Munos, P. C. Baker, B. M. Bot, M. Crouthamel, G. Vries, I. Ferguson, J. D. Hixson, L. A. Malek, J. J. Mastrototaro, V. Misra, A. Ozcan, L. Sacks, P. Wang, "Mobile health: the power of wearables, sensors, and apps to transform clinical trials" Annals of the New York Academy of Sciences. 2016/7/1 1375.1 p3-18.

[184] X. Yang, B. Lee, V. Misra, "Electrical Characteristics of SiO 2 Deposited by Atomic Layer Deposition on 4H–SiC After Nitrous Oxide Anneal" IEEE Transactions on Electron Devices. 2016/7 63.1 p2826-2830.

[183] N. Ramanan, B. Lee, V. Misra, "Physical understanding of trends in current collapse with atomic layer deposited dielectrics in AlGaN/GaN MOS heterojunction FETs" Semiconductor Science and Technology. 2016/2/15 31.3 p035016.

[182] S. R. Singamaneni, J. Prater, B. Lee, V. Misra, J. Narayan, "Memristive behavior in BaTiO 3/La 0.7 Sr 0.3 MnO 3 heterostructures integrated with semiconductors" MRS Advances 2016 1.04 p275-280.

[181] V. Misra, B. Lee, P. Manickam, M. Lim, S. K. Pasha, S. Mills, S. Bhansali, "Ultra-low power sensing platform for personal health and personal environmental monitoring" Electron Devices Meeting (IEDM), 2015 IEEE International. 2015/12/7 p13.1.1-13.1.4.

[181] N. Ramanan, B. Lee, V. Misra, "ALD gate dielectrics for improved threshold voltage stability in AlGaN/GaN MOS-HFETs for power applications" Semiconductor Science and Technology. 2015/11/20 30.12 p125017.

[180] I.-H. Ji, B. Lee, S. Wang, V. Misra, A. Q. Huang, "A new AlGaN/GaN power HFET employing partial deep trench drain structure for high voltage application" 2015 IEEE 3rd Workshop on Wide Bandgap Power Devices and Applications (WiPDA), 2015/11/2 ,147-149.

[179] X. Yang, B. Lee, V. Misra, "Investigation of Lanthanum Silicate conditions on 4H-SiC MOSFET characteristics, IEEE Transactions on Electron Devices. 2105/11 62.11 p3781-3785.

[178] V. Misra, J. Lach, A. Bozkurt, B. Calhoun, S. Datta, O. Oralkan, S. Bhansali, M. Ozturk, J. Strohmaier, "Self-powered wearable sensor platforms for wellness" Proceedings of the 2015 International Conference on Compilers, Architecture and Synthesis for Embedded Systems. 21015/10/4 ,187-187.

[177] B. Sarkar, B. Lee, V. Misra, "Understanding the gradual reset in Pt/Al2O3/Ni RRAM for synaptic applications" Semiconductor Science and Technology. 21015/8/24 30.10 p.105014.

Shekhar Bhansali, Ph.D.

Current Role(s):
Alcatel-Lucent Professor and Chair
Department of Electrical and Computer Engineering
Florida International University, Miami

Educational background:
B..E., Malaviya National Institute, 1987
M.Tech, Indian Institute of Technology, 1991
Ph.D, RMIT University, 1997

E-mail: sbhansali@gmail.com
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Interests: MEMS, Biosensors, Thin film devices and Nanostructures

Expertise Dr. Bhansali area of interest are in Microsystems, Microfluidics, bio/cemical sensors and agricultural IoT systems. He has coauthored over 100 journal papers and over 100 conference papers. He holds 31 U.S. Patents, has edited two books and authored five book chapters,. His research in the areas of bioengineering, oceanographic sensing, materials science, and alternative energy has received support from NSF, industry (SRI, Draper, and JCG), and national laboratories (Sandia and Los Alamos). Dr. Bhansali has been recognized for his research, mentoring and innovation through multiple awards. He has conceptualized and led a number of inter-connected interdisciplinary graduate student research and training programs, including NSF-IGERT, NSF Bridge to Doctorate and Alfred P. Sloan Doctoral Fellowship Programs to increase diversity, retention and graduation rates. Through these programs, he oversaw the education of over 150 graduate students with multiyear fellowships in colleges of Engineering, Arts and Sciences, and Medicine. Dr. Bhansali is the receipient of NSF-CAREER award, William R Jones Award, Sloan Foundation Mentor of the Year award, and FIU Top Scholar Award. He is Fellow of national Academy of Inventors.

ASSIST Project Titles:
Project 1: Monitoring wound severity and healing through wearable electrochemical sensing (urea)
Project 2: Towards Personalized Stress Detection (cortisol)
Project 3: Wearable Alcohol Sensor

Services Offered: Sponsored Research, collaborative projects, characterization techniques, fabrication, testing and evaluation services

Shekhar Bhansali, Ph.D.

Publication Examples

1. P. Manickam, A. Kaushik, C. Karunakaran, S. Bhansali, "Recent advances in cytochrome c biosensing technologies", *Biosensors and Bioelectronics*,87, 654-668, 2017.
2. A.H. Jalal, Y. Umasankar, P. J Gonzalez, A. Alfonso, S. Bhansali, "Multimodal technique to eliminate humidity interference for specific detection of ethanol", *Biosensors and Bioelectronics*, 87, 522-608, 2017.
3. S. RoyChoudhury, V. Rawat, A.H. Jalal, SN Kale, S. Bhansali , "Recent advances in metamaterial split-ring-resonator circuits as biosensors and therapeutic agents" , *Biosensors and Bioelectronics*,86,595-608,2016 .
4. A. Singh, S.K. Pasha, P. Manickam, S. Bhansali, "Single-domain antibody based thermally stable electrochemical immunosensor", *Biosensors and Bioelectronics*,83, 162-168, 2016.
5. K. Rincon, P. Shah, J. Ramella-Roman, S. Bhansali, "A Review of Engineering Approaches for Lymphedema Detection", *IEEE Reviews in Biomedical Engineering*,9, 79-90, 2016.
6. S. RoyChoudhury, P. Manickam, Y. Umasankar, S. Bhansali , "Enzyme Functionalized Metal Nanostructures for Enhanced Electrochemical Detection of Lactate", *ECS Transactions*, 69, 7-15, 2015.
7. P. Manickam, Y. Umasankar, S. Bhansali, "Enzyme Functionalized Gold Nanoparticles for the Enhanced Electrochemical Detection of Lactate" *Meeting Abstracts*, 1795-1795, 2015.
8. A. Kaushik, S.K Arya, B.D. Malhotra, S. Bhansali, "Organic-Inorganic Hybrid Nanocomposites Based Gas Sensors for Environment Monitoring", *Chemical Reviews*, 115 (11), 4571-4606, 2015.
9. A. Kaushik, A. Yndart, R.D. Jayant, V Sagar, V Atluri, S. Bhansali, M. Nair, "Electrochemical sensing method for poi Znt-of-care cortisol detection in human immunodeficiency virus-infected patients", Int J Nanomedicine, 10, 677-85, 2015.

Patents Issued

1. US 9,526,885 Microneedles with Sharpened Tips and Corresponding Method of Fabrication (Inventors: P. Khanna, **S. Bhansali**)
2. US 9,324,565, Systems and methods for forming contact definitions (Inventors: R Ratnadurai, S Krishnan, **S. Bhansali**)
3. US 9,267,822, Systems and methods for evaluating coupled components (Inventors: A. Rogers**, S. Bhansali)**
4. US 9,178,261, Vertical microcoaxial interconnects(Inventors: J. Boone, S. Krishnan, **S. Bhansali**)
5. US 20,150,247,816- Label-Free Electrochemical Biosensor (Inventors: S. Bhansali, A Vasudev)
6. US 9,121,806- Impedance spectroscopy-based cellular analysis device (Inventors: **S. Bhansali**, ARA Rahman)
7. US 9,123,690- Systems and methods for forming contact definitions (Inventors: R. Ratnadurai, S. Krishnan, **S. Bhansali**)
8. US 9,178,261 - Vertical micro axial interconnects (Inventors: J. Boone, S.Krishnan, **S. Bhansali**)
9. US 9,121,806 - Impedance spectroscopy-based cellular analysis device (Inventors: **S. Bhansali**, ARA Rahman)
10. US 8,908,089 - Implantable imaging device (Inventors: R. Gitlin, C. Lusk, **S. Bhansali**, A. Rosemurgy)

Alper Bozkurt, Ph.D.

Current Role(s):
Associate Professor of Electrical and Computer Engineering, NCSU
Health and Environmental Tracker Testbed Leader and ASSIST

Educational background:
BS (EE), Bogazici University, Istanbul, 2001
MS (BME) Drexel University, PA, 2004
PhD (ECE), Cornell University, NY, 2010

E-mail: aybozkur@ncsu.edu
Phone: (919) 515-7349

Interests: Embedded systems for wearable/injectable/embedded systems for biomedical applications, near infrared spectroscopy, low power and organic device based pulse oximetry, textile fiber based sensing systems for e-textiles, internet of bionic things, animal-machine-interfaces.

Expertise: At the dawn of a cyber-physical systems based new era where everything is connected to each other through the Internet of Things, connecting biological organisms to the cloud would solve real life engineering problems in innovative ways. To achieve this, Dr. Bozkurt's research group innovate new techniques to **lay the foundations of Internet-of-Bionic-Things and define out-of-the-box use-cases in three domains: a) In the MicroScale Sensors and Actuators Domain,** investigate novel devices to augment sensor/actuator interfaces with tissue for a more efficient neural, hemodynamic and biomechanical coupling with biological organisms. Some examples of the ongoing research include flexible electrodes for neural stimulation and recording, surface modification of optical sources and detectors for low power biophotonic detection, textile fiber embedded sensors for wearable sensing, injectable biopotential and biophotonic sensors and magnetic devices for electrodynamic guiding of neurons. **b) In the Embedded Systems Domain,** interface such devices with electronic systems and incorporated into wearable patches, headbands, wristbands, injectable capsules, animal harnesses and backpacks. The embedded systems efforts include system-on-chip based biopotential recording front-ends, electrochemical impedance spectroscopy, functional near infrared spectroscopy, wireless energy and data transfer. **c) In the Application Testbeds Domain**, utilize these systems in an interdisciplinary collaborative way to establish testbed platform infrastructures and understand neural and physiological mechanisms underlying behavior in various organism at different biocomplexity levels (currently targeted organisms: neural cells, insects, canines, birds, lemurs, humans) and enable novel bionic cyberphysical systems. **The ongoing funded projects include** "insect-machine-interfaces" for remotely controlled biobotic insects to enable a cyberphysical network of insects for exploration and mapping after natural disasters, "canine-machine interfaces" to enable a computer assisted canine training system and remotely interact with canines acting as biological olfactory sensors, "human-machine-interfaces" with biophotonic capability to address the current limitations with sleep study instruments to sort sleep stages and detect sleep events, and textile fiber embedded sensors integrated into clothing for simultaneous measurement of tactile forces, wetness, biopotentials and body heat. These are some of the examples of novel bionic cyberphysical systems innovated at iBionicS Lab that would have a high research, education and business impact. **These recent research achievements were covered by several media agencies** including BBC, CNN, National Geographic, Discovery Channel, Science Channel, Newsweek and Reuters. Bozkurt is a recipient of the Calhoun Fellowship from Drexel University, Donald Kerr Award at Cornell University, Chancellor's

Alper Bozkurt, Ph.D.

Innovation Award (twice) and William F. Lane Outstanding Teacher Award at North Carolina State University, the Faculty Early Career Development (CAREER) Award from National Science Foundation and IEEE Sensors Council Young Professional Award. He was included in the Popular Science Magazine Brilliant 10 list in 2015. He received best paper awards from The US Government Microcircuit Applications & Critical Technology Conference and IEEE Body Sensor Network Conference.

ASSIST Project Titles:
Low power pulse oximetry

Services Offered: Sponsored research and consulting on:

- integration of external subsystems (sensors, system-on-chip etc.) to the Health and Environmental Tracker testbed
- integration of Health and Environmental Tracker testbed to biomedical and performance tracking applications,
- characterization, fabrication, testing and evaluation services for low power biophotonic, photoplethysmography and pulse oximeter systems

Publication Examples:

- Pamula V. R., Valero-Sarmiento J.M., Yan L., Bozkurt A., Van Hoof C., Van Helleputte N., Yazicioglu R.F., Verhelst M. A 172 μW Compressively Sampled Photoplethysmographic (PPG) readout ASIC with Heart Rate Estimation Directly from Compressively Sampled Data. (invited article under review IEEE Transactions on Biomedical Circuits and Systems).
- Dieffenderfer J, Goodell H, Mills S, McKnight M, Yao S, Lin F, Beppler E, Bent B, Lee B, Misra V, Zhu Y, Oralkan O, Strohmaier J, Muth J, Peden D, and Bozkurt A. (2016) Low Power Wearable Systems for Continuous Monitoring of Environment and Health for Chronic Respiratory Disease, IEEE Journal of Biomedical and Health Informatics, 20:5. pp. 1251-1264.
- Misra V, Bozkurt A, Calhoun B, Jackson T, Jur J, Lach J, Bongmook L, Muth J, Oralkan O, Ozturk M, Trolier-McKinstry S. Vashaee D, Wentzloff D, Zhu Y. (2015). Flexible Technologies for Self-Powered Wearable Health and Environmental Sensing. Proceedings of the IEEE, 103(4), 665-681.
- Bozkurt A, Rosen A, Rosen H, Onaral B (2005). A Portable Near Infrared Spectroscopy System for Bedside Monitoring of Newborn Brain. Biomedical Engineering Online, 4:29. (among top 20 most accessed articles for all time)
- Bozkurt A; Onaral B (2004). Safety Assessment of Light Emitting Diodes for Continuous Wave Diffuse Optical Measurements. Biomedical Engineering Online, 3:9.
- Brugarolas R, Latif T, Dieffenderfer J, Walker K, Sherman B, Roberts D, Bozkurt A, (2016) Wearable Heart Rate Sensor Systems for Wireless Canine Health Monitoring, IEEE Sensors Journal, 16:10, pp. 3454-3464.
- Brugarolas R, Majikes J, Winters M, Yuschak S, Mealin S, Walker K, Yang P, Sherman B, Bozkurt A, Roberts D. (2016) Balancing Noise Sensitivity, Response Latency, and Posture Accuracy for a Computer-Assisted Canine Posture Training System. International Journal on Human Computer Studies, Special Issue on Animal Computer Interaction, 2016 (Accepted for publication, available online, doi:10.1016/j.ijhcs.2016.04.010). (cover article)
- Latif T, Whitmire E, Novak T, Bozkurt A, Sound Localization Sensors for Search and Rescue Biobots, IEEE Sensors Journal, 16:10, pp. 3444-3453.
- Bozkurt A, Roberts D, Sherman B, Brugarolas R, Mealin S, Majikes J, Yang P, Loftin R. (2014) Towards Cyber-Enhanced Working Dogs for Search and Rescue. IEEE Intelligence Systems, 26:9, pp. 32-39
- Bozkurt A, Gilmour R, Sinha A, Stern D, Lal A (2009). Insect Machine Interface Based Neuro Cybernetics. IEEE Transactions on Biomedical Engineering, 56:6, pp. 1727-33.

Philip D. Bradford, Ph.D.

Current Role(s):
Associate Professor of Textile Engineering, NC State

Educational background:
BS, North Carolina State University, 2005
MS, North Carolina State University, 2007
PhD, North Carolina State University, 2010

E-mail: Philip_bradford@ncsu.edu
Phone: (919) 515-1866

Interests: Carbon nanotube synthesis, carbon nanotube textiles, multifunctional composites, filtration, high performance fabric laminates

Expertise: Dr. Bradford is an Associate Professor in the Department of Textile Engineering, Chemistry and Science at North Carolina State University. With a PhD degree in Materials Science, and MS and BS degrees in Textiles Engineering, his current research interest is focusing on spanning these two disciplines in the area of carbon nanotubes. His research group starts with the synthesis of ultra-high aspect ratio carbon nanotube arrays and is developing new techniques to process these carbon nanotubes into structures resembling traditional textiles. These materials have been produced and utilized in his research for applications including multi-functional composites, energy storage, air filtration and energy absorbing structures.

ASSIST Project Titles:

Study of Fiber Assemblies for Flexible and Breathable Thermal Conductors

Services Offered: Sponsored Research, collaborative projects, characterization techniques, CNT samples

Publication Examples:

1. Faraji, S., Yildiz, O., Rost, C., Stano, K., Farahbakhsh, N., Zhu, Y. and Bradford. P Radial Growth of Multi-Walled Carbon Nanotubes in Aligned Sheets through Cyclic Deposition and Graphitization, (2017) *Carbon*, 111:411-418.
2. Aly, K., Li, A. and Bradford, P. Strain Sensing and Damage Detection in Composites using Aligned Carbon Nanotube Sheets Embedded in the Interlaminar Region, (2016) *Composites Part A*, 90:536-548.
3. Stano, K., Faraji, S., Hodges, R., Yildiz, O., Wells, B., Akyildiz, H., Zhao, J., Jur, J. and Bradford, P. Ultralight Interconnected Metal Oxide Nanotube Networks, (2016) *Small*, 12(18):2432-2438.

4. Qui, L., Wang, X., Su, G., Tang, D., Zheng, X., Zhu, J., Wang, Z., Norris, P., Bradford, P., and Zhu, Y. Remarkably Enhanced Thermal Transport Based on a Flexible Horizontally-aligned Carbon Nanotube Array Film, (2016) *Scientific Reports*, 6:21014.

5. Zhang, L., Wang, X., Li, R., Li, Q., Bradford, P., and Zhu, Y. Microcombing Enables High-Performance Carbon Nanotube Composites, (2016) *Composites Science and Technology*, 123:92-98.

6. Bhanushali, H. and Bradford, P. Woven Glass Fiber Composites with Aligned Carbon Nanotube Sheet Interlayers, (2016) *Journal of Nanomaterials*, 2016:9705257.

7. Stahl, J., Bogdanovich, A. and Bradford, P. Carbon Nanotube Shear-pressed sheet interleaves for Mode I Interlaminar Fracture Toughness Enhancement, (2016) *Composites Part A*, 80:127-137.

8. Yildiz, O., Stano, K., Faraji, S., Stone, C., Willis, C., Zhang, X., Jur, J. and Bradford, P. High Performance Carbon Nanotube – Polymer Nanofiber Hybrid Fabrics, (2015) *Nanoscale*, 7:16744-16754.

9. Faraji, S., Stano, K., Yildiz, O., Li, A., Zhu, Y. and Bradford, P. Ultralight Anisotropic Foams from Layered Aligned Carbon Nanotube Sheets, (2015) *Nanoscale*, 7:17038-17047.

10. Li, A. Bogdanovich, A. and Bradford, P. Aligned Carbon Nanotube Sheet Piezoresistive Strain Sensors, (2015) *Smart Materials and Structures*, 24:095004.

11. Cakmak, E., Fang, X., Yildiz, O., Bradford, P. and Ghosh, T. Carbon Nanotube Sheet Electrodes for Anisotropic Actuation of Dielectric Elastomers, (2015) *Carbon* 89:113-120.

12. Stano, K., Carroll, M., Padbury, R., McCord, M., Jur, J. and Bradford, P. Conformal Atomic Layer Deposition of Alumina on Millimeter Tall, Vertically-aligned Carbon Nanotube Arrays, (2014) *ACS Applied Materials and Interfaces*, 6(21):19135-19143.

13. Faraji, S., Stano, K., Rost, C., Maria, J-P., Zhu, Y. and Bradford, P. Structural Annealing of Carbon Coated Aligned Multi-walled Carbon Nanotube Sheets, (2014) *Carbon*, 79:113-122.

14. Fu, K., Yildiz, O., Bhanushali, H., Wang, Y., Xue, L., Zhang, X and Bradford, P. Aligned Carbon Nanotube-Silicon Sheets: A Novel Nano-architecture for Flexible Lithium Ion Battery Electrodes, (2013) *Advanced Materials*, 25(36):5109-5114.

15. Yildiz, O. and Bradford, P. Aligned Carbon Nanotube Sheet High Efficiency Particulate Air Filters, (2013). *Carbon*, 64:295-304.

16. Wang, X., Yong, Z., Li, Q., Bradford, P., Liu, W., Tucker, D., Cai, W., Wang, H., Yuan, F. and Zhu Y. Ultrastrong, Stiff and Multifunctional Carbon Nanotube Composites, (2013) *Materials Research Letters*, 1(1):19-25.

Ben Calhoun, Ph.D.

Current Role(s):
Professor of Electrical and Computer Engineering, UVA
UVA Campus Leader and Thrust IV Leader of ASSIST

Educational background:
BS, University of Virginia, 2000
MS, MIT, 2002
PhD, MIT, 2006

E-mail: bcalhoun@virginia.edu
Phone: (434) 243 2076

Interests: **S**elf powered wireless sensors for the internet of things, body area sensor networks, low power digital circuit design, system-on-chip architecture and circuits for energy constrained applications, system driven embedded hardware/software design, sub-threshold digital circuits, SRAM design for end-of-the-roadmap silicon, variation tolerant circuit design methodologies, power harvesting and delivery circuits, non-CMOS memory, low power mixed signal design, and medical applications for low energy electronics.

Expertise: Dr. Benton Calhoun (PI) is a Professor in ECE at UVA. His research interests include self powered wireless sensors for the internet of things (IoT), body area sensor networks, low power digital circuit design, system-on-chip architecture and circuits for energy constrained applications, and system driven embedded hardware/software design. He co-founded PsiKick, Inc. in 2012 to commercialize self powered wireless sensors, and he is currently co-CTO of PsiKick. He has won awards for scholarship (DARPA Young Faculty Award, 3 Best Paper Awards, ISSCC Student Design Contest, etc.), teaching (All-University Teaching Award, etc.), and entrepreneurship (Edlich-Henderson Innovator of the Year, etc.).

ASSIST Project Titles:
Integrated Sensor Node Design and Prototyping

Services Offered: Sponsored Research, collaborative projects, VLSI design.

Publication Examples:
Journals:

[1] D. Akella Kamakshi, A. Shrivastava, and B. H. Calhoun, “A 0.2 V, 23 nW CMOS Temperature Sensor for Ultra-Low-Power IoT Applications,” J. Low Power Electron. Appl. (JLPEA), Vol. 6, No. 2, 2016.

[2] F. Yahya, H. Patel, J. Boley, A. Banerjee, and B. H. Calhoun, “A Sub-threshold 8T SRAM Macro with 12.29nW/KB Standby Power and 6.24 pJ/access for Battery-Less IoT SoCs,” J. Low Power Electron. Appl. (JLPEA), Vol. 6, No. 2, 2016.

[3] D. Akella, A. Shrivastava, C. Duan, and B. H. Calhoun, “A 36nW, 7 ppm/oC Fully On-Chip Clock Source System for Ultra-Low Power Applications,” Journal of Low Power Electronics and Applications (JLPEA), Vol. 6, No. 2, 2016.

[4] A. Roy, A. Klinefelter, F. B. Yahya, X. Chen, P. Gonzalez, D. Akella, J. Boley, K. Craig, M. Faisal, S. Oh, N. E. Roberts, Y. Shakhsheer, A. Shrivastava, D. Vasudevan, D. D. Wentzloff, and B. H. Calhoun,

"A 6.45μW Self-Powered SoC with Integrated Energy-Harvesting Power Management and ULP Asymmetric Radios for Portable Biomedical Systems," Transactions on Biomedical Circuits and Systems (TBioCAS), 2015.

[5] A. Shrivastava, D. Akella, and B. H. Calhoun, "A 1.5nW, 32.768kHz XTAL Oscillator Operational from 0.3V Supply," IEEE Journal of Solid-State Circuits (JSSC), 2015.

[6] Shrivastava, N. E. Roberts, O. U. Khan, D. D. Wentzloff, and B. H. Calhoun, "A 10mV-Input Boost Converter with Inductor Peak Current Control and Zero Detection for Thermoelectric and Solar Energy Harvesting with 220mV Cold-Start and -14.5dBm, 915MHz RF Kick-Start," IEEE Journal of Solid-State Circuits (JSSC), Vol. 50, No. 8, pages 1820-1832, August 2015.

[7] V. Misra, A. Bozkurt, B. Calhoun, T. Jackson, J. Jur, J. Lach, B. Lee, J. Muth, O. Oralkan, M. Ozturk, S. Trolier-McKinstry, D. Vashaee, D. Wentzloff, and Y. Zhu, "Flexible Technologies for Self-Powered Wearable Health and Environmental Sensing," Proceedings of the IEEE, Vol. 103, No. 4, pages 665-681, April 2015.

Conferences:

[8] P. Long, J. Z. Huang, M. Povolotskyi, D. Verreck, J. Charles, T. Kubis, G. Klimeck, M. J.W. Rodwell, and B. H. Calhoun, "A Tunnel FET Design for High-Current, 120 mV Operation," IEDM, 2016.

[9] N. Liu and B. H. Calhoun, "Design Optimization of Register File Throughput and Energy using a Virtual Prototyping (ViPro) Tool," ISVLSI, 2016.

[10] D. Kamakshi, M. Fojtik, B. Khailany, S. Kudva, Y. Zhou, and B. H. Calhoun, "Modeling and Analysis of Power Supply Noise Tolerance with Fine-grained GALS Adaptive Clocks," ASYNC, 2016. (Best Paper Award Nominee)

[11] A. Roy and B. H. Calhoun, "Exploring circuit robustness to power supply variation in low-voltage latch and register-based digital systems," International Symposium on Circuits and Systems (ISCAS), 2016.

[12] A. Roy, P. Grossman, S. Vitale, and B. H. Calhoun, "A 1.3μW, 5pJ/cycle sub-threshold MSP430 processor in 90nm xLP FDSOI for energy-efficient IoT applications," International Symposium on Quality Electronic Design (ISQED), 2016.

[13] H. Patel, F. Yahya, and B. H. Calhoun, "Optimizing SRAM Bitcell Reliability and Energy for IoT Applications," International Symposium on Quality Electronic Design (ISQED), 2016.

[14] H. Patel, F. Yahya, and B. H. Calhoun, "Improving Reliability and Energy Requirements of Memory in Body Sensor Networks," VLSI Design, 2016.

[15] D. Akella, A. Shrivastava, and B. H. Calhoun, "A 23 nW CMOS ultra-Low Power Temperature Sensor Operational from 0.2 V," IEEE SOI-3D-Subthreshold Microelectronics Technology Unified Conference (S3S), 2015.

[16] J. Boley and B. H. Calhoun, "Stack Based Sense Amplifier Designs for Reducing Input-Referred Offset," ISQED, 2015. (Best Paper Award Nominee)

[17] A. Klinefelter, J. Ryan, J. Tschanz, and B. H. Calhoun, "Error-Energy Analysis of Hardware Logarithmic Approximation Methods for Low Power Applications," ISCAS, pages 2361-2364, 2015.

[18] C. J. Lukas and B. H. Calhoun, "A 0.38 pJ/bit 1.24 nW Chip-to-Chip Serial Link for Ultra-Low Power Systems," ISCAS, pages 2860-2863, 2015.

[19] A. Klinefelter, N. Roberts, Y. Shakhsheer, P. Gonzalez, A. Shrivastava, A. Roy, K. Craig, M. Faisal, J. Boley, S. Oh, Y. Zhang, D. Akella, D. D. Wentzloff, B. H. Calhoun, "A 6.45 μW Self-Powered IoT SoC with Integrated Energy-Harvesting Power Management and ULP Asymmetric Radios," IEEE International Solid-State Circuits Conference, 2015.

Suman Datta, Ph.D.

Current Role(s):

Chang Family Chair Professor of Electrical Engineering, University of Notre Dame

Thrust 2 Director of ASSIST

Educational background:

BS, Indian Institute of Technology, Kanpur 1995

PhD, University of Cincinnati, 1999

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Phone: (574) 631-8835

Interests: Advanced CMOS technology, neuromorphic hardware, non-volatile memories, dynamical systems

Expertise: Suman Datta is the Chang Family Chair Professor of Engineering Innovation in the department of Electrical Engineering at University of Notre Dame. He was previously a Professor of Electrical Engineering at Penn State University from 2007 to 2015. Before joining Penn State, from 1999 till 2007, he was in the Advanced Transistor Group at Intel Corporation, where he developed several generations of logic transistor technologies including high-k/metal gate, 3D Tri-gate and non-Silicon channel CMOS transistors. He continues to work with leading semiconductor companies on advanced CMOS transistor options such as band engineered III-V FinFETs, III-V Tunnel FETs, negative capacitance Ferro FETs and phase transition FETs. His group also works on non-Boolean computing paradigm harnessing collective state of coupled dynamical systems. He was a recipient of the Intel Achievement Award (2003) for demonstration of high-performance high-k metal gate CMOS, the Intel Logic Technology Quality Award (2002) for invention of Tri-gate CMOS, the Penn State Engineering Alumni Association (PSEAS) Outstanding Research Award (2012), the SEMI Award for North America (2012), IEEE Device Research Conference Best Paper Award (2010, 2011) and the PSEAS Premier Research Award (2015). He has published over 240 papers and holds over 163 US patents. He is a Fellow of IEEE and National Academy of Inventors (NAI).

ASSIST Project Titles:
Advanced Logic and Memory NanoTechnologies for Self-Powered, Adaptive Electronics for Wearable Health Monitoring Application

Services Offered: Sponsored Research, collaborative projects, consulting in advanced semiconductor device technologies

Suman Datta, Ph.D.

Publication Examples:

[1] A. Aziz, S. Ghosh, S. Datta and S. K. Gupta, "Physics-Based Circuit-Compatible SPICE Model for Ferroelectric Transistors," IEEE Elec. Dev. Lett., vol. 37, no. 6, pp. 805-808, June 2016.
M. S. Kim, X. Li, H. Liu, J. Sampson, S. Datta, and V. Narayanan, "Exploration of low-power high-SFDR current-steering D/A converter design using steep-slope Heterojunction Tunnel FETs," IEEE Transactions on Very Large Scale Integration Systems (TVLSI), VOL. 24, NO. 6, pp. 2299-2308, JUNE 2016.

[2] W.-Y. Tsai, X. Li, M. Jerry, B. Xie, N. Shukla, H. Liu, N. Chandramoorthy, M. Cotter, A. Raychowdhury, D. M. Chiarulli, S. P. Levitan, S. Datta, J. Sampson, N. Ranganathan, and V. Narayanan, "Enabling new computation paradigms with Hyper-FET – an emerging device," IEEE Transactions on Multi-Scale Computing Systems (TMSCS), Vol 2, NO. 1, pp 30-48, Jan-Mar 2016.

[3] M. S. Kim, W. Cane-Wissing, X. Li, and J. Sampson, S. Datta, S. K. Gupta and V. Narayanan, "Comparative Area and Parasitics Analysis in FinFET and Heterojunction Vertical TFET Standard Cells" ACM Journal on Emerging Technologies in Computing Systems, Vol. 12, No. 4, Article 38, May 2016.

[4] H.-T. Zhang, L. Guo, G. Stone, L. Zhang, Y.-X. Zheng, E. Freeman, D. W. Keefer, S. Chaudhuri, H. Paik, J. A. Moyer, M. Barth, D. G. Schlom, J. V. Badding, S. Datta, V. Gopalan, R. Engel-Herbert, "Imprinting of Local Metallic States into VO2 with Ultraviolet Light", Advanced Functional Materials, vol 26, pp 6612, August 2016

[5] A Aziz, N Jao, S Datta, SK Gupta, "Analysis of Functional Oxide based Selectors for Cross-Point Memories", IEEE Transactions on Circuits and Systems I: Regular Papers 63 (12), 2222-2235, 2016

[6] S Srinivasa, A Aziz, N Shukla, X Li, J Sampson, S Datta, JP Kulkarni, "Correlated Material Enhanced SRAMs With Robust Low Power Operation" IEEE Transactions on Electron Devices 63 (12), 4744-4752, 2016

[7] ZY Al Balushi, K Wang, RK Ghosh, RA Vilá, SM Eichfeld, JD Caldwell, S Datta, J Redwing, J Robinson, "Two-dimensional gallium nitride realized via graphene encapsulation" Nature Materials, August 2016

[8] M. Barth, H. Liu, J.H. Warner, B.R. Bennett, J.B. Boos, D. McMorrow, N. Roche, P. Paillet, M. Gaillardin, and S, Datta, "Single Event Measurement and Analysis of Antimony Based n-Channel Quantum-Well MOSFET With High-κ Dielectric,", IEEE Transactions on Nuclear Science, vol.62, no.s6, pp.2807-2814, Dec. 2015

[9] K. Martens, J. W. Jeong, N. Aetukuri, C. Rettner, N. Shukla, E. Freeman, D. N. Esfahani, F. M. Peeters, T. Topuria, P. M. Rice, A. Volodin, B. Douhard, W. Vandervorst, M. G. Samant, S. Datta, and S. S. P. Parkin, "Field Effectand Strongly Localized Carriers in the Metal-Insulator Transition Material VO2", Physical Review Letters, Nov 6, 2015.

[10] H. Paik, J. A. Moyer, T. Spila, J.W. Tashman, J. A. Mundy, E. Freeman, N.Shukla, J.M. Lapano, R. Engel-Herbert, W. Zander, J. Schubert, D.A. Muller, S. Datta, P. Schiffer, and D. G. Schlom, "Transport properties of ultra-thin VO2 films on (001) TiO2 grown by reactive molecular-beam epitaxy" Applied Physics Letters 106, 163101, Oct 19, 2015.

[11] Y. X. Zheng, A. Agrawal, G. B. Rayner, Jr., M. J. Barth, K. Ahmed, S. Datta, and R. Engel-Herbert "In Situ Process Control of Trilayer Gate-Stacks on p-Germanium With 0.85-nm EOT", IEEE Electron Device lett., vol. 36, no. 9, pp 881-883, Sep. 2015.

[12] J. U. Mehta, W. A. Borders, H. Liu, R. Pandey, S. Datta, and L. Lunardi, "III–V Tunnel FET Model With Closed-Form Analytical Solution", IEEE Trans. Elec. Dev., vol.63 , no.5 , pp 2163, Sept. 2015.

Michael Dickey, Ph.D.

Current Role(s):
Professor of Chemical and Biomolecular Engineering, NCSU

Educational background:
BS, Georgia Institute of Technology, 1999
MS, UT Austin, 2004
PhD, UT Austin, 2006

E-mail: mddickey@ncsu.edu
Phone: (919) 513-0273

Interests: Soft and stretchable electronics, 3D printing, wearable devices, soft materials (polymers, gels, liquid metals), thin films, instabilities

Expertise: Michael Dickey received a BS in Chemical Engineering from Georgia Institute of Technology (1999) and a PhD in Chemical Engineering from the University of Texas at Austin (2006) under the guidance of Professor Grant Willson. From 2006-2008 he was a post-doctoral fellow in the lab of Professor George Whitesides at Harvard University. In August 2008, he joined the Department of Chemical & Biomolecular Engineering at NC State University where he is currently a Professor. Michael's research interests include patterning and actuating soft materials by studying and harnessing thin films, interfaces, and unconventional fabrication techniques.

ASSIST Project Titles:
Project 1: Sweat harvesting and transport for sensing on wearable devices
Project 2: Stretchable thermoelectric devices for energy harvesting

Services Offered: Sponsored Research, collaborative projects, consulting

Publication Examples: [Insert publications here but only enough to fill two total pages]

1. **M.D. Dickey**. "Stretchable and Soft Electronics Using Liquid Metals," Submitted 2016.

2. T. Shay, **M.D. Dickey**, O.D. Velev. "Hydrogel-Enabled Osmotic Pumping for Microfluidics: Towards Sweat Sequestering for Wearable Human-Device Interfaces," Submitted 2016.

3. F. Saurez, D. Parekh, C. Ladd, D. Vashae, **M.D. Dickey**, M. Ozturk. "Flexible Thermoelectric Generator using bulk legs and eutectic gallium-indium (EGaIn) liquid metal interconnects," Submitted 2016.

4. Y. Liu, J. Genzer, and **M.D. Dickey**. "2D or not 2D: Shape-Programming Polymer Sheets", *Progress in Polymer Science*, 2016, 52, p. 79–106.

5. B.J. Carey, T. Daeneke, J.Z. Ou, R.M. Clarke, Z. Xu, Q. Bao, **M.D. Dickey**, and K. Kalantar-zadeh, "Wafer Scale 2D Semiconductors from Printed Oxide Skin of Liquid Metals," Accepted *Nature Communications*.

6. Y. Lu, Q. Hu, Y. Lin, D. B. Pacardo, W. Sun F. Ligler, **M.D. Dickey**, Z. Gu. "Transformable Liquid-Metal Nanomedicine," *Nature Communications*, 2015, 6, 10066.

7. I. Joshipura, H. Ayers, C. Majidi, **M.D. Dickey**. "Methods to Pattern Liquid Metals," *Journal of Materials Chemistry C*, 2015, 3, p. 3834 - 3841. (Invited Highlight Article, 2015 Hot Paper by Royal Society of Chemistry)

8. **M.D. Dickey**. "Emerging Applications of Liquid Metals Featuring Oxides," *ACS Applied Materials and Interfaces*, 2014. 6(21), p. 18369-18379. (Invited Spotlight Article, Selected for ACS Editors' Choice, Cover)

9. A. Qusba, A.K. RamRakhyani, J.-H. So, G.J. Hayes, **M.D. Dickey**, G. Lazzi. "On the Design of Microfluidic Implant Coil for Flexible Telemetry System," *IEEE Sensors Journal*, 2014. 14(4): p.1074-1080.

10. C. Ladd, J.-H. So, J. Muth, and **M.D. Dickey**. "Three-dimensional Printing of Free Standing Liquid Metal Microstructures," *Advanced Materials*, 2013. 25(36), p. 5081-5085. (Chosen for cover art)

11. S. Zhu, J.-H. So, S. Desai, W.R. Barnes, B. Pourdeyhimi, and **M.D. Dickey**. "Ultrastretchable Fibers with Metallic Conductivity Using a Liquid Metal Alloy," *Advanced Functional Materials*, 2013. 23 (18): p. 2308–2314.

12. M. Mohammed and **M.D. Dickey**. "Strain-controlled Diffraction of Light from Stretchable Liquid Metal Micro-components," *Sensors and Actuators A*, 2013. 193: p.246.

13. G.J. Hayes, J.H. So, A. Qusba, **M.D. Dickey**, and G. Lazzi. "Flexible Liquid Metal Alloy (EGaIn) Microstrip Patch Antenna," *IEEE Transactions on Antennas and Propagation*, 2012. 60(5): p. 2151- 2156.

14. H-.J. Koo, J-.H. So, **M.D. Dickey***, and O.Velev*. "Towards All-Soft Matter Circuits: Prototypes of Quasi-Liquid Devices with Memristor Characteristics," *Advanced Materials*, 2011. 23(31): p. 3559-3564. (*Co-corresponding author)

15. M. Reches, K. Mirica, R. Dasgupta, **M.D. Dickey**, M. Butte, and G.M. Whitesides. "Thread as a Matrix for Biomedical Assays," *ACS Applied Materials & Interfaces*, 2010. 2 (6): p. 1722–1728.

16. J.H. So, J. Thelen, A. Qusba, G.J. Hayes, G. Lazzi, and **M.D. Dickey**. "Reversibly Deformable and Mechanically Tunable Fluidic Antennas," *Advanced Functional Materials*, 2009. 19(22): p. 3632-3637.

Jesse S. Jur, Ph.D.

Current Role(s):
Thrust Leader, Wearability & Data, ASSIST

Educational background:
B.S., The University of South Carolina, 2001
M.S., Johns Hopkins University, 2003
Ph.D., North Carolina State University, 2007

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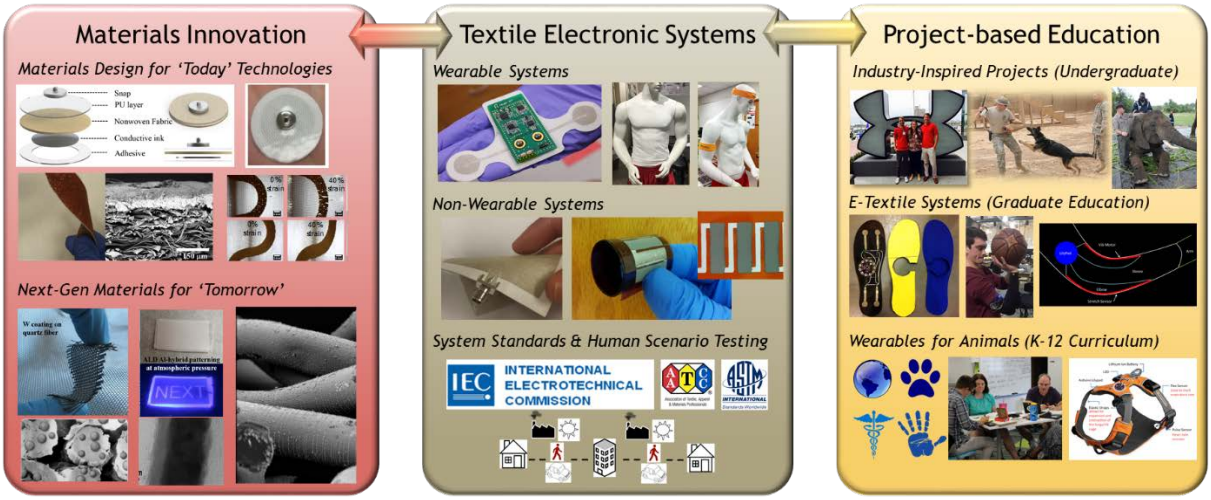
Interests:



Expertise: Dr. Jesse Jur is an Assistant Professor of Textile Engineering, Chemistry & Science at NC State University's College of Textiles, the global leader in textile education and research. After his undergraduate studies at the University of South Carolina and industrial experience in Silicon Valley, Dr. Jur earned his Ph.D. in Materials Science and Engineering at NC State in 2007. Dr. Jur's studies examine the interfaces of technologies from semiconductor device development to textile designs. His current research focuses on integration of systems electronics into wearable platforms for energy harvesting and monitoring of a person's environmental and physiological state. He is the Technology Thrust Leader for 'Wearability and Data' for ASSIST (Advanced Self-Powered Systems of Integrated Sensors and Technologies), a National Science Foundation Nanosystems Engineering Research Center (NERC). Jur was also selected as United States representative in a Strategic Group for Wearable Smart Devices from the International Electrotechnical Commission (IEC SG 10). Finally, he is the co-director of the Textile Engineering and Textile Technology Engineering Design Program in the College of Textiles, an intensive course that interfaces students and industry for innovative product development.

Faculty Website: https://textiles.ncsu.edu/blog/team/jesse-jur/
Research Website: https://sites.textiles.ncsu.edu/next/research

Jesse S. Jur, Ph.D.

ASSIST Project Titles:

- Transformative Designs toward a Self-Powered, Multi-Modal Sensing Garment (PI)
- PVDF Copolymer Strain Energy Harvester with Textile Integration (co-PI)

Services Offered:

- sponsored research grants
- collaborative projects (SBIR/STTR/Independent R&D)
- wearable system development (up to TRL 4)
- testing standards development
- human use-case scenario development & trials
- custom textile fabrication
- consulting in market competitiveness & product development

Publication Examples:

1. M. A. Yokus, R. F. Foote, J. S. Jur, "Printed Stretchable Interconnects for Smart Garments: Design, Fabrication and Characterization" IEEE Sensors 16 (22) 7967-7976 (2016).
2. M. A. Yokus, J. S. Jur "Fabric-Based Wearable Dry Electrodes for Body Surface Biopotential Recording" IEEE Transactions on Biomedical Engineering 63 (2) 423-430 (2016).
3. J. C. Halbur, R. P. Padbury, J. S. Jur, "Silver decorated polymer supported semiconductor thin films by UV aided metalized laser printing" *Journal Vacuum Science & Technology A* 34, 031402 (2016).
4. R. Hite, J. S. Jur, G. Jones "Engineering Imagination with Ideation" *Journal of Interdisciplinary Teacher Leadership* 1 (1) (2016).
5. V. Misra, A. Bozkurt, B. Calhoun, T. Jackson, J. S. Jur, J. Lach, B.Lee, J. Muth, O. Oralkan, M. Ozturk, S. Trolier-McKinstry, D. Vashaee, D. Wentzloff, Y. Zhu "Flexible Technologies for Self-Powered Wearable Health and Environmental Sensing" *Proceedings of the IEEE* 103(4) 665-681 (2015).
6. K. L Stano, M. Carroll, R. Padbury, M. McCord, J. S. Jur, P. D. Bradford "Conformal atomic layer deposition of alumina on millimeter tall, vertically-aligned carbon nanotube arrays" *ACS Applied Materials & Interfaces* 6(21) 19135-19143 (2014).
7. H. I Akyildiz, M. Lo, E. Dillon, A.T. Roberts, H. O. Everitt, J.S. Jur "Formation of novel photoluminescent hybrid materials by sequential vapor infiltration into polyethylene terephthalate fibers" *Journal of Materials Research* 29 (23) 2817-2826 (2014).
8. R. P. Padbury, J. S. Jur "Temperature-dependent infiltration of polymers during sequential exposures to trimethylaluminum" Langmuir 30(30) 9228-9238 (2014).
9. J. C. Halbur, R. P. Padbury, J. S. Jur "Induced Wetting of Polytetrafluoroethylene by Atomic-Layer Deposition for Application of Aqueous-based Nanoparticle Inks" *Materials Letters* 101 25-28 (2013).
10. J. S. Jur, W. J. Sweet, C. J. Oldham, G. N. Parsons "Atomic Layer Deposition of Conductive Coatings on Cotton, Paper, and Synthetic Fibers: Conductivity Analysis and Functional Chemical Sensing using "All-Fiber" Capacitors" *Advanced Functional Materials*, 21 (11) 1993-2002 (2011).

Mehdi Kiani, Ph.D.

Current Role(s):
Assistant Professor of Electrical Engineering, PSU

Educational background:
BS, Shiraz University, 2005
MS, Sharif University of Technology, 2008
PhD, Georgia Institute of Technology, 2014

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Phone: (814) 867-5753

Interests: Analog, Mixed-Signal, RF, and Power-Management Integrated Circuits and Systems, Energy Harvesting, Wireless Healthcare Monitoring, Wireless Neural Interfacing, Implantable Microelectronic Devices, Assistive Technologies, Wireless Sensing and Actuating

Expertise: Analog, Mixed-Signal, RF, and Power-Management Integrated Circuits and Systems, Development of novel circuit- and system-level techniques for wireless interfacing of advanced implantable microelectronic devices

ASSIST Project Titles: An Efficient Application-Specific Integrated Circuit (ASIC) for Energy Harvesting from a Multi-Beam Mechanical Transducer

Services Offered: Collaborative projects and testing and evaluation services

Publication Examples:
[1] M. Meng and M. Kiani, "A hybrid inductive-ultrasonic link for wireless power transmission to millimeter-sized biomedical implants," IEEE Trans. Cir. Syst. II, 2016.
[2] H. Sadeghi and M. Kiani, "Current-based resonant power delivery with multi-cycle switching for extended-range inductive power transmission," IEEE Trans. Cir. Syst. I, vol. 63, pp. 1543-1552, Sept. 2016.
[3] M. Meng and M. Kiani, "Design and optimization of ultrasonic wireless power transmission links for millimeter-sized biomedical implants," IEEE Trans. Biomed. Cir. Syst., 2016.
[4] A. Ibrahim and M. Kiani, "A Figure-of-merit for design and optimization of inductive power transmission links for millimeter-sized biomedical implants," Accepted for publication in IEEE Trans. Biomed. Cir. Syst., 2016.
[5] H. Sadeghi and M. Kiani, "An adaptive reconfigurable voltage/current-mode power management with self-regulation for extended-range inductive power transmission," To be presented in IEEE Int. Solid State Cir. Conf. (ISSCC), Feb. 2017.
[6] S. Lee, B. Lee, M. Kiani, B. Mahmoudi, R. Gross, and M. Ghovanloo, "An inductively-powered wireless neural recording system with a charge sampling analog front-end," IEEE Sensors Journal, vol. 16, pp. 475-484, Jan. 2016.
[7] M. Kiani, B. Lee, P. Yeon, and M. Ghovanloo, "A Q-modulation technique for efficient inductive power transmission," IEEE Journal of Solid State Circuits, vol. 50, pp. 2839-2848, 2015.
[8] B. Lee, M. Kiani, and M. Ghovanloo, "A smart wirelessly-powered homecage for long-term high-throughput behavioral experiments," IEEE Sensors Journal, vol. 15, pp. 4905-4916, Sept. 2015.
[9] M. Kiani and M. Ghovanloo, "A 13.56-Mbps pulse delay modulation based transceiver for

simultaneous near-field power and data transmission," IEEE Trans. Biomed. Cir. Syst., vol. 9, pp. 1-11, Feb. 2015.
[10] M. Kiani and M. Ghovanloo, "High-performance multi-coil inductive power transmission links," Forum for Electromagnetic Research Methods and Application Technologies (FERMAT), Dec. 2014.
[11] D. Ahn, M. Kiani, and M. Ghovanloo, "Enhanced wireless power transmission using strong paramagnetic response," IEEE Trans. Magnetics, vol. 50, Mar. 2014.
[12] U. Jow, P. McMenamin, M. Kiani, and M. Ghovanloo, "EnerCage: A Smart Experimental Arena with Scalable Architecture for Behavioral Experiments," IEEE Trans. Biomed. Eng., vol. 61, pp. 139-148, Jan. 2014.
[13] M. Kiani and M. Ghovanloo, "A figure-of-merit for designing high performance inductive power transmission links," IEEE Trans. Indus. Elect., vol. 60, pp. 5292-5305, Nov. 2013.
[14] M. Kiani and M. Ghovanloo, "A 20 Mbps pulse harmonic modulation transceiver for wideband near-filed data transmission," IEEE Trans. Cir. Syst.-II, vol. 60, pp. 382-386, July 2013.
[15] H. Park, M. Kiani, H. Lee, J. Kim, J. Block, B. Gosselin, and M. Ghovanloo, "A wireless magnetoresistive sensing system for an intraoral tongue-computer interface," IEEE Trans. Biomed. Cir. Syst., vol. 6, pp. 571-585, Dec. 2012.
[16] U. Jow, M. Kiani, X. Huo, and M. Ghovanloo, "Towards a smart experimental arena for long-term electrophysiology experiments," IEEE Trans. Biomed. Cir. Syst., vol. 6, pp. 414-423, Oct. 2012.
[17] M. Kiani and M. Ghovanloo, "The circuit theory behind coupled-mode magnetic resonance based wireless power transmission," IEEE Trans. Cir. Syst.-I, vol. 59, Sept. 2012.
[18] M. Kiani, U. Jow, and M. Ghovanloo, "Design and optimization of a 3-coil inductive link for efficient wireless power transmission," IEEE Trans. Biomed. Cir. Syst., vol. 5, pp. 579-591, Dec. 2011.
[19] S. Lee, H. Lee, M. Kiani, U. M. Jow, and M. Ghovanloo, "An inductively powered scalable 32-channel wireless neural recording system-on-a-chip for neuroscience applications," IEEE Trans. Biomed. Cir. Syst., vol. 4, pp. 360-371, Dec. 2010.
[20] F. Inanlou, M. Kiani, and M. Ghovanloo, "A 10.2 Mbps pulse harmonic modulation based transceiver for implantable medical devices," IEEE Journal Solid State Cir., vol. 46, pp. 1296-1306, June 2011.
[21] M. Kiani and M. Ghovanloo, "An RFID-based closed loop wireless power transmission system for biomedical applications," IEEE Trans. Cir. Syst.-II, vol. 57, no. 4, pp. 260-264, Apr. 2010.
[22] M. Meghdadi, M. Azizi, M. Kiani, A. Medi, and M. Atarodi, "A 6-bit CMOS phase shifter for S-band," IEEE Trans. Microwave Theory Tech., vol. 58, pp. 3519-3526, Dec. 2010.
[23] M. Kiani, M. Sharif Bakhtiar, and M. Atarodi, "Low voltage low noise open loop automatic amplitude control for voltage-controlled oscillators," Analog Integ. Cir. Sig. Proc., vol. 62, pp. 319-325, Mar. 2010.

John Lach, Ph.D.

Current Role(s):
Professor and Chair of Electrical and Computer Engineering, UVA
Associate Director for Translational Research, ASSIST
Co-Director, UVA Center for Wireless Health

Educational background:
BS, Stanford University, 1996
MS, UCLA, 1998
PhD, UCLA, 2000

E-mail: jlach@virginia.edu
Phone: (434) 924-6086

Interests: Embedded and cyber-physical systems, smart and connected health, body sensor networks, integrated circuit design methodologies, fault and defect tolerance, safety-critical system design and analysis, and application-specific and general-purpose processor design

Expertise: John Lach received the B.S. (1996) degree in Science, Technology, and Society from Stanford University and the M.S. (1998) and Ph.D. (2000) degrees in Electrical Engineering from UCLA. Since 2000, he has been a faculty member in the Charles L. Brown Department of Electrical and Computer Engineering at the University of Virginia and has held the rank of Professor and Department Chair since 2012. He is a Senior Member of the IEEE and is a past Associate Editor for the *IEEE Transactions on Computers* and the *IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems*.

He has been the PI or co-PI on over 35 grants totaling over $16M and has published over 150 refereed papers, including five Best Paper Awards. His research group has won two conference poster competitions and the 2011 DAC/ISSCC Student Design Contest. He is a founder and Steering Committee member of the Wireless Health Conference Series (http://wirelesshealth.org/), a founder and co-director of the UVA Center for Wireless Health (http://wirelesshealth.virginia.edu/), and Associate Director for Translational Research for the NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST). He won an All-University Teaching Award in 2005 and the UVA School of Engineering and Applied Science Distinguished Faculty Award in 2016.

ASSIST Project Title: Towards Successful Demonstration, Deployment, and Refinement of ASSIST Testbeds

Services Offered: Sponsored research, consulting collaborative projects, embedded system prototyping, human subject studies, student interns and permanent hires

Publication Examples (since 2015):

[1] J. Gong, J. Lach, Y. Qi, M.D. Goldman, “Causal Analysis of Inertial Body Sensors for Enhancing Gait Assessment Separability towards Multiple Sclerosis Diagnosis,” International Conference on Body Sensor Networks, 1-6, 2015

[2] R. Nama, K. Sanders, J. Guy, T. Smith-Jackson, J. Lach, A. Bankole, M. Anderson, "Knowledge Representation for Complex Systems: Empowering Caregivers of People with Dementia," Industrial and Systems Engineering Research Conference, in press, 2015

[3] J. Gong, K.M. Rose, I.A. Emi, J.P. Specht, E. Hoque, D. Fan, S.R. Dandu, R.F. Dickerson, Y. Perkhounkova, J. Lach, J.A. Stankovic, "Home Wireless Sensing System for Monitoring Nighttime Agitation and Incontinence in Patients with Alzheimer's Disease," Wireless Health, 8 pages, 2015

[4] J. Gong, M.M. Engelhard, M.D. Goldman, J. Lach, "Correlations between Inertial Body Sensor Measures and Clinical Measures in Multiple Sclerosis," International Conference on Body Area Networks, 18-24, 2015

[5] M.M. Engelhard, S.R. Dandu, J. Lach, M.D. Goldman. S.D. Patek, "Toward Detection and Monitoring of Gait Pathology using Inertial Sensors under Rotation, Scale, and Offset Invariant Dynamic Time Warping," International Conference on Body Area Networks, 269-75, 2015

[6] J. Gong, J. Lach, "Motion Markers Discovery from Inertial Body Sensors for Enhancing Objective Assessment of Robotic Surgical Skill," International Symposium on Bioelectronics and Bioinformatics, 215-18, 2015

[7] V. Misra, A. Bozkurt, B. Calhoun, T. Jackson, J. Jur, J. Lach, B. Lee, J. Muth, O. Oralkan, M. Ozturk, S. Trolier-McKinstry, D. Vashaee, D. Wentzloff, Y. Zhu, "Flexible Technologies for Self-Powered Wearable Health and Environmental Sensing," Proceedings of the IEEE, 103(4):665-81, April 2015

[8] S.M. Boker, T.R. Brick, J.N. Pritikin, Y. Wang, T. von Oertzen, D. Brown, J. Lach, R. Estabrook, M.D. Hunter, H.H. Maes, M.C. Neale, "Maintained Individual Data Distributed Likelihood Estimation," Multivariate Behavioral Research, 50(6):706-20, November 2015

[9] J. Gong, D. Fan, L. Lopez Ruiz, J. Lach, "Profiling, Modeling, and Predicting Energy Harvesting for Self-Powered Body Sensor Platforms," International Conference on Body Sensor Networks, 402-7, 2016

[10] S. Russell, Y. Zhuang, J. Gong, D.C. Kerrigan, B.C. Bennett, J. Lach, "Gait Tracker Shoe for Accurate Step-by-step Determination of Gait Parameters," International Conference on Body Sensor Networks, 13-8, 2016

[11] S.R. Dandu, M.M. Engelhard, M.D. Goldman, J. Lach, "Determining Physiological Significance of Inertial Gait Features in Multiple Sclerosis," International Conference on Body Sensor Networks, 266-71, 2016

[12] D. Fan, J. Gong, J. Lach, "Eating Gestures Detection by Tracking Finger Motion," Wireless Health, 1-6, 2016

[13] J. Gong, M.D. Goldman, J. Lach, "DeepMotion: A Deep Convolutional Neural Network on Inertial Body Sensors for Gait Assessment in Multiple Sclerosis," Wireless Health, 165-71, 2016

[14] M.M. Engelhard, J. Lach, M.D. Goldman, S.D. Patek, "Adaptive Symptom Reporting for Mobile Patient-Reported Disability Assessment," Wireless Health, 172-9, 2016

[15] J. Gong, P. Asare, Y. Qi, J. Lach, "Piecewise Linear Dynamical Model for Action Clustering from Real-World Deployments of Inertial Body Sensors," IEEE Transactions on Affective Computing, 7(3):231-42, April 2016

[16] M.M. Engelhard, S.R. Dandu, S.D. Patek, J. Lach, M.D. Goldman, "Quantifying Six-Minute Walk Induced Gait Deterioration with Inertial Sensors in Multiple Sclerosis Subjects," Gait & Posture, 49:340-5, July 2016

[17] J. Gong, Y. Qi, M.D. Goldman, J. Lach, "Causality Analysis of Inertial Body Sensors for Multiple Sclerosis Diagnostic Enhancement," IEEE Journal of Biomedical and Health Informatics, 20(5):1273-80, September 2016

[18] S. Chen, J. Lach, B. Lo, G.-Z. Yang, "Towards Pervasive Gait Analysis with Wearable Sensors: A Systematic Review," Journal of Biomedical and Health Informatics, 20(6):1521-37, November 2016

Edgar Lobaton, Ph.D.

Current Role(s):
Assistant Professor of Electrical and Computer Engineering
North Carolina State University

Educational background:
BS, Seattle University, 2004
PhD, University of California at Berkeley, 2009

E-mail: edgar.lobaton@ncsu.edu
Phone: (919) 515-5151

Interests: Pattern recognition, machine learning and signal processing with applications to wearable sensors and devices, robotics and computer vision.

Expertise: Dr. Edgar J. Lobaton has been an Assistant Professor in the Department of Electrical and Computer Engineering at North Carolina State University (NCSU) since 2011. Dr. Lobaton earned his B.S. in Mathematics and Electrical engineering from Seattle University in 2004. He completed his Ph.D. in Electrical Engineering and Computer Sciences from the University of California, Berkeley in 2009. Dr. Lobaton was engaged in research at Alcatel-Lucent Bell Labs in 2005 and 2009. He was awarded the NSF CAREER Award in 2016. He was also awarded the 2009 Computer Innovation Fellows post-doctoral fellowship and conducted research in the Department of Computer Science at the University of North Carolina (UNC) at Chapel Hill from 2009 until 2011. His research focuses on the development of tools for the fields of pattern recognition, estimation theory, and statistical and topological data analysis in order to solve problems in the areas of wearable health and environmental monitoring, robotics and computer vision.

ASSIST Project Titles:

Power-Efficient Respiratory Rate Estimation via Inertial and EKG Sensing

Services Offered: Sponsored or Collaborative Research on pattern recognition for wearable technologies. Design of robotic platforms. Consulting in pattern recognition and machine learning.

Edgar Lobaton, Ph.D.

Publication Examples:

[1] G.M. Pomann, A. Staicu, E. Lobaton, A. Mejia, B. Dewey, D.S. Reich, E. Sweeney, R. Shinohara, “Functional Linear Model for Prediction of Magnetization Transfer Ratio in Multiple Sclerosis Lesions,” Annals of Applied Statistics, 10(4), 2017, 2325-2348.

[2] J. Cole, F. Mohammadzadeh, C. Bollinger, T. Latif, A. Bozkurt, E. Lobaton, "A Study on Motion Mode Identification for Cyborg Roaches," Intl. Conf. on Acoustics, Speech and Signal Processing (ICASSP), 2017.

[3] A. Dirafzoon, T. Latif, F. Gong, M. Sichitiu, A. Bozkurt, E. Lobaton, "Biobotic Motion and Behavior Analysis in Response to Directional Neurostimulation," Intl. Conf. on Acoustics, Speech and Signal Processing (ICASSP), 2017.

[4] A. Dirfazoon, A. Bozkurt, E. Lobaton, “Geometric Learning and Topological Inference with Biobotic Networks,” IEEE Transactions on Signal and Information Processing over Networks, PP, 2016.

[5] A. Dirafzoon, N. Lokare and E. Lobaton, “Action Classification from Motion Capture Data using Topological Data Analysis,” IEEE Global Conf. on Signal and Information Processing (GlobalSIP), 2016.

N. Lokare, D. Benavides, S. Juneja and E. Lobaton, “Hierarchical Activity Clustering Analysis for Robust Graphical Structure Recovery,” IEEE Global Conf. on Signal and Information Processing (GlobalSIP), 2016.

[6] N. Lokare, L. Gonzalez and E. Lobaton, “Comparing the Effect of Muscle Activation in Wearable Devices using Wet and Textile Electrodes,” IEEE Engineering in Medicine and Biology Conference (EMBC), 2016.

Ömer Oralkan, Ph.D.

Current Role(s):
Associate Professor of Electrical and Computer Engineering, NCSU
Thrust Leader, Wearable Nanosensors, ASSIST

Educational background:
BS, Bilkent University, 1995
MS, Clemson University, 1997
PhD, Stanford University, 2004

E-mail: omer.oralkan@ncsu.edu
Phone: (919) 513-7847

Interests: Wearable ultra-low-power environmental sensors, micromachined ultrasonic transducers, MEMS, sensor interface circuits, ultrasound imaging and therapy, photoacoustic imaging, biosensors, air-coupled ultrasound.

Expertise: Ömer Oralkan joined the Department of Electrical and Computer Engineering, North Carolina State University, Raleigh, as an Associate Professor in 2012. Prior to joining NC State, he was a Research Associate (2004-2007) and then a Senior Research Associate (2007-2011) in the E. L. Ginzton Laboratory at Stanford University. His current research focuses on developing devices and systems for ultrasound imaging, photoacoustic imaging, image-guided therapy, biological and chemical sensing, and ultrasound neural stimulation.

Dr. Oralkan is an Associate Editor for the IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control and serves on the Technical Program Committee of the IEEE Ultrasonics Symposium. He received the 2002 Outstanding Paper Award of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society, 2013 DARPA Young Faculty Award, and 2016 William F. Lane Outstanding Teacher Award at NC State. Dr. Oralkan has authored more than 150 scientific publications.

ASSIST Project Titles:

Mechanically resonant chemical sensor arrays based on capacitive micromchined ultrasonic transducers

Services Offered: Sponsored research; collaborative projects; design, fabrication, and characterization of micromachined sensors and actuators; sensor system integration; consulting in the mentioned fields.

Publication Examples

[1] X. Zhang, F. Y. Yamaner, and **Ö. Oralkan**, "Fabrication of vacuum-sealed capacitive micromachined ultrasonic transducers with through-glass-via interconnects using anodic bonding," *IEEE J. Microelectromech. Syst.*, accepted for publication.

[2] A. Novell, C. B. Arena, **O. Oralkan**, and P. A. Dayton, "Wideband acoustic activation and detection of droplet vaporization events using a capacitive micromachined ultrasonic transducer," *J. Acous. Soc. Am. Exp. Lett.*, vol. 139, no. 6, pp. 3193-3198, Jun. 2016.

[3] J. Dieffenderfer, H. Goodell, S. Mills, M. McKnight, S. Yao, F. Lin, E. Beppler, B. Bent, V. Misra, Y. Zhu, **O. Oralkan**, J. Strohmaier, J. Muth, D. Peden, and A. Bozkurt, "Low power wearable systems for continuous monitoring of environment and health for chronic respiratory disease," *IEEE J. Biomed. Health Inform.*, vol. 20, no. 5, pp. 1251-1264, Sept. 2016.

[4] F. Y. Yamaner, X. Zhang, and **Ö. Oralkan**, "A three-mask process for fabricating vacuum sealed capacitive micromachined ultrasonic transducers using anodic bonding," *IEEE Trans. Ultrason., Ferroelect., Freq. Contr.*, vol. 62, no. 5, pp. 972-982, May 2015.

[5] V. Misra, M. Ozturk, S. Trolier-McKinstry, T. Jackson, B. Calhoun, D. Wentzloff, A. Bozkurt, Y. Zhu, **Ö. Oralkan,** and J. Jur, "Flexible technologies for self-powered wearable health and environmental sensing," *Proc. IEEE*, vol. 103, no. 4, pp. 665-681, April 2015.

[6] H. J. Lee, K. K. Park, M. Kupnik, **Ö. Oralkan,** and B. T. Khuri-Yakub, "A multi-channel oscillator for a resonant chemical sensor system," *IEEE Trans. Indust. Elect.*, vol. 61, no. 10, pp. 5632-5640, Oct. 2014.

[7] A. Bhuyan, J. W. Choe, B. C. Lee, I. Wygant, A. Nikoozadeh, **Ö. Oralkan,** and B. T. Khuri-Yakub, "Integrated circuits for volumetric ultrasound imaging using CMUT technology," *IEEE Trans. Biomed. Circ. Syst.*, vol. 7, no. 6, pp. 796-804, Dec. 2013. (GS: 17, WoS: 7)

[8] M. Prieto, **Ö. Oralkan**, B. T. Khuri-Yakub, and M. Maduke, "Dynamic response of model lipid membranes to ultrasonic radiation force," *PLoS ONE*, 8 (10), e77115, October 23, 2013.

[9] J. W. Choe, A. Nikoozadeh, **Ö. Oralkan**, and B. T. Khuri-Yakub, "GPU-based real-time volumetric ultrasound image reconstruction for a ring array," *IEEE Trans. Med. Imag.*, vol. 32, no. 7, pp. 1258-1264, Jul. 2013. (GS: 16, WoS: 8)

[10] A. Kamaya, S. Vaithilingam, B. Chung, **Ö. Oralkan,** and B. T. Khuri-Yakub, "Photoacoustic imaging of the bladder wall: a pilot study," *J. Ultrasound Med.*, vol. 32, pp. 1245-1250, Jul. 2013.

[11] K. K. Park, **Ö. Oralkan,** and B. T. Khuri-Yakub, "A comparison between conventional and collapse-mode capacitive micromachined ultrasonic transducers in 10-MHz 1-D arrays," *IEEE Trans. Ultrason., Ferroelect., Freq. Contr.*, vol. 60, no. 6, pp. 1245-1255, Jun. 2013.

[12] M. D. Menz, **Ö. Oralkan**, P. T. Khuri-Yakub, and S. A. Baccus, "Precise neural stimulation in the retina using focused ultrasound," *Jour. of Neuroscience*, vol. 33, no. 10, pp. 4550-4560, March 6, 2013.

[13] J. W. Choe, **Ö. Oralkan**, A. Nikoozadeh, M. Gencel, D. N. Stephens, M. O'Donnell, D. J. Sahn, and B. T. Khuri-Yakub, "Volumetric real-time imaging using a CMUT ring array," *IEEE Trans. Ultrason., Ferroelect., Freq. Contr.*, vol. 59, no. 6, pp. 1201-11, Jun. 2012.

[14] S.-R. Kothapalli, T.-J. Ma, S. Vaithilingam, **Ö. Oralkan**, B. T. Khuri-Yakub, S. S. Gambhir, "Deep tissue photoacoustic imaging using a miniaturized 2-D capacitive micromachined ultrasonic transducer array," *IEEE Trans. Biomed. Eng.*, vol. 59, no. 5, pp. 1199-1204, May 2012.

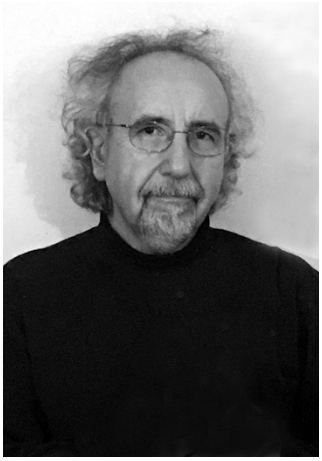
[15] D. N. Stephens, U. Truong, A. Nikoozadeh, **Ö. Oralkan**, C. H. Seo, J. Cannata, A. Dentinger, K. E. Thomenius, A. Delarama, T. Nguyen, F. Lin, P. T. Khuri-Yakub, A. Mahajan, K. Shivkumar, M. O'Donnell, and D. J. Sahn, "First in-vivo use of a CMUT array based imaging and ablation catheter," *J. Ultrasound Med.*, vol. 31, no. 2, pp. 247-25, Feb. 2012.

[16] H. J. Lee, K. K. Park, M. Kupnik, **Ö. Oralkan**, and B. T. Khuri-Yakub, "Chemical vapor detection using a capacitive micromachined ultrasonic transducer," *Anal. Chem.*, vol. 83, no. 24, pp. 9314-20, 15 Dec. 2011.

[17] K. K. Park , H. Lee, M. Kupnik, **Ö. Oralkan**, J.-P. Ramseyer, H. P. Lang, M. Hegner, C. Gerber and B. T. Khuri-Yakub, "Capacitive micromachined ultrasonic transducer (CMUT) as a chemical sensor for DMMP detection," *Sens. Act. B.*, vol. 20, no. 1, pp. 1120-1127, Dec. 2011.

[18] B. T. Khuri-Yakub and **Ö. Oralkan**, "Capacitive micromachined ultrasonic transducers for medical imaging and therapy," *J. Micromech. Microeng.*, vol. 21, no. 5, 054004, May 2011.

Mehmet C. Ozturk, Ph.D.



Current Role(s):
Professor of Electrical and Computer Engineering, NCSU
Deputy Director of ASSIST

Educational background:
BS, Bosphorus University, Istanbul, Turkey 1980
MS, Michigan Technological University, 1983
PhD, North Carolina State University, 1988

E-mail: mco@ncsu.edu
Phone: (919) 515-9594

Interests: Dr. Ozturk's research interests center around new electronic materials, processes and device structures. His current research interests center around energy harvesting with emphasis on flexible thermoelectric devices.

Expertise: Dr. Ozturk worked on applications of low temperature epitaxy of Group IV materials (Si, $Si_{1-x}Ge_x$ & $Si_{1-x}C_x$ in source/drain and channel engineering of advanced MOS transistors. He developed ultrahigh vacuum rapid thermal chemical vapor deposition for Group IV epitaxy and pioneered the work on low resistivity, self-aligned germanosilicide contacts to $Si_{1-x}Ge_x$ alloys. He was first to propose recessed $Si_{1-x}Ge_x$ for p-channel transistors, which is now a standard process in advanced CMOS integrated circuits. In ASSIST, Dr. Ozturk has been working on developing novel technologies to enable both thin and thick film flexible thermoelectric devices.

ASSIST Project Titles:
High Performance Flexible Thermoelectric Devices

Services Offered:
Device structures involving materials and processes used in flexible/stretchable device integration including different elastomers, polyimide, interconnects etc. Efficient quasi 3-D modeling of thermoelectric generators.

Figure 1 Flexible Thermoelectric Generator with Liquid Metal Interconnects.

Recent Publication Examples:

1. Francisco Suarez, Dishit P. Parekh, Collin Ladd, Daryoosh Vashaee , Michael D. Dickey and Mehmet C. Ozturk, Wearable thermoelectric Generator using bulk legs and liquid metal interconnects (under review)
2. F. Suarez, A. Nozariasbmarz, D. Vashaee, M. C. Ozturk, Designing thermoelectric generators for selfpowered wearable electronics, Energy & Environmental Science 9 (6) (2016) 2099–2113.
3. F. Suarez, V.P. Ramesh, D. Vashaee, M.C. Öztürk, "Flexible thermoelectric device using bulk materials", presented at International Conference on Thermoelectrics, June 28 – July 2, 2015, Dresden Germany
4. Mehmet C. Ozturk, Self-Powered Integrated Sensors and Technologies for Health and Environmental Monitoring, ASME 2015 Conference on Smart Materials, Adaptive Structures and

Intelligent Systems, Energy Harvesting Symposium, Colorado Springs, CO, September 21-23, 2015

5. Mehmet C. Ozturk, Advanced Self-powered Systems of Integrated Sensors and Technologies, Flexible Hybrid Electronics for Wearable Applications – Challenges and Solutions, STS Semiconductor Technology Symposium, Semicon West, San Francisco, CA, July 14-16 2015

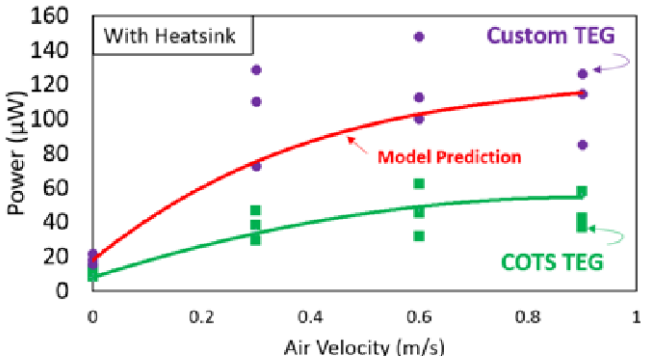


Figure 2 Modeling of thermoelectric generators and experimental verification

6. Misra, V. Bozkurt, A., Calhoun, B., Jackson, T. , Jur, J., Lach, J., Bongmook Lee, Muth, J., Oralkan, O. , Ozturk, M., Trolier-McKinstry, S., Vashaee, D., Wentzloff, D., Yong, ZhuFlexible Technologies for Self-Powered Wearable Health and Environmental Sensing, Proceedings of the IEEE, Volume:103 , Issue: 4, pp. 665 - 681, April 2015
7. Alper Gurarslan, Yifei Yu, Liqin Su, Yiling Yu, Francisco Suarez, Shanshan Yao, Yong Zhu, Mehmet Ozturk, Yong Zhang and Linyou Cao, "Surface-Energy-Assisted Perfect Transfer of Centimeter-Scale Monolayer and Few-Layer MoS2 Films onto Arbitrary Substrates", *ACS Nano*, **2014**, *8* (11), pp 11522–11528

Selected Publications from Prior Research Projects:

1. Emre Alptekin and Mehmet C. Ozturk. Ultrahigh Vacuum Chemical Vapor Deposition of Doped and Intrinsic Si1-xCx Epitaxy from Disilane, Trimethylsilane, and Phosphine. *JOURNAL OF THE ELECTROCHEMICAL SOCIETY*, 157(6):H699–H704, 2010.
2. Emre Alptekin and Mehmet C. Ozturk. Tuning of the Nickel Silicide Schottky Barrier Height on p-Type Silicon by Indium Implantation. *IEEE ELECTRON DEVICE LETTERS*, 30(12):1272–1274, DEC 2009.
3. J Liu, MC Ozturk, "Nickel Germanosilicide contacts formed on heavily boron doped Si< sub> 1-x</sub> Ge< sub> x</sub> source/drain junctions for nanoscale CMOS", IEEE Transactions on Electron Devices, 52 (7), 1535-1540 (2005)
4. Shyam Gannavaram, Nemanja Pesovic, C Ozturk, "Low temperature (800 C) recessed junction selective silicon-germanium source/drain technology for sub-70 nm CMOS", IEEE International Electron Devices Meeting,Technical Digest, pp. 437-440 (2000)
5. Y. Zhong, MC Ozturk, DT Grider, JJ Wortman, MA Littlejohn, "Selective low-pressure chemical vapor deposition of Si 1-x Ge x alloys in a rapid thermal processor using dichlorosilane and germane" Applied physics letters 57 (20), 2092-2094 (1990)
6. SP Ashburn, MC Ozturk, G Harris, DM Maher, "Phase transitions during solid-state formation of cobalt germanide by rapid thermal annealing", Journal of applied physics 74 (7), 4455-4460 (1993)
7. Mehmet C Ozturk, Jimmie J Wortman, Carlton M Osburn, Atul Ajmera, George A Rozgonyi, Eric Frey, W-K Chu, Clinton Lee, "Optimization of the germanium preamorphization conditions for shallow-junction formation", IEEE Transactions on Electron Devices, Vol. 35, pp. 659-668, 1988

Nezih Pala, Ph.D.

Current Role(s):
Associate Professor of Electrical and Computer Engineering, FIU

Educational background:
BS, Middle East Technical University, 1996
MS, Rensselaer Polytechnic Institute, 1999
PhD, Rensselaer Polytechnic Institute, 2002

E-mail: npala@fiu.edu
Phone: (305) 348 3016

Interests: Nanostructure based bio/chemical sensors, Plasmonic structures and devices for bio/chemical sensing, communication and energy harvesting, Nanoscale tunable plasmonic THz detectors, Compact and tunable THz sources based on nonlinear phenomena and silicon photonics, Control of electronic structures of graphene and fabrication of graphene field effect transistors, Integration of novel 2D materials including ZnO, graphene and MoS_2, Free-space-optical communication (FSO) utilizing multi-element smart lighting systems.

Expertise Nezih Pala is currently an Associate Professor at the Electrical &Computer Engineering Department of Florida International University. During his PhD research, he worked on GaN-based high electron mobility transistors (HEMTs) for high-power, high-frequency applications as well as UV LEDs and photodetectors. Before joining FIU he worked for DoD contractor research companies and developed several SBIR and STTR research projects primarily on GaN technologies and THz plasmonics. After joining FIU, while continuing THz plasmonics studies, he expanded his research into UV-visible-IR plasmonics, 1D and 2D (nano)materials for bio/chemical sensing and energy harvesting and free space optical communication. His research has been supported by NSF, US Army, NIH, Department of Energy, EPA, Florida Light & Power Inc. and internationally by Qatar National Research Fund. He is a recipient of NSF CAREER award. He has authored/coauthored more than 100 articles published in peer reviewed scientific journals and conferences.

ASSIST Project Titles:
Self-Powered Wearable Sensor Arrays for Multiplexed Human Sweat Analysis

Services Offered: Micro/Nano-fabrication (e-beam lithography, photolithography, FIB, thin film deposition, Material characterization (SEM, TEM, XRD, EDX, Raman, AFM), Solar cell efficiency and internal quantum efficiency measurement, Numerical analysis (FDTD, FEM).

Publication Examples:
[16] P. K. Vabbina, A. Kaushik, N. Pokhrel, S. Bhansali and N. Pala, “Electrochemical cortisol immunosensors based on sonochemically synthesized zinc oxide 1D nanorods and 2D nanoflakes”, Biosensors and Bioelectronics, 63:124-30, (2015)

[15] R. Sinha, P. K. Vabbina, A. Ahmadivand, M. Karabiyik, B. Gerislioglu and N. Pala, "Ultraviolet LED based compact and fast cortisol detector with ultra high sensitivity," 2016 IEEE SENSORS, Orlando, FL, USA, 2016, pp. 1-3.

[14] A. Ahmadivand, B. Gerislioglu, R. Sinha, M. Karabiyik, N. Pala, Optical Switching Using Transition from Dipolar to Charge Transfer Plasmon Modes in Ge2Sb2Te5 Bridged Metallodielectric Dimers" Nature Scientific Reports, Accepted

[13] I. Mushfique, P. Palathingal, Y. S. Eroglu, M. Yuksel, I. Guvenc, N. Pala, "Same Source, More Data: A Software-Defined Multi-Element VLC Architecture", IEEE Communications Magazine, Accepted

[12] C. Al-Amin; M. Karabiyik; N. Pala, "Fabrication of Graphene Field-Effect Transistor with Field Controlling Electrodes to Improve fT", Microelectronic Engineering, vol. 164, Issue C, pp.71-74 (2016).

[11] A. Ahmadivand , R. Sinha, S. Kaya, N. Pala, "Rhodium Plasmonics for Deep-Ultraviolet Bio-Chemical Sensing" Plasmonics, Volume 11, Issue 3, pp 839-849 (2016).

[10] C. Al-Amin, P.K. Vabbina, M. Karabiyik, R. Sinha, C. Wang, and N. Pala "Bandgap engineering of single layer graphene by randomly distributed nanoparticles", J. of Mat. Science: Materials in Electronics, 27, 7454 (2016).

[9] A. Sahin, Y.S. Eroglu, ˙I. Guvenc, N. Pala, and M. Yuksel, "Hybrid 3-D Localization for Visible Light Communication Systems", Journal of Lightwave Technology, Vol. 33, No. 22, p.4589 (2015)

[8] M. Karabiyik, A. Ahmadivand, R. Sinha, C. Al-Amin, P. Kiran Vabbina, S. Kaya, G. Rupper, S. Rudin, M. Shur, N. Pala "Plasmonic properties of asymmetric dual grating gate plasmonic crystals", Physica Status Solidi (b), Vol. 253, Nr. 4, pp. 605-788 (2016) (Featured on the cover of the issue)

[7] P.K. Vabbina, N. Choudhary, C. Al-Amin, R. Sinha, M. Karabiyik, S. Das, W. Choi and N. Pala, "Highly Sensitive Wide Bandwidth Photodetector Based on Internal Photoemission in CVD Grown Monolayer P-Type MoS_2/Graphene Schottky Junction", ACS App. Mat. & Interfaces, 7 (28), 15206, (2015).

[6] A. Ahmadivand, M. Karabiyik, N. Pala, "Fano-Like Resonances in Split Concentric Nanoshell Dimers in Designing Negative-index Metamaterials for Bio/Chemical Sensing and Spectroscopic Purposes" Applied Spectroscopy, 69(5), pp. 563-573 (2015).

[5] R. Sinha, M. Karabiyik, C. Al-Amin, P.i K. Vabbina, D. O. Guney and N. Pala, "Tunable Room Temperature THz Sources Based On Nonlinear Mixing in a Hybrid Optical and THz Micro-Ring Resonator", Nature Scientific Reports, 5, 9422 (2015)

[4] A. Vora, J. Gwamuri, N. Pala, A. Kulkarni, J. M. Pearce and D. Ö. Güney, "Exchanging Ohmic Losses in Metamaterial Absorbers with Useful Optical Absorption for Photovoltaics", Nature Scientific Reports, 4, Article number: 4901 (2014)

[3] M. Yang, S. Neupane, X. Wang, J. He, W. Li, N. Pala, "Multiple Step Growth of Single Crystalline Rutile Nanorods with the Assistance of Self-Assembled Monolayer for Dye Sensitized Solar Cells", ACS Appl. Mater. Interfaces, 5 (19), pp 9809–9815 (2013)

[2] M. Karabiyik, C. Al-Amin, and N. Pala, "Deep Sub-wavelength Multimode Tunable In-Plane Plasmonic Lenses Operating at Terahertz Frequencies", IEEE Transactions on Terahertz Science and Technology, Vol. 3, Issue: 5, pp.1-8 (2013)

[1] N. Pala and M.S. Shur, "Plasmonic terahertz detectors for biodetection", Electronics Letters, Vol. 44, Issue 24, pp. 1391-1393, (2008) (Selected "paper of the month" by the editor)

Christopher D. Rahn, Ph.D.

Current Role(s):
Professor of Mechanical Engineering, PSU
Associate Dean for Innovation, College of Engineering

Educational background:
BSME, University of Michigan, 1985
MSME, University of California, Berkeley, 1986
Ph.D., University of California, Berkeley, 1992

E-mail: cdrahn@psu.edu
Phone: (814) 865-6237

Interests: Modeling, analysis, design, and control of mechatronic systems

Expertise: Christopher D. Rahn graduated from the University of Michigan with a B.S. in mechanical engineering in 1985 and an M.S. from the University of California, Berkeley in 1986. After three years as a Research and Development Engineer at Ford Aerospace, he returned to Berkeley to pursue a Ph.D. After graduating from Berkeley in 1992, Dr. Rahn joined the Department of Mechanical Engineering at Clemson University. In 2000, he moved to the Pennsylvania State University where he is now a Professor of Mechanical Engineering, Director of the Mechatronics Research Laboratory, Co-Director of the Battery and Energy Storage Technology Center, and Associate Dean for Innovation in the College of Engineering. Dr. Rahn's research work on the modeling, analysis, design, and control of mechatronic systems has resulted in three books, over two hundred peer reviewed publications, and several patents. An ASME Fellow, Dr. Rahn served as an Associate Editor of two ASME journals and chaired an ASME technical committee and the ASME Design Engineering Division.

ASSIST Project Titles:
Chest Band Strain Energy Harvesting

Services Offered: Sponsored Research, collaborative projects, fabrication, testing and evaluation services, in mechatronic devices.

Publication Examples:

1. G. Zhang, L. Cao, S. Ge, C.Y. Wang, C. Shaffer, and C. Rahn, "In Situ Measurement of Radial Temperature Distributions in Cylindrical Li-ion Cells," Journal of the Electrochemical Society, Vol. 161, No. 10, pp. A1499-A1507, 2014.
2. T. Tanim, C. Rahn, and C.Y. Wang, "State of charge estimation of a lithium ion cell based on a temperature dependent, electrolyte enhanced, single particle model," Energy, Vol. 80, pp. 731 – 739, 2014.
3. L. Scarborough, C. Rahn, E. Smith, and K. Koudela, "Coupled Pitch Links for Multi-Harmonic Isolation Using Fluidic Circuits," Journal of the American Helicopter Society, Vol. 59, No. 4, 042005 (11 pgs.), 2014.
4. Y. Li, Z. Shen, A. Ray, and C. Rahn, "Real-time Estimation of Lead-acid Battery Parameters: A Dynamic Data-driven Approach," Journal of Power Sources, Vol. 268, pp. 758-64, December 2014.
5. T. Tanim, C. Rahn, and C.Y. Wang, "A Temperature Dependent, Single Particle, Lithium Ion Cell Model Including Electrolyte Diffusion," ASME Journal of Dynamic Systems, Measurement, and Control, Vol. 137, No. 1, 011005 (11 pages), August 2014.
6. B. Zhu, C. Rahn, and C. Bakis, "Fluidic Flexible Matrix Composite Vibration Absorber for a Cantilever Beam,"

ASME Journal of Vibration and Acoustics, Vol. 137, No. 2, 021005 (11 pages), 2015.

7. B. Zhu, C. Rahn, and C. Bakis, "Fluidic Flexible Matrix Composite Damping Treatment for a Cantilever Beam," Journal of Sound and Vibration, Vol. 340, pp. 80 – 94, 2015.
8. Y. Li, P. Chattopadhyay, A. Ray, and C. Rahn, "Identification of the Battery State-of-Health Parameter from Input-Output Pairs of Time Series Data," Journal of Power Sources, Vol. 285, pp. 235 – 246, July 2015.
9. S. Lu, X. Chen, T. Levard, P. Diglio, L. Gorny, C. Rahn, and Q. Zhang, "Large Displacement in Relaxor Ferroelectric Terpolymer Blend Derived Actuators Using Al Electrode for Braille Displays," Scientific Reports, 5:11361, pp. 1 – 7, 2015.
10. T. Tanim and C. Rahn, "Aging formula for lithium ion batteries with solid electrolyte interphase layer growth," Journal of Power Sources, Vol. 294, pp. 239 – 247, 2015.
11. A. Singh, L. Cao, J. Ma, J. Seo, C. Bakis, Y. Zhang, M. Hickner, and C. Rahn, "Design, manufacture and test of a novel structural battery based on sandwich construction," Journal of Sandwich Structures and Materials, Vol. 17, No. 6, pp. 666 – 690, 2015.
12. X. Ma, A. Wilson, C. Rahn, and S. Trolier-McKinstry, "Efficient Energy Harvesting Using Piezoelectric Compliant Mechanisms: Theory and Experiment," ASME Journal of Vibration and Acoustics, Vol. 138, No. 2, 021005 (9 pages), 2016.
13. G. Zhang, L. Cao, S. Ge., C.-Y. Wang, C. Shaffer, and C. Rahn, "Reaction temperature sensing (RTS)-based control for Li-ion battery safety," Scientific Reports - Nature, Vol. 5, 18237, 2015.
14. H. Yoo, X. Ma, S. Trolier-McKinstry, and C. Rahn, "Efficient Piezoelectric Energy Harvesters Utilizing (001) Textured Bimorph PZT Films on Flexible Metal Foils," Advanced Functional Materials, Vol. 26, Issue 32, pp. 5940 – 5946, 2016.
15. X. Ma, S. Trolier-McKinstry, and C. Rahn, "Piezoelectric Compliant Mechanism Energy Harvesters Under Large Base Excitations," Smart Materials and Structures, Vol. 25, No. 9, 095023, 2016.
16. Y. Li, P. Chattopadhyay, S. Xiong, A. Ray, and C. Rahn, "Dynamic data-driven and model-based recursive analysis for estimation of battery state-of-charge," Applied Energy, Vol. 184, pp. 266-275, 2016.
17. Yue, L., Ray, A., Chattopadhyay, P., and Rahn, C., "Identification of Battery Parameters Via Symbolic Input-Output Analysis: A Dynamic Data-Driven Approach," American Control Conference, Paper FrB14.2, Chicago, IL, July 1 – 3, 2015, **Invited Paper.**
18. Ma, X., Yeo, H., Rahn, C., and Trolier-McKinstry, S., "Efficient and Sensitive Energy Harvesting Using Piezoelectric MEMS Compliant Mechanisms," 2015 ASME IDETC, DETC2015-47539, August 2015.
19. Miura, K., Zhu, B., Rahn, C., Smith, E., and Bakis, C., "Vibration Isolation of a Cantilever Beam Using Fluidic Flexible Matrix Composite Tubes," 2015 ASME IDETC, DETC2015-47764, August 2015.
20. Tanim, T., Rahn, C., and Legnedahl, N., "Elevated temperatures can extend the life of lithium iron phosphate cells in hybrid electric vehicles," ASME 2015 Dynamic Systems and Control Conference, DSCC2015-9763, October 2015.
21. Ma, X., and Rahn, C., "Efficient Aeroelastic Energy Harvesting from HVAC Ducts," ASME 2015 Dynamic Systems and Control Conference, DSCC2015-9851, October 2015.
22. Krott, M., Miura, K., LaBarge, S., Rahn, C., Smith, E., and Romano, P. "Tube Compliance Effects on Fluidic Flexible Matrix Composite Devices for Rotorcraft Vibration Control," 56th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 2015.
23. Tanim, T., Garg, M., and Rahn, C., "An Intelligent Nail Design for Lithium Ion Battery Penetration Test," ASME Power and Energy Conference, PowerEnergy2016-59073, June 2016.
24. Ma, J., Rahn, C., and Frecker, M., "Optimal Battery-Structure Composites for Electric Vehicles," ASME Power and Energy Conference, PowerEnergy2016-59177, June 2016.
25. Krott, M., Miura, K., Rahn, C., and Smith, E., "Finite Element Modeling of Fluidic Flexible Matrix Composite (F^2MC) Treatments for Bending and Torsional Vibration Control," 57th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA 2016-1479, 2016.
26. Safwat, T., Tosto, R., Grissom, M., and Rahn, C., "A Dynamic Model of Electrostrictive Unimorph Actuators for Haptic Devices," 2016 ASME IDETC, IDETC2016-60512, August 2016.
27. Ma, X., and Rahn, C., "Piezoelectric Compliant Mechanism Energy Harvesters Excited Under Large Base Accelerations," 2016 ASME IDETC, IDETC2016-59196, August 2016.

Ramakrishnan Rajagopalan, Ph.D.

Current Role(s):
Assistant Professor of Engineering, PSU DuBois

Educational background:
BS, National Institute of Technology, Warangal, India 1997
MS, University of Cincinnati, 1999
PhD, University of Cincinnati, 2001

E-mail: rur12@psu.edu
Phone: (814)-571-6629

Interests: Nanostructured carbons, Electrochemistry, Energy Storage, Polymer synthesis and characterization

Expertise: Dr. Ramakrishnan Rajagopalan is an Assistant Professor in Department of Engineering at Penn State DuBois. He is also affiliated with Materials Research Institute and Department of Engineering Science and Mechanics at The Pennsylvania State University. He specializes in the area of porous carbon and polymeric materials, electrochemical characterization and testing of energy storage devices. His current interests include nanomaterials synthesis and characterization as well as study of interfacial phenomena of ion/charge transport in various electrochemical systems. He has published over 50 peer-reviewed publications and has six US patents on various energy related topics that include energy storage, catalysis and gas adsorption.

ASSIST Project:
Development of high energy density electrochemical capacitors: The project involves design and development of two low leakage electrochemical capacitor technologies namely electrical double layer capacitors and lithium ion capacitors that can provide energy storage solution for self-powered wearable platforms. Current area of research include study of electrochemical stability of high voltage electrolytes and fabrication of high capacitance electrodes with excellent rate capability and cyclability.

Services Offered: Sponsored Research, Collaborative projects, porous carbon characterization, polymer synthesis and characterization, electrochemical evaluation of electrode materials, fabrication, testing and modeling of electrochemical capacitors and battery systems

Selected Publication:

1. "Factors influencing high voltage performance of coconut char derived carbon based electrical double layer capacitor made using acetonitrile and propylene carbonate based electrolytes" **Journal of Power Sources**, 272, 90 – 99 (2014).
2. "Synthesis of carbon with bimodal porosity by simultaneous polymerization of furfuryl alcohol and phloroglucinol", M. Peer, A. Qajar, R. Rajagopalan and H.C. Foley, **Microporous and Mesoporous Materials**, 196, 235 -242 (2014).
3. "Role of Additives in Formation of Solid–Electrolyte Interfaces on Carbon Electrodes and their Effect on High-Voltage Stability", W. Qu, E. Dorjpalam, R. Rajagopalan and C.A. Randall, **ChemSusChem,** 7, 1162-1169 (2014).

4. "Synthesis of electroactive manganese oxide thin films by plasma enhanced chemical vapor deposition" A.R. Merritt, R. Rajagopalan and J.D. Carter, **Thin Solid Films**, 556, 28-34 (2014).
5. "Ultrahigh power flexible electrochemical capacitors using binder free single walled carbon nanotube electrodes and hydrogel membranes, J. Kalupson, D. Ma, C.A. Randall, R. Rajagopalan and K. Adu, **The Journal of Physical Chemistry C**, 118, 2943-2952 (2014).
6. "On the effects of confinement within a catalyst consisting of platinum embedded within nanoporous carbon for the hydrogenation of alkenes" M. Peer, A. Qajar, R. Rajagopalan and H.C. Foley, **Carbon** 66, 459 – 466 (2014).
7. "Characterization of micro- and mesoporous materials using accelerated dynamics adsorption" A. Qajar, M. Peer, R. Rajagopalan and H.C. Foley, **Langmuir** 29, 12400 -12409 (2013).
8. "Surface Compression of Light Adsorbates inside Microporous PFA-derived Carbons", A. Qajar, M. Peer, R. Rajagopalan, Y. Liu, C. Brown and H.C. Foley, **Carbon**, 60, 538-549 (2013).
9. "Platinum embedded within carbon nanospheres for shape selective liquid phase hydrogenation reactions" M. Peer, A.Qajar, B.P.M. Holbrook, R. Rajagopalan and H.C. Foley, **Carbon**, 57, 485 (2013).
10. "On the effects of emulsion polymerization of furfuryl alcohol on the formation of carbon spheres and other structures derived by pyrolysis of polyfurfuryl alcohol" M. Peer, A. Qajar, R. Rajagopalan and H.C. Foley, **Carbon**, 51, 85 – 93 (2013).
11. "Shape selective carbon catalysts for liquid phase reaction: Study of olefin hydrogenation using platinum embedded nanoporous carbon", B.P.M. Holbrook, R. Rajagopalan, K. Dronavajjala, Y.K. Choudhary and H.C. Foley, **Journal of Molecular Catalysis A: Chemical**, 367, 61-68 (2013).
12. "Synthesis of boron/nitrogen substituted carbons for aqueous asymmetric capacitors", T. Tomko, R. Rajagopalan, P. Aksoy and H.C. Foley, **Electrochimica Acta** , 56, 5369 -5375 (2011).
13. "High energy density capacitor using coal tar pitch derived nanoporous carbon/MnO2 electrodes in aqueous electrolytes", T. Tomko, R. Rajagopalan, M.T. Lanagan and H.C. Foley, **Journal of Power Sources**, 196, 2380 –2386 (2011).
14. "Overcoming the barrier to graphitization in a polymer-derived nanoporous carbon", C.L. Burket, R. Rajagopalan and H.C. Foley, **Carbon**, 46, 501-510 (2008).
15. "Genesis of porosity in polyfurfuryl alcohol derived carbons", C.L. Burket, R. Rajagopalan, A.P. Marencic, K.D. Dronavajjala and H.C. Foley, **Carbon**, 44, 2957-2963 (2006).

US Patents

1. "Process for characterization of micro- and meso porous materials", US Patent 9,274,040.
2. "High energy density ionic dielectric materials and devices", US Patent 8,906,818.
3. "Self healing high energy glass capacitors", US Patent 8,542,475.
4. "Method for the synthesis of porous carbon materials", US Patent 8,648,009
5. "Composite ionic conducting electrolytes", US Patent Appl. 13/506,239.
6. "Carbon nanocomposite membranes and their method of fabrication" US Patent 7,708,810.

Shad Roundy, Ph.D.

Current Role:
Assistant Professor of Mechanical Engineering, Univ. of Utah

Educational background:
BS, Brigham Young University, 1996
MS, University of California at Berkeley, 2000
PhD, University of California at Berkeley, 2003

E-mail: shad.roundy@utah.edu
Phone: (801) 581-4303

Interests: Energy harvesting from vibrations, human motion, acoustics, etc. Wireless power transfer for biomedical implants using ultrasound and magnetics. Piezoelectric transducers. MEMS inertial sensors.

Expertise: Shad Roundy received his PhD in Mechanical Engineering from the University of California, Berkeley in 2003. From there he moved to the Australian National University where he was a senior lecturer for 2 years. He spent the next several years working with startup companies LV Sensors and EcoHarvester developing MEMS pressure sensors, accelerometers, gyroscopes, and energy harvesting devices. In 2012, he re-entered academia joining the mechanical engineering faculty at the University of Utah. Dr. Roundy is the recipient of the DoE Integrated Manufacturing Fellowship, the Intel Noyce Fellowship, and was named by MIT's Technology Review as one of the world's top 100 young innovators for 2004. His current research interests are in harvesting energy for wireless sensors, particularly from vibrations, acoustics, and human motion, and in MEMS inertial sensing.

ASSIST Project Titles:
Non-resonant Mechanical Energy Harvesting from Wrist and Upper Arm Motion

Mechanical Energy Harvesting from Elbow Joint Motion

Services Offered: Sponsored Research, collaborative projects, characterization techniques for body worn inertial harvester, consulting in energy harvesting and piezoelectric transducers.

Publication Examples:

Books

1. Briand, D., Yeatman, E., Roundy, S., (Eds.). (2015). *Micro Energy Harvesting (Advanced Micro and Nanosystems)* . John Wiley & Sons. ISBN-10: 3527319026

Journal Articles

1. Xue, T., Roundy, S. "On magnetic plucking configurations for frequency up-converting mechanical energy harvesters." *Sensors and Actuators A: Physical* 253 (2017): 101-111.
2. Basaeri, H., Christensen, D., Roundy, S., 2016. "A Review of Acoustic Power Transfer for Bio-Medical Implants", *Smart Materials and Structures.* 25.12 (2016): 123001.
3. Christensen, D., Roundy, S., 2015. "Ultrasonically powered piezoelectric generators for bio-implantable sensors: Plate versus diaphragm." *Journal of Intelligent Material Systems and Structures* 27.8 (2016): 1092-1105.

4. Heit, J.D., Roundy, S., 2015. "A Framework to Determine the Upper Bound on Extractable Power as a Function of Input Vibration Parameters", *Energy Harvesting and Systems* 3.1 (2016): 69-78.
5. Roundy, S., Tola, J., 2014 "An energy harvester for rotating environments using offset pendulum and nonlinear dynamics". *Smart Materials and Structures*, 23 (2014) 105004
6. Roundy, S., Takahashi, E., 2013 "A Planar Electromagnetic Energy Harvesting Transducer Using a Multi-pole Magnetic Plate." *Sensors and Actuators A: Physical* (195) June 2013, pp. 98–104.
7. Steingart, D., Roundy, S., Wright, P.K., Evans, J.W., 2008 "Micropower Materials Development for Wireless Sensor Networks", *Materials Research Society (MRS) Bulletin*, vol. 33, no. 4, 2008, pp. 408-409.
8. Bryzek, J., Roundy, S., Bircumshaw, B., Chung, C., Castelino, K., Stetter, J.R., Vestel, M. 2006 "Marvelous MEMS", *Circuits and Devices Magazine*, vol. 22 (2) 2006, pp. 8-28.
9. Roundy, S., Leland E.S., Baker J., Carleton E., Reilly E., Lai E., Otis B., Rabaey J.M., and Wright P.K. 2005 "Improving Power Output for Vibration-Based Energy Scavengers", *IEEE Pervasive Computing*, Jan. – Mar. 2005, pp. 28-36.
10. Roundy, S.,and Wright, P. K., 2004. "A Piezoelectric Vibration based Generator for Wireless Electronics", *Smart Materials and Structures*, Volume 13, 2004, pp. 1131-1142.
11. Roundy, S., Wright, P. K., and Rabaey, J., 2003. "A Study of Low Level Vibrations as a Power Source for Wireless Sensor Nodes", *Computer Communications*, vol. 26, no. 11, pp 1131 – 1144.
12. Rabaey, J.M., Ammer, M. J., da Silva, J. L., Patel, D., Roundy, S., 2000. "PicoRadio Supports Ad Hoc Ultra Low-Power Wireless Networking," *Computer*, vol.33, (no.7), IEEE Comput. Soc. p.42-8.

Conference Papers

1. Rantz, R., et al. "Comparative Analysis of Wrist-worn Energy Harvesting Architectures." *Journal of Physics: Conference Series*. Vol. 773. No. 1. IOP Publishing, 2016.
2. Yu, Y., Nguyen, T., Tathireddy, P., Roundy, S., and Young, D.J. 2016. "Wireless Hydrogel-Based Glucose Sensor For Future Implantable Applications", *IEEE Sensors*, Oct. 30 – Nov. 2, 2016, Orlando, FL.
3. Xue, T., Kakkar, S. Lin, Q., and Roundy, S. 2016. "Characterization of Micro-Generators Embedded in Commercial-Off-the-Shelf Watches for Wearable Energy Harvesting", *SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring*, pp. 98010O-98010O. International Society for Optics and Photonics, 2016.
4. Xue, T., and Roundy, S. 2015. "Analysis of Magnetic Plucking Configurations for Frequency Up-Converting Harvesters", *Journal of Physics: Conference Series.* Vol. 660. N. 1. IOP Publishing, 2015.
5. Christensen, D., and Roundy, S. 2015. "Non-Dimensional Modeling of Depth, Alignment, and Orientation in Ultrasonic Power Transfer Systems", *Proceedings of the ASME 2015 Conference on Smart Materials, Adaptive Structures and Intelligent Systems SMASIS 2015*, September 21-23, 2015, Colorado Springs, Colorado.
6. Xue, T., Ma, X., Rahn, C., and Roundy, S. 2014. "Analysis of Upper Bound Power Output for a Wrist-Worn Rotational Energy Harvester from Real-World Measured Inputs." *Journal of Physics: Conference Series*. Vol. 557. No. 1. IOP Publishing, 2014.

Patents

1. Takahishi, E., Roundy, S.J., EcoHarvester Inc. (2015) *Multipolar Electromagnetic Generator*, US Pat. 9048717.
2. Takahashi, E., Roundy, S.J., Tola, J., Bircumshaw, B.L., Carl, S., EcoHarvester Inc. (2014), *Wireless Switch with Multipolar Electromagnetic Generator*, US Pat. 8665042.
3. Roundy, S., Bryzek, J., Ray, C., Malaga, M., Brown, D.L., LV Sensors Inc. (2007) *Power Generation Utilizing Tire Pressure Changes*, US Pat. 7,260,984

Shedra Amy Snipes, Ph.D.

Current Role(s):
Assistant Professor of Biobehavioral Health, PSU

Educational background:
BS, Emory University, 2000
MA, University of Washington, 2003
PhD, University of Washington, 2007

E-mail: sas84@psu.edu
Phone: (814)865-4668

Interests: Role of social beliefs in health; cultural tailoring and use of mHealth technologies; use of mixed methods (quantitative, survey, and qualitative/ethnographic) to understand health beliefs and behaviors

Expertise: My research examines the role that anthropology can play in understanding health beleifs and behaviors. I am particularly interested in understanding and overcoming barriers in health, particularly with regard to environmental exposures. To do this, I use a combination of ethnographic inquiry, qualitative user techniques, surveys and biomarker assessments. Additionally, my research examines barriers to health-seeking, use of mHealth technologies, and measuring use feasibility and satisfaction in interventions in diverse populations. Finally, my research has a bent toward social justice and public health, with the goal of reducing disparities in health among immigrant and minority populations. Here, I work primaritly with Latino immigrants by examining health behavior, biology, culture and the environment. Currently, my research program in this area examines how perceptions about environmental risks influence pesticide mhealth intervention programs for Mexican Immigrant farmworkers. I also examine ways in which social beleifs, demographic factors, and risk perception influence beliefs about mhealth sensor technologies in youth and adults with the goal of understanding how social factors can improve technology designs for the most vulnerable populations (low income and minority).

ASSIST Project Titles:

Assessing how Technology Matters for Asthma (Project AsThMA)

Services Offered: Consulting in role of social beliefs in health

Shedra Amy Snipes, Ph.D.

Publication Examples:

Snipes, S.A. "Who are you making this for: Analysis of mhealth social factors by patient vulnerability for asthma attacks. Forthcoming.

Snipes, S.A., Montiel-Ishino, F.A.*, Smyth, J.M., Murphy, D., Miranda, P.Y. "A mobile pesticide safety intervention for immigrant farmworkers: measures of acceptance, usability and satisfaction." JMIR mHealth and uHealth 2016: 4:2:e28. doi:10.2196/mhealth.4455. PMID: 27066727.

Snipes, S.A., Smyth, J.M., Murphy, D., Miranda, P.Y., Montiel-Ishino, F.A.* "Provision increases reported PPE use for Mexican immigrant farmworkers: An mHealth pilot study." Journal of Environmental and Occupational Medicine 2015: 57:12. doi:10.1097/JOM.0000000000000563; PMID: 26641832

Snipes S.A., Hayes-Constant T., Trumble, B.C., Goodreau, S.M., Morrison, D.M., Shell-Duncan, B.K., Pelman, R.S., O'Connor K. "Masculine perspectives about work and family concurrently promote and inhibit men's healthy behaviors." *International Journal of Men's Health* 2015: 14:1. doi: 10.3149/jmh.1401.1 [no PMID].

Susan Trolier-McKinstry, Ph.D.

Current Role(s):

Steward S. Flaschen Professor of Ceramic Science and Engineering and Professor of Electrical Engineering

Director – Penn State Nanofabrication Facility

Co-Director – Center for Dielectrics and Piezoelectrics

ASSIST Thrust 1 Leader

Educational background:

Ph.D.**:** Ceramic Science from The Pennsylvania State University, 1992.

M. S.**:** Ceramic Science from The Pennsylvania State University, 1987.

B. S.**:** Ceramic Science and Engineering from The Pennsylvania State University, 1987 (honors).

E-mail: STMcKinstry@psu.edu

Phone: (814) 863-8348

Interests: Electroceramic Materials, Ferroelectrics, Structure-Microstructure Property Relations in Thin Films, Spectroscopic Ellipsometry

Expertise: Susan Trolier-McKinstry's research program revolves around thin films for dielectric and piezoelectric applications. Her group studies 1) the fundamentals of what controls the magnitude of the materials constants, as well as how to optimize the figures of merit for particular applications, 2) the processing science of complex oxides: including sputter deposition, chemical solution deposition, and chemical solution deposition, as well as various patterning approaches, and 3) piezoelectric microelectromechanical systms. She is a fellow of the American Ceramic Society, IEEE, and the Materials Research Society, and an academician of the World Academy of Ceramics. She currently serves as an associate editor for *Applied Physics Letters*. She is 2017 President of the Materials Research Society; previously she served as president of the IEEE Ultrasonics, Ferroelectrics and Frequency Control Society, as well as Keramos. Twenty people that she has advised/co-advised have gone on to take faculty positions around the world.

ASSIST Project Titles:

Project 1: Mechanical energy harvesting. Her group fabricates high figure of merit piezoelectric films and integrates these films into efficient harvesting devices.

Services Offered: Sponsored Research, collaborative projects, characterization techniques: diffraction, electron microscopy, dielectric and piezoelectric measurements as a function of temperature, field amplitude, and frequency, fabrication of > 20 compositions of electroceramic films, as well as integration of these films into devices, testing and evaluation services

Susan Trolier-McKinstry, Ph.D.

Publication Examples:

Hong Goo Yeo, Xiaokun Ma, Christopher Rahn, and Susan Trolier-McKinstry, "Efficient Piezoelectric Energy Harvesters Utilizing (001) Textured Bimorph PZT Films on Flexible Metal Foils," Adv. Funct. Mat. 26 (32) 5940-5946 (2016).

J. F. Ihlefeld, D. T. Harris, R. Keech, J. L. Jones, J.-P. Maria, and S. Trolier-McKinstry, "Scaling Effects in Perovskite Ferroelectrics: Fundamental Limits and Process-Structure-Property Relations," J. Am. Ceram. Soc. 99 (8) 2537-2557 (2016).

X. Ma, S. Trolier-McKinstry and C. D. Rahn, "Piezoelectric Compliant Mechanism Energy Harvesters Under Large Base Excitations," Smart Mat. Structures 25 (9) 095023 (2016).

P. M. Solomon, B. A. Bryce, M. A. Kuroda, R. Keech, S. Shetty, T. M. Shaw, M. Copel, L.-W. Hung, A.G. Schrott, C. Armstrong, M.S. Gordon, K. B. Reuter, T. N. Theis, W. Haensch, S. M. Rossnagel, H. Miyazoe, B. G. Elmegreen, X.-H. Liu, S. Trolier-McKinstry, G. J. Martyna, and D. M. Newns, "Pathway to the Piezoelectronic Transduction Logic Device," Nano Letters 15 (4) 2391 – 2395 (2015).

D. Marincel, H. R. Zhang, A. Kumar, S. Jesse, S. V. Kalinin, W. M. Rainforth, I. M. Reaney, C. A. Randall, and S. Trolier-McKinstry, "Influence of a Single Grain Boundary on Domain Wall Motion in Ferroelectrics," Adv. Funct. Mat. 24 (10) 1409-1417 (2014).

C.-B. Eom and S. Trolier-McKinstry, "Thin – Film Piezoelectric MEMS," MRS Bull. 37 (11) 1007-1017 (2012).

S. H. Baek, J. Park, D. M. Kim, V. Aksyuk, R. R. Das, S. D. Bu, D. A. Felker, J. Lettieri, V. Vaithyanathan, S. S. N. Bharadwaja, N. Bassiri-Gharb, Y. B. Chen, H. P. Sun, C. M. Folkman, H. W. Jang, D. J. Kreft, S. K. Streiffer, R. Ramesh, X. Q. Pan, S. Trolier-McKinstry, D. G. Schlom, M. S. Rzchowski, R. H. Blick, C. B. Eom, "Giant piezoelectricity on Si for hyper-active MEMS," Science 334, 958-961 (2011).

P. Bintachitt, S. Jesse, D. Damjanovic, Y. Han, I. M. Reaney, S. Trolier-McKinstry, and S. V. Kalinin, "Collective Dynamics Underpins Rayleigh Behavior in Disordered Polycrystalline Ferroelectrics," Proc. Nat. Acad. Sci. USA 107 (16) 7219-7224 (2010).

R. G. Polcawich, J. S. Pulskamp, D. Judy, P. Ranade, S. Trolier-McKinstry, M. Dubey, "Surface Micromachined Microelectromechancial Ohmic Series Switch Using Thin-Film Piezoelectric Actuators," IEEE T-MTT 55 (12) 2642 – 2654 (2007).

S. Trolier-McKinstry and P. Muralt, "Thin Film Piezoelectrics for MEMS," J. Electroceram. 12 (1-2) 7-17 (2004).

F. Xu, S. Trolier-McKinstry, W. Ren, and B. Xu, "Domain Wall Motion and its Contribution to the Dielectric and Piezoelectric Properties of Lead Zirconate Titanate Films," J. Appl. Phys. 89 (2) 1336-1348 (2001).

T. M. Shaw, S. Trolier-McKinstry, and P.C. McIntyre, "The Properties of Ferroelectric Films at Small Dimensions," Annu. Rev. Mater. Sci. 30 263-298 (2000)

J. F. Shepard, Jr., P. J. Moses, and S. Trolier-McKinstry, "The Wafer Flexure Technique for the Determination of the Transverse Piezoelectric Coefficient (d_{31}) of PZT Thin Films," Sens. Actuators A 71 133-138 (1998)

G. Zavala, J. H. Fendler, and S. Trolier-McKinstry, "Characterization of Ferroelectric Lead Zirconate Titanate Films by Scanning Force Microscopy," J. Appl. Phys. 81(11) 7480-7491 (1997).

Orlin D. Velev, Ph.D.

Current Role(s):
INVISTA Professor
Chemical and Biomolecular Engineering, NCSU

Educational background:

Post-doctoral Fellow, University of Delaware,	1996-1998
Ph.D. in Physical Chemistry University of Sofia, Bulgaria	1996
BS and M.Sc. in Chemistry University of Sofia, Bulgaria	1989

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Phone: (919) 513-4318

Interests: Colloidal assembly of functional structures from nanoparticles, microspheres, Janus and patchy particles by using electric fields. New types of biosensors, microfluidic gel-based device, hydrogel actuators and soft robotic components and self-propelled microbots.
Velev group web-page: http://www.che.ncsu.edu/velevgroup/
Velev faculty page: http://crystal.che.ncsu.edu/

Expertise: Dr. Orlin Velev received M.Sc. and Ph.D. degrees from the University of Sofia, Bulgaria, while also spending one year as a researcher in Nagayama Protein Array Project in Japan. After graduating in 1996, Velev accepted a postdoctoral position with the Department of Chemical Engineering, University of Delaware. He initiated an innovative program in colloidal assembly and nanomaterials and was promoted to research faculty in 1998. In 2001 formed his new research group in the Department of Chemical and Biomolecular Engineering, North Carolina State University, where he was promoted to an Associate Professor with tenure in 2006, to full professor in 2008 and to INVISTA chaired professor in 2009. He has contributed more than 180 publications, which have been cited more than 17,000 times, and has presented more than 220 invited presentations at major conferences and at universities and companies. Recent awards include NSF Career, Camille Dreyfus Teacher-Scholar, Sigma Xi, NC State Alcoa Distinguished Engineering Research, NC State Innovator of the Year, Springer Colloid and Polymer Science Lecture Award and election to an ACS Fellow. Velev has served as member of the Editorial Advisory Boards of *Langmuir*, *Chemistry of Materials*, *Biomicrofluidics* and *Particle*. He has been an advocate of incorporating the latest achievements in the areas of nanoscience and nanotechnology in the engineering curriculum.

Velev has established a record of innovative research in the area of nanostructures with electrical and photonic functionality, biosensors, microfluidics and nanomanufacturing. He has been the first to synthesize "inverse opals", one of the most widely studied types of photonic materials today. Velev has also pioneered techniques for making novel nanoparticle materials, Janus particles, rod-like particles and responsive foams. Technologies based on his research have formed the basis of two Research Triangle Area startup companies, *Xanofi* and *Benanova*.

ASSIST Project Title: Human testing and practical implementation of non-invasive, long-term sweat sampling by biomimetic osmotic principles (in collaboration with Prof. Michael Dickey)

Services Offered: Velev and his group have an established record in performing sponsored research, collaborating with, and consulting for, many corporate partners ranging from large multinational companies to startups. The majors goal of these industrial interactions are strong innovation and transcribing research into impactful applied outcome.

Orlin D. Velev, Ph.D.

Publication Examples: [Selected from more than 180 publications, cited more than 17,000 times]

1. D. Morales, B. Bharti, M. D. Dickey and O. D. Velev, *Small*, **12**, 2283–2290 (2016). Bending of Responsive Hydrogel Sheets Guided by Field-Assembled Microparticle Endoskeleton Structures.
2. B. Bharti, A-L. Fameau, M. Rubinstein and O. D. Velev, *Nature Mater.,* **14**, 1104–1109 (2015). Nanocapillarity-mediated magnetic assembly of nanoparticles into ultraflexible filaments and reconfigurable networks.
3. A. P. Richter, J. S. Brown, B. Bharti, A. Wang, S. Gangwal, K. Houck, E. A. C. Hubal, V. N. Paunov, S. D. Stoyanov and O. D. Velev, *Nature Nanotech.,* **10,** 817-823 (2015). Nanoengineered antimicrobial nanoparticles with environmentally benign cores infused by silver ions.
4. B. S. Mertens and O. D. Velev, *Soft Matter*, **11**, 8621-8631 (2015). Characterization and control of surfactant-mediated Norovirus interactions.
5. S. K. Smoukov, T. Tian, N. Vitchuli, S. Gangwal, P. Geisen, M. Wright, E. Shim, M. Marquez, J. Fowler, O. D. Velev, *Adv. Mater.*, **27**, 2642–2647 (2015). Scalable Liquid Shear-Driven Fabrication of Polymer Nanofibers.
6. R. Sharma and O. D. Velev, *Adv. Funct. Mater.*, **25**, 5512–5519 (2015). Remote steering of self-propelling microcircuits by modulated electric field.
7. B. Bharti and O. D. Velev, *Langmuir,* **31**, 7897−7908 (2015). Assembly of Reconfigurable Colloidal Structures by Multi-directional Field-induced Interactions. *Invited feature article.*
8. D. Morales, E. Palleau, M. D. Dickey and O. D. Velev, *Soft Matter*, **10**, 1337 - 1348 (2014). Electro-actuated hydrogel walkers with dual responsive legs.
9. E. Palleau, D. Morales, M. D. Dickey and O. D. Velev, *Nature Comm.*, **4**, 2257, 1-7 (2013). Reversible patterning and actuation of hydrogels by electrically assisted ionoprinting.
10. A.-L. Fameau, S. Lam and O. D. Velev, *Chem. Sci.*, **4**, 3874–3881 (2013). Multi-stimuli responsive foams combining particles and self-assembling fatty acids.
11. H.-J. Koo and O. D. Velev, *J. Mater. Chem. A*, **1**, 11106–11110 (2013). Biomimetic Photocatalytic Reactor with a Hydrogel-Embedded Microfluidic Network.
12. H.-J. Koo and O. D. Velev, *Sci. Rep.*, **3**, 2357, 1-6 (2013). Regenerable Photovoltaic Devices with Hydrogel-Embedded Microvascular Network.
13. H.-J. Koo and O. D. Velev, *Biomicrofluidics,* **7**, 031501, 1-10 (2013). Ionic Current Devices – Recent Progress in the Merging of Electronic, Microfluidic and Biomimetic Structures.
14. S. Gupta, P. K. Kilpatrick, E. M. Melvin and O. D. Velev, *Lab Chip*, **12**, 4279 - 4286 (2012). On-chip latex agglutination immunoassay readout by electrochemical impedance spectroscopy.
15. J. Kleinert, S. Kim and O. D. Velev, *Langmuir*, **28**, 3037−3044 (2012). Electric-field-controlled flow in nanoscale-thin wetting films.
16. S. Lam, E. Blanco, S. Smoukov, K. P. Velikov, O. D. Velev, *J. Am. Chem. Soc.*, **133**, 13856–13859 (2011). Magnetically responsive Pickering foams.
17. H.-J. Koo, J.-H. So, M. D. Dickey, O. D. Velev, *Adv. Mater,* **23**, 3559-3564 (2011). Towards all-soft matter circuits: Prototypes of quasi-liquid devices with memristor characteristics.
18. H.-J. Koo, S. T. Chang, J. M. Slocik, R. R. Naik and O. D. Velev *J. Mater. Chem.*, **21**, 72-79 (2011). Aqueous soft matter based photovoltaic devices.
19. H.-J. Koo, S.-T. Chang and O. D. Velev, *Small*, **6**, 1393-1397 (2010). Ion-current diode with aqueous Gel/SiO2 nanofilm interfaces.
20. O. D. Velev and S. Gupta, *Adv. Mater.* **21**, 1897–1905 (2009). Materials fabricated by micro and nanoparticle assembly - The challenging path from science to engineering.

Chunlei (Peggy) Wang, Ph.D.

Current Role(s)
Professor of Mechanical and Materials Engineering, FIU

Educational background:
BS, Jilin University, 1990
MS, Jilin University, 1993
PhD, Jilin University, 1997

E-mail: wangc@fiu.edu
Phone: (305) 348-1217

Interests: Chemical Vapor Deposition (CVD), homoepitaxy, p-doping & n-doping, ion-implantation, Electrostatic Spray Deposition (ESD), electrospinning, Si processing, nanoimprinting, Carbon-MEMS/NEMS(C-MEMS/NEMS), flip-chip bonding, fluidic self-assembly, diamond, wide-bandgap, GaN, metal oxide, conductive polymer, nanoscale materials, carboneous materials, VCSEL, photodiode, tunable LED, Etalon, heat-sink, Li-ion battery, Na battery/capacitor, Na-S battery, Magnesium Battery, 3D microbattery, microsupercapacitor, on-chip micropower, micro biofuel cell, hybrid micropower, biosensor, glucose sensor, protein sensor, DNA sensor, gas sensor, H_2O_2 sensor, drug delivery.

Expertise: Chunlei (Peggy) Wang is a full professor in the Mechanical and Materials Engineering Department at Florida International University. She received her MS (1993) and PhD (1997) in Physics from Jilin University (China). Before joining FIU, she held various research positions at Osaka University (1995-2001) and University of California Irvine (2001-2006). At FIU, Dr. Chunlei (Peggy) Wang has developed a vigorous research program that integrates electrochemically active materials with device applications. Her group focuses on the development of micro and nanofabrication methods for building novel micro and nanostructures and synthesizing nanomaterials that have unique structures and useful properties for energy and biological applications. In support of her work she has assembled state-of-the-art equipment and a high-quality team of students. She has published 10 book chapters, 108 peer-reviewed journal articles and 44 conference proceeding articles. Her research is currently supported by National Science Foundation. She is a recipient of DARPA Young Faculty Award in 2008. FIU faculty award in research and creative activities (2013) and FIU Kauffman Professor Award (2009). She was a co-founder of Carbon Microbattery Corporation (now: Enevate Corp), a consultant at Intel Lab (2012), and a guest scientist at Max Planck Institute (2012-2013).

ASSIST Project Titles:
Development of Miniaturized Hybrid Capacitors

Services Offered: Microfabrication and nanofabrication, materials characterization, electrochemical characterization, device design and evaluation, simulation and modeling, consulting

Publication Examples:

1. Pranjal Nautiyal, Archana Loganathan, Richa Agrawal, Benjamin Boesl, Chunlei Wang, Arvind Agarwal, Oxidative Unzipping and Transformation of High Aspect Ratio Boron Nitride Nanotubes into “White Graphene Oxide” Platelets, Scientic Reports, 6 (2016) 29498:1-8, doi:10.1038/srep29498

2.Yong Hao, Chunhui Chen , Xinyi Yang, Chunhui Chen, Bo Zou and Chunlei Wang, Phase dependent electrochemical performance of MnS in Lithium ion battery application, Journal of Power Sources, 338 (2017) 9-16

3. D. S. Gardner, C. W. Holzwarth III, Y. Liu, S. B. Clendenning, W. Jin, B. K. Moon, C. Pint, Z. Chen, E. Hannah, C. Chen, C. P. Wang, E. Mäkilä, R. Chen, T. Aldridge, and J. L. Gustafson, Integrated On-Chip Energy Storage Using Passivated Nanoporous-Silicon Electrochemical Capacitors, Nano Energy, 25 (2016) 68–79, doi:10.1016/j.nanoen.2016.04.016

4. Chowdhury Al-Amin, Phani Kiran Vabbina, Mustafa Karabiyik, Raju Sinha, Chunlei Wang, Nezih Pala, Bandgap engineering of single layer graphene by randomly distributed nanoparticles, J Mater Sci: Mater Electron, 27 (2016) 7454–7459, DOI 10.1007/s10854-016-4722-z

5.Varun Penmatsa, Ruslinda A. Rahim, Hiroshi Kawarada and Chunlei Wang, Functionalized carbon microarrays platform for high sensitive detection of HIV-Tat peptide, RSC Advance, 5 (2015) 65042-65047

6. Yin Song, Chunhui Chen, Chunlei Wang, Graphene/enzyme-encrusted three-dimensional carbon micropillar arrays for mediatorless micro-biofuel cells, Nanoscale, 7 (2015) 7084-7090 (invited paper)

7. Lijun Fu, Kepeng Song, Xifei Li, Peter A. van Aken, Chunlei Wang, Joachim Maier and Yan Yu, Direct Evidence of Conversion Mechanism in $NiSnO_3$ Anode for Lithium Ion Battery Application, *RSC Advances*, 4 (2014) 36301-36306.

8. Yin Song, Varun Penmatsa and Chunlei Wang, Modeling and Simulation of Enzymatic Biofuel Cells with Three-Dimensional Microelectrodes, *Energies*, 7 (2014) 4694-4709.

9. Xifei Li, Abirami Dhanabalan, Lin Gu, and Chunlei Wang, Three-dimensional Porous Core/shelled Sn@Carbon Composite Anode for High Performance Lithium Ion Batteries Applications, *Advanced Energy Materials*, 2(2012) 238-244.

10. Majid Beidaghi and Chunlei Wang, Micro-Supercapacitors Based on Interdigitated Reduced Graphene Oxide and Carbon Nanotube Composites with Ultra-High Power Handling Performance, *Adv. Funct. Mater.,* 22 (2012) 4501-4510.

11. Xifei Li and Chunlei Wang, Engineering Nanostructured Anodes via Electrostatic Spray Deposition in High Performance Lithium Ion Battery Application. *J. Mater. Chem. A,* 1 (2013) 165-182.

12. Wei Chen, Zhongli Fan, Lin Gu, Xinhe Bao, and Chunlei Wang, Enhanced Capacitance of Manganese Oxide iia Confinement inside Carbon Nanotubes, *Chem. Commun.*, 46 (2010) 3905-3907.

13. Y. Parikh, J. H. Yang, C. Wang, Optimizing the Mass Transport Phenomenon around Micro-Electrodes of an Enzymatic Biofuel Cell inside a Blood Artery via Finite Element Analysis Method, *Journal of Power Sources*, 195 (2010) 4685-4694.

14. Yan Yu, Lin Gu, Chunlei Wang, Abirami Dhanabalan, Peter A. van Aken, Joachim Maier, Encapsulation of Sn@carbon Nanoparticles in Bamboo-like Hollow Carbon Nanofibers as Anode for Lithium Ion Batteries Applications , *Angewandte Chemie. International Edition*, 48 (2009) 6485-6489.

15. Chunlei Wang, Guangyao Jia, Lili Taherabadi, and Marc Madou, A Novel Method for the Fabrication of High Aspect Ratio C-MEMS Structures, *Journal of Microelectromechanical Systems*, 14 (2005) 348-358.

David Wentzloff, Ph.D.

Current Role(s):

Associate Professor of Electrical and Computer Engineering, University of Michigan

Faculty Co-Director of Graduate Education in the

Educational background:

B.S.E., University of Michigan, 1999

S.M., Massachusetts Institute of Technology, 2002

Ph.D., Massachusetts Institute of Technology, 2007

E-mail: wentzlof@umich.edu

Phone: (734) 647-4499

Interests: Low-power integrated circuits (ICs) for wireless communication in energy-constrained (e.g. powered by harvested energy) and volume-constrained (e.g. cubic-mm sensor nodes) applications. More specifically, his research group focuses on: 1) Synthesizable all-digital radios and radio building blocks, 2) Wireless body sensor networks (channel modeling, radios, and antennas), and 3) radios and interfaces for the mm-scale class of computers

Expertise: David D. Wentzloff received the B.S.E. degree in Electrical Engineering from the University of Michigan, Ann Arbor, in 1999, and the S.M. and Ph.D. degrees from the Massachusetts Institute of Technology, Cambridge, in 2002 and 2007, respectively. Since August, 2007 he has been with the University of Michigan, Ann Arbor, where he is currently an Associate Professor of Electrical Engineering and Computer Science. His research focuses on RF integrated circuits, with an emphasis on ultra-low power design. In 2012, he co-founded PsiKick, a fabless semiconductor company developing ultra-low power wireless SoCs. He is the recipient of the 2009 DARPA Young Faculty Award, 2009-2010 Eta Kappa Nu Professor of the Year Award, 2011 DAC/ISSCC Student Design Contest Award, 2012 IEEE Subthreshold Microelectronics Conference Best Paper Award, the 2012 NSF CAREER Award, the 2014 ISSCC Outstanding Forum Presenter Award, the 2014-2015 Eta Kappa Nu ECE Professor of the Year Award, the 2014-2015 EECS Outstanding Acheivement Award, and the 2015 Joel and Ruth Spira Excellence in Teaching Award. He has served on the technical program committee for ICUWB 2008-2010, ISLPED 2011-2015, S3S 2013-2014, and RFIC 2013-2015, and as a guest editor for the IEEE T-MTT, the IEEE Communications Magazine, and the Elsevier Journal of Signal Processing: Image Communication. He is a member of IEEE, IEEE Circuits and Systems Society, IEEE Microwave Theory and Techniques Society, IEEE Solid-State Circuits Society, and Tau Beta Pi.

ASSIST Project Titles:
Project: Low Power Radios (Thrust 4 Task: Low Power SoC and Radios)

Services Offered: Sponsored Research

David Wentzloff, Ph.D.

Publications:

Journals:

Y. Chen, N. Chiotellis, L.-X. Chuo, C. Pfeiffer, Y, Shi, R. G. Dreslinski, A. Grbic, T. Mudge, D. D. Wentzloff, D. Blaauw, H. S. Kim, "Energy-Autonomous Wireless Communication for Millimeter-Scale Internet-of-Things Sensor Nodes," IEEE Journal on Selected Areas in Communications (JSAC), vol. 34, no. 12, pp. 3962-3977, December 2016.

H. S. Kim, D. D. Wentzloff, "Back-Channel Wireless Communication Embedded in WiFi-Compliant OFDF Packets," IEEE Journal on Selected Areas in Communications (JSAC), issue 99, Sept. 2016

A. Roy, A. Klinefelter, F. B. Yahya, X. Chen, L. P. Gonzalez-Guerrero, C. J. Lukas, D. A. Kamakshi, J. Boley, K. Craig, M. Faisal, S. Oh, N. E. Roberts, Y. Shakhsheer, A. Shrivastava, D. P. Vasudevan, D. D. Wentzloff, B. H. Calhoun, “A 6.45 \mu{\rm W} Self-Powered SoC With Integrated Energy-Harvesting Power Management and ULP Asymmetric Radios for Portable Biomedical Systems,” in Biomedical Circuits and Systems, IEEE Transactions on , vol.9, no.6, pp.862-874, Dec. 2015.

A. Shrivastava, N.E. Roberts, O.U. Khan, D.D. Wentzloff, B.H. Calhoun, “A 10 mV-Input Boost Converter With Inductor Peak Current Control and Zero Detection for Thermoelectric and Solar Energy Harvesting With 220 mV Cold-Start and $-$14.5 dBm, 915 MHz RF Kick-Start,” IEEE Journal of Solid-State Circuits, vol. 50, no. 8, Aug. 2015, pp 1-13.

V. Misra, A. Bozkurt, B. Calhoun, T. Jackson, J. Jur, J. Lach, B. Lee, J. Muth, O. Oralkan, M. Ozturk, S. Trolier-McKinstry, D. Vashaee, D. Wentzloff, Y. Zhu, “Flexible Technologies for Self-Powered Wearable Health and Environmental Sensing,” in Proceedings of the IEEE , vol.103, no.4, pp.665-681, April 2015.

Conferences:

H. Zhang, D. D. Wentzloff, H. S. Kim, "Software-Defined, WiFi and BLE Compliant Back-Channel for Ultra-Low Power Wireless Communication," IEEE GLOBECOM, Dec. 2016

Y. Shi, M. Choi, Z. Li, G. Kim, Z. Foo, H.-S. Kim, D. D. Wentzloff, D. Blaauw, “A 10mm3 Syringe-Implantable Near-Field Radio System on Glass Substrate” IEEE International Solid-State Circuits Conference (ISSCC), Feb. 2016, pp. 448-449.

H. Kim, G. Kim, Y. Lee, Z. Foo, D. Sylvester, D. Blaauw, D. Wentzloff, “A 10.6mm3 fully-integrated, wireless sensor node with 8GHz UWB transmitter,” in Symp. VLSI Circuits Dig. Tech. Papers, vol., no., pp.C202-C203, June 2015.

N. E. Roberts, M. C. Kines, D. D. Wentzloff, “A 380µW Rx, 2.6mW Tx 433MHz FSK transceiver with a 102dB link budget and bit-level duty cycling,” in Radio Frequency Integrated Circuits Symposium (RFIC), 2015 IEEE, pp.171-174, 17-19 May 2015.

A. Klinefelter, N. E. Roberts, Y. Shakhsheer, P. Gonzalez, A. Shrivastava, A. Roy, K. Craig, M. Faisal, J. Boley, S. Oh, Y. Zhang, D. Akella, D. D. Wentzloff, B. H. Calhoun, "A 6.45µW Self-Powered IoT SoC with Integrated Energy-Harvesting Power Management and ULP Asymmetric Radios," IEEE International Solid-State Circuits Conference (ISSCC), pp. 384-386, February 2015.

Douglas H. Werner, Ph.D.

Current Role(s):
John L. and Genevieve H. McCain Chair Professor
Department of Electrical Engineering
The Pennsylvania State University
Director, Computational Electromagnetics and Antennas Research Lab (CEARL: http://cearl.ee.psu.edu/)

Educational Background:

BS EE, The Pennsylvania State University, 1983

MS EE, The Pennsylvania State University, 1985

MA Math, The Pennsylvania State University, 1986

PhD EE, The Pennsylvania State University, 1989

E-mail: dhw@psu.edu

Phone: (814) 867-1452

Interests: Computational electromagnetics, antenna theory and design, phased arrays (including ultra-wideband arrays), microwave devices, wireless and personal communication systems (including on/off-body networks), wearable and e-textile antennas, RFID tag antennas, conformal antennas, reconfigurable antennas, frequency selective surfaces, electromagnetic wave interactions with complex media, metamaterials, electromagnetic bandgap materials, zero and negative index materials, transformation optics, nanoscale electromagnetics (including nanoantennas), fractal and knot electrodynamics, and nature-inspired optimization techniques (genetic algorithms, clonal selection algorithms, particle swarm, wind driven optimization, and various other evolutionary programming schemes).

Expertise: He is the director of the Computational Electromagnetics and Antennas Research Lab (CEARL) as well as a member of the Communications and Space Sciences Lab (CSSL). He is also a faculty member of the Materials Research Institute (MRI) at Penn State. Prof. Werner was presented with the 1993 Applied Computational Electromagnetics Society (ACES) Best Paper Award and was also the recipient of a 1993 International Union of Radio Science (URSI) Young Scientist Award. In 1994, Prof. Werner received the Pennsylvania State University Applied Research Laboratory Outstanding Publication Award. He was a co-author (with one of his graduate students) of a paper published in the *IEEE Transactions on Antennas and Propagation* which received the 2006 R. W. P. King Award. He received the inaugural *IEEE Antennas and Propagation Society Edward E. Altshuler Prize Paper Award* and the *Harold A. Wheeler Applications Prize Paper Award* in 2011 and 2014 respectively. He also received the *2015 ACES Technical Achievement Award*. He was the recipient of a College of Engineering PSES Outstanding Research Award and Outstanding Teaching Award in March 2000 and March 2002, respectively. He was also presented with an IEEE Central Pennsylvania Section Millennium Medal. In March 2009, he received the PSES Premier Research Award. He is a Fellow of the IEEE, the IET (formerly IEE), and the ACES. Prof. Werner is a former Associate Editor of *Radio Science*, a former Editor of the *IEEE Antennas and Propagation Magazine*, an Associate Editor of the *Nature* subjournal *Scientific Reports*, a member of URSI Commissions B and G, Eta Kappa Nu, Tau Beta Pi and Sigma Xi. He holds eight patents, has published over 700 technical papers and proceedings articles, and is the author of fourteen book chapters with several additional chapters currently in preparation. He has published several books including *Frontiers in Electromagnetics* (Piscataway, NJ: IEEE Press, 2000), *Genetic Algorithms in Electromagnetics* (Hoboken, NJ: Wiley/IEEE, 2007), *Transformation Electromagnetics and Metamaterials: Fundamental Principles and Applications* (London, UK: Springer, 2014), and *Electromagnetics of Body Area Networks: Antennas,*

Douglas H. Werner, Ph.D.

Propagation, and RF Systems (Hoboken, NJ: Wiley/IEEE, 2016). He has also contributed chapters for several books including *Electromagnetic Optimization by Genetic Algorithms* (New York: Wiley Interscience, 1999), *Soft Computing in Communications* (New York: Springer, 2004), *Antenna Engineering Handbook* (New York: McGraw-Hill, 2007), *Frontiers in Antennas: Next Generation Design and Engineering* (New York: McGraw-Hill, 2011), *Numerical Methods for Metamaterial Design* (New York: Springer, 2013), *Computational Electromagnetics* (New York: Springer, 2014), *Graphene Science Handbook: Nanostructure and Atomic Arrangement* (Abingdon, Oxfordshire, UK: CRC Press, 2016), and *Handbook of Antenna Technologies* (New York: Springer, 2016).

ASSIST Project Titles: Multifunctional and Compact Form-Factor Flexible Wearable Antennas.

Services Offered: Customized antenna design, fabrication and testing (including wearable antennas for BAN and IoT applications). On-/off-body propagation analysis for BANs.

Publication Examples:

[1] Z. H. Jiang, D. E. Brocker, P. E. Sieber, and D. H. Werner, "A compact, low-profile metasurface-enabled antenna for wearable medical body area network devices," *IEEE Transactions on Antennas and Propagation*, vol. 62, no. 8, pp. 4021–4030, Aug. 2014.

[2] T. Yue, Z. H. Jiang, and D. H. Werner, "Compact, wideband antennas enabled by interdigitated capacitor-loaded metasurfaces," *IEEE Transactions on Antennas and Propagation*, vol. 64, no. 5, pp. 1595-1606, May 2016.

[3] Z. H. Jiang and D. H. Werner, "A compact, wideband circularly polarized co-designed filtering antenna and its application for wearable devices with low SAR," *IEEE Transactions on Antennas and Propagation*, vol. 63, no. 9, pp. 3808-3818, Sept. 2015.

[4] Z. H. Jiang, M. D. Gregory, and D. H. Werner, "Design and experimental investigation of a compact circularly polarized integrated filtering antenna for wearable biotelemetric devices," *IEEE Transactions on Biomedical Circuits and Systems*, vol. 10, no. 2, pp. 328-338, 2016.

[5] Z. H. Jiang, and D. H. Werner, "A compact and robust circularly-polarized wearable antenna using an anisotropic metasurface," *Proceedings of the 2016 Applied Computational Electromagnetics Society (ACES) Conference*, 13-17 March 2016, Honolulu, Hawaii, USA.

[6] Z. H. Jiang, C. Zheng, T. Yue, Y. Zhu, D. H. Werner, and Y. Zhu, "A compact, robust circularly-polarized wearable antenna based on flexible silver nanowire and polydimethylsiloxane composite material," Submitted to *IEEE Transactions on Biomedical Circuits and Systems*.

[7] Z. H. Jiang, and D. H. Werner, "A compact circularly-polarized conformal antenna using an anisotropic artificial ground," *2016 IEEE Antennas and Propagation Society International Symposium*, 26 June – 1 July 2016, Fajardo, Puerto Rico.

[8] T. Yue, Z. H. Jiang, and D. H. Werner, "Miniaturized low profile dual-band antenna enabled by a novel two-layer metasurface loaded with CSSRs and rectangular patches," *2016 IEEE Antennas and Propagation Society International Symposium*, 26 June – 1 July 2016, Fajardo, Puerto Rico.

[9] I. Martinez, and D. H. Werner, "Multilayer stacked-patch antenna optimized for on-body communications," *2016 IEEE Antennas and Propagation Society International Symposium*, 26 June – 1 July 2016, Fajardo, Puerto Rico.

[10] T. Yue, Z. H. Jiang, A. Panaretos, and D. H. Werner, "Ultra-compact dual-band antenna enabled by complementary split ring resonator loaded metasurface," Submitted to *IEEE Transactions on Antennas and Propagation.*

[11] Z. H. Jiang, T. Yue, and D. H. Werner, "Metamaterial-Enabled and Microwave Circuit Integrated Wearable Antennas for Off-Body Communications," Chapter in *Electromagnetics of Body Area Networks: Antennas, Propagation, and RF Systems*, Edited by D. H. Werner and Z. H. Jiang, Wiley-IEEE Press, pp 27-60, 2016.

Ebenezer Adelowo: Ph.D. 2nd year - Materials Engineering (FIU)
Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position
E-mail: eadel004@fiu.edu

Project title: FABRICATION AND EVALUATION OF 3D HYBRID MICRO-SUPERCAPACITORS

Project Supervisor: Dr. Chunlei Wang

Project goal and Industry relevance: Our goal is to develop hybrid micro-supercapacitors with three dimensional (3D) electrodes having high energy and power density. To achieve this goal, we utilize carbon-microelectromechanical systems (C-MEMS) technique in producing the 3D electrodes. The technique is generally based on pyrolysis of photopatterned photoresists followed by the deposition of electroactive materials on the pyrolyzed carbon structure obtained. The pyrolyzed carbon can acts as both current collector as well as electroactive material. We also study effect of the materials used as electrodes and the processing conditions on the performance of the microsupercapacitor.

Other Relevant Information about me:
I have worked on the synthesis of nanostructures using electrospinning method. I have also participated in carrying out basic and applied materials studies, materials tests for quality control assessment on steels, alloys, ceramics, and other non-metallic materials was at the Centre for Energy Research and Development (CERD), Ile-Ife, a highly reputable research institute in Nigeria. My bachelor's thesis was on studies on the plastic properties of Lafia coal, a locally sourced coal in Nigeria, for metallurgical cokemaking. My objective was to determine the cokeability of the coal with the aim of verifying its effective utilization in the production of iron by blast furnace process. I am always highly determined to achieve my set goals.

Honors and Awards:

Tertiary Education Tax Fund (Tet fund) awardee 2015

Publications and Citations:

1. **Adelowo E.D (2012).** Synthesis of Zinc Oxide Nanofibers Doped with Al^{3+} and Sn^{2+} using Electrospinning Technique. *Thesis for Masters of Science in Materials Engineering Obafemi Awolowo University*, Ile Ife.
2. **Adelowo E.D (2008).** Studies on the Plastic Properties of Lafia Coal for Metallurgical Coke Making. *Thesis for Bachelors of Science in* Metallurgical and Materials Engineering *Obafemi Awolowo University***.**

Ebenezer Adelowo
Miami, Florida
7867819076
eadel004@fiu.edu

SUMMARY

Self-motivated and highly disposed to accurately assessing operations and developing effective strategies for driving organizational excellence. Outstanding interpersonal and communication skills for forming strong relationships and fostering collaborative efforts. Strong analytic, critical thinking, and problem solving skills.

EDUCATION

FLORIDA INTERNATIONAL UNIVERSITY Miami, FL
Ph.D., Materials Engineering In view
- *Membership*: National Society of Black Engineers (NSBE), Materials Advantage

OBAFEMI AWOLOWO UNIVERSITY Ile-Ife, Nigeria
M.S., Materials Engineering November 2012
- *Membership*: Nigerian Society of Engineers,

OBAFEMI AWOLOWO UNIVERSITY Ile-Ife, Nigeria
B.S. Metallurgical and Materials Engineering January 2008

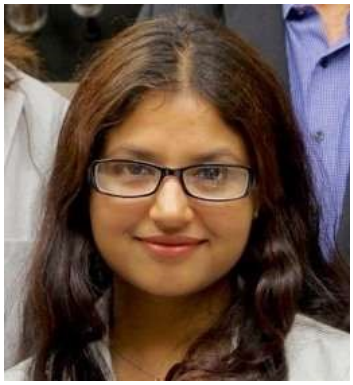
EXPERIENCE

FLORIDA INTERNATIONAL UNIVERSITY Miami, FL
(Dr. Chunlei Wang Research Group) *2015- date*
Ph.D Student
- Characterization of materials using XRD, TEM, SEM.
- Assembling of electrochemical cells and performance evaluation.
- Fabrication of carbon-microelectromechanical systems (C-MEMS) based microelectrodes from micro-supercapacitors.
- Use of electrostatic spray deposition(ESD) method for electrode materials deposition

FLORIDA INTERNATIONAL UNIVERSITY Miami, FL
(Mechanical and Materials Engineering Department) *2015- date*
Graduate Teaching Assistant
- Assisting professors in teaching and mentoring undergraduate student and other duties assigned.

CENTER FOR ENERGY RESEARCH AND DEVELOPMENT (CERD) Ile-Ife, Nigeria
Research Associate May- September, 2006
- Participated in carrying out basic and applied materials studies.
- Involved in the development of foundry and casting techniques for replacement of spare parts.
- Carried out materials tests for quality control assessment on steels, alloys, ceramics, and other non-metallic materials.

NATIONAL IRON ORE MINING COMPANY Itakpe, Nigeria
Intern April- September, 2005
- Participated in the designing and fabrication of spare parts and control devices



RICHA AGRAWAL Ph.D. Candidate (Materials Science and Engineering) (Florida International University)
Industry interests: ☐ Mentorship ☐ Internship ☐ Full-time position
E-mail: ragra005@fiu.edu

Project Title: Hybridization of Lithium-Ion Batteries and Electrochemical Capacitors - Fabrication, Miniaturization and Optimization
Project Supervisor: Dr. Chunlei "Peggy" Wang

Project goal and Industry relevance: The fast-growing microelectronics industry requires the development of micro-power sources that can be integrated onto the micro-devices. My project focuses on developing hybrid miniaturized energy storage systems that essentially combine the high energy densities of batteries and the high power handling and cycle longevity of electrochemical capacitors. The empirical performance optimization of the miniaturized device can be realized from i) design/architectural and/or ii) materials aspect. In a typical process, the carbon 3D microelectrode platforms are synthesized via carbon microelectromechanical systems (C-MEMS), followed by active material integration, which include both lithium-intercalating compounds and double-layer type carbons. The other aspects of my research interests include theoretical aspects of operation conditions for the optimal energy-power tradeoff from the hybridized devices.

Social Media Links:

Selected Honors and Awards:

2015	**Doctoral Evidence Acquisition (DEA) Fellowship,** Florida International University
2011	**Presidential Fellowship,** Florida International University

Selected Publications and Citations:

1) **Agrawal, R.** , Chen, C., Dages, S., and Wang, C., A High Energy 3V Lithium-Ion Capacitor Synthesized via Electrostatic Spray Deposition, *Advanced Materials Letters* (In Press)
2) Nautiyal, P., Loganathan, A., **Agrawal, R.,** Boesl, B., Wang, C., Agarwal, A., Oxidative Unzipping and Transformation of High Aspect Ratio Boron Nitride Nanotubes into "White Graphene Oxide" Platelets, 2016, *Scientific Reports, 6,* 29498; doi: 10.1038/srep29498
3) **Agrawal, R.** and Wang, C., ***Laser beam Machining***: In ***Encyclopedia of Nanotechnology*** (ed. Bharat Bhushan) pp 1-15, SpringerReference (2016); ISBN: 978-94-007-6178-0; doi: 10.1007/978-94-007-61780_101020-1
4) **Agrawal, R.,** Chen, C., Hao, Y., Song, Y., and Wang, C., ***Graphene for Supercapacitors***: In ***Graphene-Based Energy Devices*** (ed A. R. bin Mohd Yusoff), pp 171-214, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany (2015); ISBN: 978-3-527-33806-1; doi: 10.1002/9783527690312.ch6
5) **Agrawal, R.,** Nieto, A., Chen, H., Mora, M., Agarwal, A., Nano-scale damping characteristics of Boron Nitride Nanotubes and Carbon Nanotubes Reinforced Polymer Composites, *ACS Applied Materials and Interfaces,* 2013, 5 (22), 12052-12057; doi: 10.1021/am4038678

*20 Publications: Σ Citations: 76; h index: 6; i-10 index: 2 (As of January 2017) (Source: Google Scholar; Profile: https://scholar.google.com/citations?user=4rWa7EQAAAAJ&hl=en)

RICHA AGRAWAL

Florida International University, Miami, FL

(305) 502-2725

Email: ragra005@fiu.edu

SUMMARY

My technical background comprises Materials Science and Engineering and Physics and currently my research interests include design, fabrication and analyses of electrochemical energy storage devices. I also have experience in teaching undergrad level courses. I am disciplined, responsible, and perseverant toward my work.

EDUCATION

Doctor of Philosophy	**Florida International University, United States** Materials Science and Engineering Dissertation - Hybridization of lithium-ion batteries and electrochemical capacitors – fabrication and optimization	**~Summer 2017** (GPA – 3.98)
Master of Science	**Florida International University, United States** Materials Science and Engineering	**Spring 2015**
Master of Science	**University of Delhi, India** Physics (Specialization – Solid State physics)	**July 2012**
Bachelor of Science	**University of Delhi, India** Physics (Honors degree)	**July 2009**

EXPERIENCE

September 2011-Present – Doctoral student/candidate – *Florida International University*, Miami, FL Research:

Electrochemical energy storage devices

- Electrospun activated carbon nanofiber anodes for high capacity lithium storage
- Tin oxide/graphene composites as high capacity lithium-ion battery anodes
- Tin oxide/polypyrrole hollow spheres anodes for lithium-ion battery application
- Lithium titanate (Li4Ti5O12)-silicon composite anodes for lithium ion batteries
- Electrostatic Spray Deposition (ESD) based nanostructured carbons and Li4Ti5O12-anatase TiO2 for lithium-ion hybrid capacitor applications

Carbon microelectromechanical systems (C-MEMS) for energy storage

- C-MEMS based microsupercapacitors, microbiofuel cells, and microbatteries **Other studies**
- Nano-scale damping characteristics of BNNT and CNT reinforced polymers
- Defect based oxidative unzipping of BNNT into BN nanosheets

Project Handling:

- Significant experience in proposal writing, attending PI meetings, writing annual project reports o **Project:** National Science Foundation (NSF) Nanosystems Engineering Research Center (NERC) for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

August 2009-August 2011 – Master student – *University of Delhi*, Delhi, India

- **Project:** Dependence of size on the magnetic properties of magnetite (Fe3O4)

Teaching Experience

2014 – Instructor – Department of Mechanical and Materials Engineering, *Florida International University*, Miami, FL (EGN 3365 – Materials Engineering, *Summer 2014*)

2013-2015 - Teaching Assistant* – Department of Mechanical and Materials Engineering, *Florida International University*, Miami, FL

- EML 4905 – Senior Design - *Spring 2014*
- EGN 3365 - Materials Engineering - *Fall 2013, Spring 2015, Fall 2015*
- EGN 1100 – Introduction to Engineering - *Spring 2014*
- EGN 1033 –Technology, Humans, and Society *Fall 2013, Fall 2014, Spring 2015*

***** Department of Mechanical and Materials Engineering nominee for University Graduate School Provost Award for Outstanding Graduate Teaching Assistant

AMIR REZA AREF : Ph.D. 2nd year – Engineering Science and Mechanics (PSU)

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position

E-mail: axa59@psu.edu

Project title: Development of high energy electrochemical capacitors

Project Supervisor: Dr. Clive Randall; Ramakrishnan Rajagopalan

Project goal and Industry relevance: Our group works on developing high energy density electrochemical capacitors. We have strong expertise in the area of nanomaterial synthesis, electrochemical characterization, fabrication and testing of energy storage devices. We have developed and tested ultra-low leakage electrochemical capacitor technologies that can provide energy storage solution for self-powered wearable platforms. Current area of research includes study of electrochemical stability of high voltage electrolytes, high capacitance electrodes with excellent rate capability and cyclability.

Honors and Awards:

Won the best poster contest entitled "Development of high energy density electrochemical capacitors"
ESM Today 2016, 13th Annual Engineering Science and Mechanics Research Symposium

Publications and Citations:(1)

1. Huang W, Komarneni S, **Aref AR**, Noh YD, Ma J, Chen K, et al. Nanolayered tin phosphate: a remarkably selective Cs ion sieve for acidic waste solutions. Chem Commun (Camb). 2015;51(86):15661-4.

2. Komarneni S, **Aref AR**, Hong S, Noh YD, Cannon FS, Wang Y. Organoclays of high-charge synthetic clays and alumina pillared natural clays: Perchlorate uptake. Applied Clay Science. 2013;80-81:340-5.

3. Hosseini-Yazdi SA, Khandar AA, Azizi H, **Aref AR**. Synthesis, Characterization, X-ray Structures, and Solution Studies of Nickel(II) Complexes of an Aza-Crown Macrocycle with a Hydroxyl Pendant-Armed. Zeitschrift für anorganische und allgemeine Chemie. 2008;634(11):1943-9.

AMIR REZA AREF LALEH
State College, PA
814-441-6221
axa59@psu.edu

SUMMARY

I have a MS degree in Inorganic chemistry and a B.S. in general chemistry. At the present time, I am a PhD student at the Pennsylvania State University, department of Engineering Science and Mechanics. My research experiences are: synthesis of materials through melting, sol-gel, hydrothermal and microwave hydrothermal methods, synthesis of organo-clay for wastewater treatment, pyrolysis, and chemical and physical activation of polymer materials to make high surface area carbon for energy storage application. Besides, I am familiar with some material characterization techniques including: infrared spectroscopy (FT-IR), X-ray diffraction, UV-Vis spectroscopy, Scanning Electron Microscopy (SEM), Optical Microscopy, Differential Scanning Calorimetric (DSC), Thermo-Gravimetric Analysis (TGA), sputtering, physical vapor deposition, and electrochemical testing such as Cyclic voltammetry, constant current charge/ discharge measurement, and Electrochemical Impedance Spectroscopy (EIS). In addition, I have more than two years of experiences in teaching college level chemistry lab II and chemistry lab I.

EDUCATION

PSU Engineering Science and Mechanics University Park, PSU
Ph.D.., Development of high energy electrochemical capacitors ***May 2019***

Department of Chemistry
M.S. Inorganic Chemistry

Tabriz, Iran
Sep 2007

Thesis: “Potentiometric and Spectrophotometric study of complex formation of some transition metal ions with oxygen-nitrogen donors Macrocyclic Ligands incorporating hydroxyl groups.”
Supervisor: Professor Ali Akbar Khandar

UNDERGRADUATE UNIVERSITY

Department of Chemistry
B.S. Pure Chemistry

Tabriz, Iran
Feb 2003

Raj P. Bhakta Ph.D. 2nd year – Textile Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position

E-mail: rpbhakta@ncsu.edu

Project title: Printed Electronics on Textiles: A low-cost and scalable manufacturing process for smart textiles for healthcare applications

Project Supervisor: Dr. Jesse Jur

Project goal and Industry relevance: I am developing a disruptive manufacturing paradigm for printing electronics onto textiles for smart textiles applications. I am approaching this research from conducting voice-of-customer on the smart textiles space and realizing that there is a scalability and cost problem. Automation and printing technologies must be incorporated into the textiles manufacturing processes to reduce complex and laborious integration methods for integrating electronics onto textiles. Printed electronics offers a unique technology roadmap for achieving the high scalability and low-cost that is needed to add smart functionality onto textiles. Current technologies such as conductive yarns are expensive to scale, complex to integrate hard components onto, and lack the materials breadth of the printed electronics space. My research aims to bring printed electronics manufacturing techniques such as screen-printing, direct-write, flexographic, and gravure printing to textiles to make true electronic textiles. I am aiming to achieve marginal costs (<$1) and high-scalability (1 M units/month) for making smart textiles through my process and materials development. My project also aims to produce products such as smart biometrics garments and wearables for health monitoring applications. This workflow allows me to readily commercialize my research and bridge the 'valley of death' that faces many technologies today by utilizing my entrepreneurial and inventor-minded approach.

Other Relevant Information about me:

As an entrepreneurially minded researcher, I have recently received the National Science Foundation I-Corps Technology Commercialization grant of $50,000. I completed the 'start-up accelerator' program through NSF by conducting voice-of-customer on over a 100 stakeholders in the wearable technology space. At the end of this program, I made a business model canvas to utilize our smart biometrics garment for real-time stress tracking in law-enforcement training.

Honors and Awards:

NSF I-Corps Technology Commercialization grant recipient August 2016
Industrial Fabrics Association Student Product Design- *Low-cost, self-powered, multimodal sensing garment* September 2016
IDTechEx 2016 'Best Poster Award' for *Printed Electronics on Textiles: An iron-on approach* November 2016
NC State 'Wolftank' New Start-up Pitch Contest Winner October 2016

Publications and Citations:

Direct Write Printing on Textiles *in submission*

Patents

Flexible Interconnects, Systems, And Uses Thereof
United States Application No. 15/174,677, filed June 6, 2016.

Raj P. Bhakta
Raleigh, NC
rpbhakta@ncsu.edu

SUMMARY

Creativity + Innovation + Invention + Entrepreneurship = Threads of the fabric I wear. I'm a scientist, engineer, inventor, and entrepreneur that seeks to solve real-world problems and commercialize them for the benefit of humanity. I am on a relentless pursuit to add smart functionality to textiles at a marginal cost to help democratize healthcare and bring the textiles industry to the computing age.

EDUCATION

North Carolina State University
Graduate Student in Fiber & Polymer Science | Textile Engineering
The University of Texas at Austin
Bachelor of Science in Physics (Nuclear Eng. Option)
December 2014

Relevant Awards

- NSF I-Corps $50,000 Technology Commercialization grant recipient | August 2016
- Industrial Fabrics Association Student Product Design- Low-cost, self-powered, multimodal sensing garment| September 2016
- NC State 'Wolftank' New Start-up Pitch Contest Winner for $500| October 2016
- IDTechEx 2016 'Best Poster Award' for *Printed Electronics on Textiles: An iron-on approach*

Skills

- Voice-of-customer and Business Model Canvas
- Statistical Data Analysis with MATLAB
- ImageJ software for visual data analysis
- Surface Modification on Textiles
- Scanning Electron Microscopy
- Screen Printing Electronics
- Direct-write Printing Electronics
- Experience with technical scientific writing
- Microsoft Word, Excel, PowerPoint

WORK EXPERIENCE

NFUSP Summer Research Intern| Y-12 National Security Complex| Dr. James Bradshaw| 6/01/2014 - 8/15/2014

- As a NFUSP fellowship recipient, I was assigned to Y-12 under Dr. James Bradshaw to assemble and benchmark a $500,000 Spark-Source Mass Spectrometer with his PhD student Jennifer Charlton
- Radiochemistry process development implementing UTEVA™ and TRU™ resins with Dr. Bob Smithwick to optimize time and cost efficiencies for large volume Bioassay procedures

RESEARCH PROJECTS

Printed Electronics on Textiles| NC-State| January 2016 - Present

- Conducting R&D on screen-printing and direct-write printed electronics processes to integrate sensors and interconnects onto textiles for smart textiles, wearable technology, and healthcare applications at 1000x scalability and 10x less cost than current technologies
- Approaching research by applying voice-of-customer analysis and tailoring solutions to satisfy real needs
- Co-inventor on 1 filed patent and co-inventor on 4 invention disclosures with applications in the fields of smart textiles, electronics, automotive, and medical spaces
- Lead the SAS-ASSIST collaboration for ECG shirt based healthcare internet-of-things project
- Conduct product and use-case development for smart biometrics garment (ECG Shirt)
- Manage 4+ undergraduates and 1 high-school student on research and product development
- Network with stakeholders in the wearable technology, printed electronics, and textiles spaces to negotiate partnerships with ASSIST and NEXT Research Group

PRESENTATIONS AND POSTERS

Printed Electronics on Textile: An iron-on approach | November 2016

- Presented and won 'Best Poster' at the IDTechEx Printed Electronics Showcase amongst 14 presenters across the world

LEADERSHIP EXPERIENCE

Entrepreneurial Lead | NSF I-Corps Program – New Start-up Ventures | Oct 2016 - Present

- Conducted voice-of-customer on 100+ stakeholders in wearable technology and law enforcement space
- Made a business model canvas for our biometrics smart garment to detect real-time stress levels in law-enforcement training

Desi Dance Network, Inc (501c Non-Profit) | Board of Directors | May 2015 – Present

- I am establishing cross-promotional partnerships with businesses to increase our publicity reach

Christopher M. Boggs Ph.D. 4th year – Major: Mechanical Engineering, Minor: Chemical Engineering (NCSU)

Industry interests: ✓ Mentorship __ Internship ✓ Full-time position

E-mail: cmboggs@NCSU.edu

Project title: Heterostructured Thin-Films for Energy Harvesting Applications

Project Supervisor: Dr. Daryoosh Vashaee

Project goal and Industry relevance:

Currently our research is focused on investigating low-dimensional heterostrured materials for solid-state cooling applications. These nanostructured thin-films can greatly enhance the overall device performance through utilizing optimized electron/phonon transport. The newly designed materials and devices have a broad range of applications ranging from wearable electronics to on-chip-cooling for infrared imaging. In addition, these devices are compatible with modern thin-film semiconductor materials and manufacturing processes. Our approach to achieve this type of material architecture is accomplished through a combination of cross-beam pulse laser deposition and molecular beam epitaxial fabrication processes.

Honors and Awards:

Promoting Interests in Energy Researches: Developing a Low Cost Potentiostat for African Universities as Teaching Tool, MRS Foundation Grassroots Grant, 2016-2018

2016 Joint U.S. and Africa Materials Institute research fellow

Spring 2016 Materials Research Society "Sustainability in My Community" 2nd Place Poster Award

2015 NC State Diversity Mini Grant

Publications and Citations:

[4] **C. Boggs,** T. Boquet-Caron, S. Boyd, J. Brodie, A. Cruz, I. Mohamed, M. Omary, S. Radhakrishnan, A. Squires, R. Wang, & M. Watkins. "*Building the SciBridge between Africa and the U.S.*" Poster presentation at the Materials Research Society Spring 2016 Meeting, Phoenix, AZ. April 2016.

[3] Song, H., **Boggs, C. M.**, Akunuri, S. N., Turk, B. S., & Gupta, R. (2011, September). *Catalytic CO_2 Char Gasification for Commercial Materials Production*. Presented at 2011 International Pittsburgh Coal Conference, Pittsburgh, PA.

[2] **C. Boggs**, S. Mukerjee, J. Saunders, B. Glenn, J. Meyres, C. Cucksey, "*Pulsing for Enhanced CO Mitigation: Effect of Catalyst Durability*", presented and submitted to the 211th meeting of the Electrochemical Society (2007)

[1] Jackson, G.S., Sai, R., Plaia, J.M., **Boggs, C.M.**, Kiger, K.T., (2002) "Influence of Hydrogen on the Response of Lean Methane Flames to Highly Strained Flows", *Combustion and Flame*, 132, p503-511

Christopher M. Boggs
Durham, NC
(240) 899-3519
cmboggs@ncsu.edu

EDUCATION

PhD, Mechanical Engineering (Minor Chemical Engineering), NC State University, Expected 2018
Advisor: Dr. Daryoosh Vashaee Topic: Pulse Laser Deposition of Thin Films
MS, Mechanical Engineering, Northeastern University, 2007
Advisor: Dr. Sanjeev Mukerjee Topic: CO Mitigation Strategies in PEM Fuel Cells
BS, Mechanical Engineering, University of Maryland, College Park, 2002
Advisor: Dr. Greg Jackson Topic: Highly Strained Lean Premixed Flames

RESEARCH AND PROFESSIONAL EXPERIENCE

NC State University, NanoScience and Engineering Research Group 2015 to Present
Research Assistant Raleigh, NC

- Nanofabrication of thin films for thermoelectric applications using cross-beam pulse laser deposition
- Study the roll of interface defects and geometrical impacts of nanostructures on thermoelectric energy generation performance and device optimization
- Characterization of surfaces and thin films by ex-situ Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), and Energy Dispersive x-ray Spectra (EDS)
- Systematically analyze thin film growth kinetics by Pulse Laser Deposition, correlate growth conditions to film and thermoelectric device properties, controlling for 4 co-dependent variables

Research Triangle Institute, International 2009 to 2015
Mechanical Engineer Durham, NC

- Held responsibility for the development, design, optimization, and scale up of novel process technologies that are intended to produce and use clean energy for the chemical, refining, transportation, and power industries
- Reviewed and prepared detailed process flow diagrams (PFDs) and piping and instrumentation diagrams (P&IDs)
- Fabricated and operated laboratory-scale reactor systems for novel microreactors for Gas-to-Liquids processes

Northeastern University, Electrochemical Energy Conversion Laboratory 2005 to 2007
Research Assistant Boston, MA

- Researched and developed CO mitigation strategies for PEM fuel cells
- Investigated the effects that transient oscillations have on the durability and performance of an electrochemical system for extended periods
- Fabricated and tested novel membrane electrode assemblies
- Created experimental methods for the analysis of electro-catalyst stability

Thermal Circuits Inc. 2003 to 2005
Design Engineer Salem, MA
Design Engineer

- Managed the creative design and engineering of various types of etched foil heaters using CAD and CAM methods to assist in the product development process
- Confirmed heater designs and manufacturing process though testing and statistical analysis
- Wrote standard operating procedures for the manufacturing of heater elements

University of Maryland, Reacting Flow Laboratory 2001 to 2002
Laboratory Assistant College Park, MD

- Designed and conducted experiments to analyze the effects of fuel composition and transient conditions on the dynamics of lean premixed flames
- Created a virtual interface to record and analyze high frequency temperate measurements using thin wire thermocouples and SCXI-1102 chassis
- Validated computational flame structure/extinction models using experimental results

Allison Bowles, M.S.

Current Role(s):
Research Associate, NEXT Research Group, NCSU

Educational background:
BS, North Carolina State University, 2007
MS, North Carolina State University, 2016

E-mail: aebowles@ncsu.edu
Phone: (336) 749-7836

Interests: Textile integration of wearable technology, knitting technology, garment design and fit, screen-printed sensors, energy harvesting

Expertise: Allison is a product developer for the NEXT Research Group at N.C. State University College of Textiles. Her work includes integrating printed and textile sensors into biomonitoring garments so that they are wearable and functional for a variety of target markets.

ASSIST Project Titles:
Electrocardiogram Compression Shirt

PVDF Copolymer Strain Energy Harvester with Textile Integration

Services Offered: product development for textile based wearable technology, conductive knitting, wholegarment knitting

Allison Bowles, M.S.

Raleigh, NC
(336) 749-7836
aebowles@ncsu.edu

SUMMARY

Designer and product developer with an interest in textile wearable technology integration and sustainability in the textile supply chain. Skills include: apparel design and development, textile design, knitwear, pattern making wholegarment knitting, conductive textiles. Software proficiencies include: Photoshop, Illustrator, InDesign , Kaledo Print, Gerber Accumark, Shima Seiki APEX3

EDUCATION

NCSU COLLEGE OF TEXTILES Raleigh, NC
M.S. Zero-Waste Garment Design, Product Development May 2016

- *Honors:* AATCC Herman and Myrtle Goldstein Student Paper Competition, Finalist; NCSU Graduate Student Research Symposium, 3rd place Social Sciences and Management
- *Membership*: NCSU Entrepreneurship Initiative, Advancement of Women Entrepreneurs

NCSU COLLEGE OF TEXTILES Raleigh, NC
B.S. Textile and Apparel Management, Fashion Development December, 2007

- Young Menswear Association (YMA) Scholarship Recipient
- College of Textiles Senior Showcase Fashion Show, Co-director/designer

EXPERIENCE

NANO-EXTENDED TEXTILES (NEXT) RESEARCH GROUP Raleigh, NC
Product Developer June 2016 - Current

- Collaborate with researchers to integrate biomonitoring technology into apparel and textile products. Work with printed electronics, cut and sew garment design, and whole garment knitting

SOCK AND ACCESSORY BRANDS GLOBAL Advance, NC
Brand Manager 2008 - 2014

- Manage product development timeline including tech pack creation, sample requests, sample revisions, pre-production and TOP samples in order to meet both brand and retailer deliveries on time
- Communicate closely and efficiently with brand and face-to-face collaboration with brand design teams
- Create and deliver marketing/product presentations to promote new business

Designer Dates of Employment

- Design seasonal and “special make-up” hosiery and accessories collections following brand, buyer, and market direction
- Communicate with off-shore manufacturers by email, technical sketches, and custom PDM program to develop product samples from yarn to finished goods, focused on cylinder knit construction.

Laura Gonzalez Ph.D. 2nd year – Electrical and Computer Engineering (NCSU)

Email: llgonzal@ncsu.edu

Industry interests: ✓ Mentorship ✓ Internship __ Full-time position

Project title: EKG and ACTIVITY MONITORING

Project Supervisor: Dr. Edgar Lobaton

Project goal and Industry relevance: Our research aims to identify the dependence of heart rate variability and respiratory rate on the activities performed by healthy individuals with a focus on characterization of motion artifacts on wearable devices. Analysis of signal is currently done on both smart phone devices as well as on cloud.

Other Relevant Information about me:
Through signal processing and machine learning I hope to impact wearable devices for medical platforms by increasing accessibility and providing preventative healthcare.

Honors and Awards:
First Place Senior Design (2015): ASSIST ECG T-shirt

Publications and Citations:
L. Gonzalez, K. Walker, K. Keller, D. Beckman, H. Goodell, G. Wright, C. Rhone, A. Emery, and R. Gupta, *Textile Sensor System for Electrocardiogram Monitoring*, IEEE Virtual Conference on Applications of Commercial Sensors (VCACS), 2015, DOI: 10.1109/VCACS.2015.7439568
L. Gonzalez, K. Walker, S. Challa, B. Bent, *Monitoring a Skipped Heartbeat*, IEEE Virtual Conference on Applications of Commercial Sensors (VCACS), 2016.
N. Lokare, **L. Gonzalez**, and E. Lobaton, *Comparing Wearable Devices with Wet and Textile Electrodes for Activity Recognition*, 38th Engineering in Medicine and Biology Conference (EMBC), 2016. (Presenting Author)

Highlighted Course Project Experience:
Machine Learning/Matlab/C

- Implemented an image segmentation system, which detects water pixels within pictures using a Bayesian Network, a Support Vector Machine and a Convolutional Neural Network
- Built a wearable device detects premature ventricular contraction detector (PVC) in an ECG on an android device using a Support Vector Machine
- Segmented regions of Foraminifera by applying principal component analysis then using a K-means clustering, Naive Bayes Classifier, and Linear Discriminant analysis, Random Forest, and a Conditional Random Field
- Labeled movements from accelerometer data from a cockroach using a Random Forest Classifier and a Hidden Markov Model

Embedded Systems/Design/Java/Matlab/C/C++

- Developed an ECG monitor embedded in a T-shirt, an android app on a team that receives ECG data and coded ECG filtering algorithms for an Android app
- Implemented a flexible cache and memory hierarchy simulator.
- Built an autonomous toy car that can complete simple obstacle courses

Laura Gonzalez

Raleigh, NC
336 – 343 - 7508
llgonzal@ncsu.edu
linkedin.com/in/laura-gonzalez-18b206a7

SUMMARY

Second year PHD student in Electrical and Computer Engineering. My focus is on signal processing and machine learning.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D.., Computer Engineering, Electrical Engineering May 2019

- *Leadership*: *ASSIST Student Leadership Council (SLC) – Social Chair*

NCSU COLLEGE OF ENGINEERING
B.S. Computer Engineering, Electrical Engineering May 2015

- *Member of Engineering World Health*

EXPERIENCE

North Carolina State University - ASSIST Raleigh, NC
Graduate Research Assistant January 2014 – August 2014

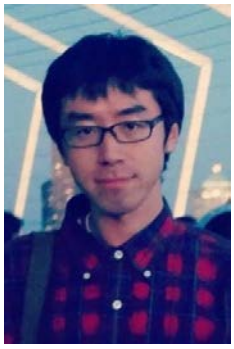
- Currently researching in Signal Processing and Machine learning on physiological data from wearable sensors
- Collaborated with SAS to continuously upload wearable data from an android device to the cloud
- Worked on an IRB to further Data collection efforts from wearable devices
- Currently mentoring an undergraduate senior design team

Platform Development Team Co-op August 2014 – May 2015

- EKG T-shirt - Developed a wearable T-shirt integrated with textile electrodes, which measured EKG, filtered then sent the signal via Bluetooth low-energy to an android device, where it was displayed in real time. Work performed under the Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) NSF Center.

Oracle Morrisville, NC
Platform Development Team Co-op January 2014 – August 2014

- Worked closely on a team of 10 engineers to deploy and maintain a Linux Distribution used by Telecom providers.
- Used Perl and Bash to fix and add features to pre-existing software packages.
- Obtained knowledge and experience with Open Source Software, Networking, Virtualization (KVM), and Linux software packaging using RPM.
- Developed a deeper understanding of the Linux operating system, including operation of SSH, Telnet, FTP, and general shell functions.



Yong Hao Postdoc Associate– Materials Science and Engineering (FIU)
Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position
E-mail: yhao004@fiu.edu

Project title: SULFUR BASED ELECTRODE MATERIALS FOR SECONDARY BATTERIES Project Supervisor: Dr. Chunlei Wang

Project goal and Industry relevance: Developing next generation secondary batteries has attracted much attention in recent years due to the increasing demand of high energy and high power density energy storage for portable electronics, electric vehicles and renewable sources of energy. This project investigates sulfur based advanced electrode materials in Lithium/Sodium batteries. We expect to enhance the electrochemical performances of the electrode materials by developing the unique nano structures as well as the formation of novel composites. The low-cost materials and applicable battery manufacturing techniques make sulfur based secondary batters a very competitive position in batteries industry.

Honors and Awards:

- Doctoral Evidence Acquisition (DEA) Fellowship, Summer 2015, FIU
- Graduate Assistant Scholarship, Fall 2011- Summer 2016, FIU
- Graduate & Professional Student Committee (GPSC) Travel Grant, 14' MRS Fall, 16' ECS Spring, FIU
- Council for Student Organizations (CSO) Travel Funds, 15' MRS Spring, FIU

Publications and Citations:

- Yong Hao, Chunhui Chen, Xinyi Yang, Guanjun Xiao, Bo Zou and Chunlei Wang, Studies on intrinsic phase-dependent electrochemical properties of MnS nanocrystals as anodes for lithiumion batteries, Journal of Power Sources, 2016/11; 338:9-16
- Yong Hao, Xifei Li, Xueliang Sun and Chunlei Wang, Nitrogen-doped graphene nanosheets/sulfur composite as lithium-sulfur batteries cathode, Materials Science and Engineering: B, 2016/4, 213:83-89
- Jujun Yuan, Xianke Zhang, Chunhui Chen, Yong Hao, Richa Agrawal, Chunlei Wang, Wei Li, Huajun Yu, Yi Yu, Xiurong Zhu, Zuzhou Xiong, Yingmao Xie, Facile fabrication of threedimensional porous ZnO thin films on Ni foams for lithium ion battery anodes, Materials Letters, 2016/12; 190:37-39
- Jujun Yuan, Chunhui Chen, Yong Hao, Xianke Zhang, Richa Agrawal, Chunlei Wang, Synthesis of three-dimensionally porous ZnMn2O4 thin films for lithium-ion battery anodes by electrostatic spray deposition technique, Journal of Alloys and Compounds, 2016/12; 696:1174-1179
- Jujun Yuan, Chunhui Chen, Yong Hao, Xianke Zhang, Bo Zou, Richa Agrawal, Chunlei Wang, SnO2/polypyrrole hollow spheres with improved cycle stability as lithium-ion battery anodes, Journal of Alloys and Compounds, 2016/8; 691:34-39
- Richa Agrawal, Yong Hao, Yin Song, Chunhui Chen, Chunlei Wang, Hybridization of lithium-ion batteries and electrochemical capacitors: fabrication and challenges, Proc. SPIE : Sensing, Technology & Applications. 2015/5; 94930B:1-7
- Jun Wu, Chunhui Chen, Yong Hao, Chunlei Wang, Enhanced electrochemical performance of nanosheet ZnO/reduced graphene oxide composites as anode for lithium-ion batteries, Colloids and Surfaces A, 2014/12; 468: 17–21
- Yin Song, Richa Agrawal, Yong Hao, Chunhui Chen, Chunlei Wang, C-MEMS based microsupercapacitors and microsensors, ECS Transactions, 2014/5; 61(7): 55-64
- Chunhui Chen, Richa Agrawal, Yong Hao, Chunlei Wang, Activated Carbon Nanofibers as High Capacity Anodes for Lithium-Ion Batteries, ECS Journal of Solid State Science and Technology, 2013/09; 2(10):M3074-M3077
- Richa Agrawal, Chunhui Chen, Yong Hao, Yin Song, Chunlei Wang, Graphene for supercapacitors, Chapter 6 in Graphene based Energy Devices, edit by Rashid bin Mohd Yusoff, ISBN 978-3-527-33806-1, Wiley-VCH Verlag GmbH & Co. KGaA. 2015/04, 171–214

Yong Hao
Miami, FL
305-934-8501
yhao004@fiu.edu

SUMMARY

I am currently a Postdoc in Dr. Chunlei Wang's research group at Florida International University. I finished my PhD in materials science and engineering in the same group in 2016. Before that, I obtained both my bachelor and master degrees in China. My research interests are nanomaterials and nanocomposites as advanced electrodes in Li-ion batteries, Li-S batteries, Na-S batteries and Supercapacitors.

EDUCATION

Ph.D. in Materials Science and Engineering — September 2011-August 2016
Florida International University, Miami, US
Supervisor: Prof. Chunlei Wang
Dissertation: Sulfur Based Electrode Materials for Secondary Batteries

M.S. in Materials Science — August 2008-July 2011
Kunming University of Science and Technology, Kunming, China

B.S. in Mineral Engineering — August 2002-July 2006
China University of Mining and Technology (Beijing), Beijing, China

EXPERIENCE

Postdoctoral Fellow — September 2016-present
Florida International University, Department of Mechanical and Materials Engineering

Research Assistant — September 2011-August 2016
Florida International University, Department of Mechanical and Materials Engineering, Advanced Materials Engineering Research Institute (AMERI),

- Fabrication and electrochemical evaluation of N-doped Graphene/Sulfur as electrode for Li-S and room temperature Na-S batteries.
- The nano-confinement effect and electrochemical performance of CNTs/S for Li-S batteries.
- Electrochemical evaluation of phase dependent RS-, ZB-, and WZ-MnS as anodes for Li-ion batteries (LIBs).
- Synthesis and electrochemical evaluation of SnO_2/polypyrrole composite for LIBs ESD derived and evaluation of ZnO/reduced graphene oxide composites for LIBs.
- ESD derived $ZnCo_2O_4$, $CoMn_2O_4$ and $ZnMn_2O_4$ thin film for LIBs.
- Fabrication of carbon nanofibers (CNFs) by electrospinning and KOH chemical activation of CNFs as anode material for LIBs.

Teaching Assistant — September 2011-August 2016
Florida International University, Department of Mechanical and Materials Engineering

Alexandra J. Henriques M.S. 2nd year – Materials Science & Engineering (FIU)

Industry interests: ✓Mentorship ✓ Internship _ Full-time position
E-mail: ahenr014@fiu.edu

Project title: Nano-Confined Metal Oxide in Carbon Nanotube Composite Electrodes

Project Supervisor: Dr. Chunlei "Peggy" Wang

Project goal and Industry relevance: We are working on testing various nano-scale metal oxides within carbon nanotubes as a composite active material for characterization and electrochemical testing as improved electrodes for various applications in energy storage. The objective is to obtain higher capacity, faster charging, and better capacity retaining energy storage devices for use in various industries including consumer electronics, medical equipment, alternative and green energy, and transportation.

Other Relevant Information about me: I have prior research experience in piezoelectrics and multiferroics through research projects on piezoelectric ceramics for use in high neutron radiation environments and electrospun multiferroic nanofibers. I have assisted in experiments at the Advanced Photon Source at Argonne National Laboratories and have experience in x-ray diffraction, ceramic processing, scanning electron microscopy, and electrochemistry. I have a B.S. in Chemical Engineering from the University of Florida and will be finishing my M.S. in Materials Science and Engineering from Florida International University in May 2017. I have experience using Origin, CrystalMaker, AutoCAD, Excel VBA, LabVIEW, GSAS, and UniSim. I am fully fluent in oral and written Spanish.

Honors and Awards:

Tau Beta Pi Inductee, 2016
Dean's List, Spring Term, 2015
Dean's List, Summer Term, 2014
3rd place poster at the American Institute of Chemical Engineers National Conference, 2013
HHMI Science for Life Intramural Scholarship, 2013
2nd place poster at the Electronic Materials and Applications Conference, 2013
Engineering Convocation Ceremony Student Speaker, 2012
University Scholars Program Awardee, 2012
Research Experience in Materials Program Awardee, 2011
National Merit Scholar, 2010

Publications and Citations:

A. Henriques, J. T. Graham, S. Landsberger, J. F. Ihlefeld, G. L. Brennecka, D. W. Brown, J. S. Forrester, J. L. Jones, AIP Advances 4, 117125 (2014)

ALEXANDRA HENRIQUES
Miami, FL
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SUMMARY

I have both research and industrial experience in Materials Science and Engineering and Chemical Engineering respectively. I have worked in manufacturing in consumer products for Procter and Gamble and worked in three research groups during my undergraduate and graduate programs. I am resilient, determined, self-motivated, and tenacious in my work, extracurricular activities, and community outreach.

EDUCATION

FLORIDA INTERNATIONAL UNIVERSITY COLLEGE OF ENGINEERING Miami, FL
M.S., Materials Science and Engineering May 2017

- *Honors:* Tau Beta Pi Inductee
- *Leadership*: Summer Research Internship (SRI) Program Mentor, Electrochemical Society (ECS) Council for Student Organizations Representative
- *Membership*: Material Advantage, ECS, Tau Beta Pi

UNIVERSITY OF FLORIDA COLLEGE OF ENGINEERING Gainesville, FL
B.S., Chemical Engineering August 2015

- *Honors:* Golden Key International Honor Society, Honors College, National Merit Scholar, University Scholar's Program, Howard Hughes Medical Institute Science for Life Scholar, Engineering Convocation Ceremony Student Speaker
- *Leadership*: Freshman Leadership in Engineering Group President, Engineering Leadership Circle (Epilon Lambda Chi) Vice President & Secretary
- *Membership*: Engineering Ambassadors, American Institute of Chemical Engineers (AIChE), Society of Hispanic Professional Engineers (SHPE), Society of Women Engineers (SWE)

EXPERIENCE

FLORIDA INTERNATIONAL UNIVERSITY COLLEGE OF ENGINEERING Miami, FL
Dr. Chunlei Wang Research Group, Mechanical and Materials Engineering October 2015 – Present

- Synthesized nano-confined tin oxide/carbon nanotube composite materials
- Used electrostatic spray deposition (ESD) to produce thin films of active materials for use as lithium ion battery (LIB) electrodes
- Assembled coin cells in a glove box for subsequent electrochemical testing
- Used scanning electron microscopy (SEM), transmission electron microscopy (TEM), and x-ray diffraction (XRD) to characterize materials

UNIVERSITY OF FLORIDA Gainesville, FL
Dr. Jennifer Andrew Research Group, Materials Science and Engineering August 2013 – August 2014

- Electrospun biphasic multiferroic nanofibers for optimization of processing techniques and aligned electrospinning studies
- Characterized fibers using SEM and XRD

Dr. Jacob Jones Research Group, Materials Science and Engineering January 2011 – May 2013

- Worked on analysis of neutron diffraction data for irradiated lead zirconate titanate (PZT)
- Processed PZT powder and disc samples for irradiation studies
- Assisted in XRD data collection at the Advanced Photon Source (APS) at Argonne National Laboratory in April of 2013 and October of 2014

PROCTER & GAMBLE, MANUFACTURING IN PROCESS SUPPLY CHAIN Albany, GA
Utilities Department Summer Internship May – August 2013

- Conducted audit and created process improvement plan for steam systems
- Analyzed water consumption throughout the plant and worked on plan for minimizing usage and waste

Bounty Converting and Engineering Summer Internship May – August 2012

- Managed 5 projects ranging from the design phase through construction and startup
- Worked with contractors to meet strictly scheduled deadlines for the startup of newly installed equipment Verified installations had been completed correctly according to P&IDs and electrical drawings

Bounty IE Department Summer Internship May – August 2011

- Created a tracking system to find variances in material usage over time and trends in deviation from ideal specifications
- Documented the process by which Excel automations confirm finished product and reconcile materials to improve troubleshooting
- Developed a tracking system for run hours of decorator plates and a trigger system for plate changes

Charles Hood B.S./M.S. – 2nd Year Junior – Accelerated Masters (NCSU

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position

E-mail: chood2@ncsu.edu

Project title: HET (Health Environmental Tracking) Testbed

Project Supervisor(s): Dr. Alper Bozkurt & Dr. John Muth

Project goal and Industry relevance:
The HET System being developed by ASSIST is oriented towards better health informatics for patients with chronic respiratory diseases. Being able to correlate data from environmental factors and their medical effects can help better diagnose and predict symptoms from conglomerate data received through the set of devices. The test bed is composed of: A chest patch for EKG and Pulse Oximetry, a handheld spirometer for lung capacity, and a small wearable for detecting ozone, VOCs, humidity, and temperature. All devices are also equipped with movement sensors for further more data collection. As the development progresses, clinical trials at UNC will begin to show proof of concept as the set of devices begins to move from the research stage, into a marketable product.

Other Relevant Information about me:

VieMetrics is a small company formed from the IP based off of the spirometer in the HET system. We consist of two other engineering students from ASSIST and a MBA student from the Poole College of Management. While the company was initially formed to market VitalFlo (Spirometer), the focuses of the company have moved to technology development. Many research projects and early development are too unreliable to bring in venture capital; we will aid in bridging the gap between concept projects and their path to market.

Otherwise, I work on personal hardware projects and ventures. Over the last few months I have been developing an electric longboard with a full 10-Cell Smart Battery Management System (AFE + Fuel Gauge) also enveloped in sensors for real-time data about battery SOC and physical awareness for altitude and movement.

Honors and Awards:

ASSIST Undergraduate Fellow
Dean's List (All Semesters)

Publications and Citations:

Keller, K., Wilkins, M., Reynolds, J., Dieffenderfer, J., **Hood, C.**, Daniele, M. A., . . . Tunc-Ozdemir, M. (2016). *Nanocellulose electrodes for interfacing plant electrochemistry.* 2016 IEEE Sensors. doi:10.1109/icsens.2016.7808846

Dieffenderfer, J., Wilkins, M., **Hood, C.,** Beppler, E., Daniele, M. A., & Bozkurt, A. (2016). *Towards a sweat-based wireless and wearable electrochemical sensor. 2016 IEEE Sensors.* doi:10.1109/icsens.2016.7808470

CHARLES HOOD
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CHOOD2@NCSU.EDU | (704)907-8730

OBJECTIVES

Electrical & Computer Engineering Student interested in developing new technologies looking at their potential applications. Looking for an internship over the summer to get hands-on experience with technical skills.

EDUCATION

North Carolina State University May 2018
B.S in Computer & Electrical Engineering [GPA 3.98]
Accelerated Masters Program (Electrical Engineering)
Minor in Mathematics

EXPERIENCE

Co-founder of Viemetrics Inc. December 2016 - Present

- Development company oriented towards technology development to bring high risk medical prototypes to market
- Working to finish development of a FDA approved portable spirometer (Class II Medical)

Autodesk Fusion360 Catalyst May 2016 – Present

- Acting liaison on campus to connect professors and students with Autodesk educators for outreach in free education software as well as to teach software to students and groups around campus.

Undergraduate Research - NCSU ASSIST Center October 2015 – Present

- Development of prototypes wearable devices and body sensors for eventual path to market
- Focus to better health analytics and informatics

Bamboo Mobile Health August 2015 – Present

- Engineering medical devices for an aging population
- Projects include a wearable for patients with Parkinson's and an IoT needle container

IT Technician, NCSU Office of Information Technology August 2015 – May 2016

- ClassTech maintains technology in 200+ class rooms across campus, as well as responds to any immediate assistance calls

FRP Equipment Spring 2015

- CAD designer for runway painter nozzles to control liquid flow and pattern

UNCC Research Intern Summer 2014

- Nanotechnology internship to synthesize and characterize Porphyrin-POSS Hybrid Materials to explore their potential applications across plastics, fire retardants, and organic LEDs

H. Alex Hsain Junior in Materials Science & Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position
E-mail: hahsain@ncsu.edu

Project title: Micro-scale Energy Harvesting Utilizing Reverse Electrowetting Phenomenon

Project Supervisor: Dr. Michael Dickey

Project goal and Industry relevance: We are developing a reverse electrowetting energy harvesting system for low-powered electronics which converts mechanical stimulus to electrical power using a microarray of water droplets. The system stores charge at a dielectric-metal interface upon compression, and releases excess charge when the system is decompressed. In order to maximize energy output, we have employed the use of high-K dielectrics, hydrophobic surfaces, and the inherent driving force potential of the metal electrodes. Preliminary results demonstrate a baseline energy density up to 4 $\mu W/cm^2$ without the application of an additional bias or ionic charge carriers. Additionally, we have demonstrated scalability of our device by increasing effective surface area up to 120 mm^2 and by utilizing an ionic liquid for modulation, yielding an energy density of 96 $\mu W/cm^2$. This method of energy harvesting addresses crucial considerations to the wearable electronics industry by its ability to utilize a broad range of mechanical motion, its scalability to larger devices, and its potential to be made cost effective with common materials.

Other Relevant Information about me: My research interests include energy harvesting systems for wearable electronics, electrical properties of materials, and sustainable technology development. I hope to pursue a Ph.D in Materials or Electrical Engineering upon graduation and work in fields such as national security, space enterprise, or alternative energy. I am also an advocate for science literary and work with a group at NC State called SciBridge in an effort to promote engineering design and research collaborations with affiliate universities in South Africa.

Honors and Awards:
MSE Department External Advisory Board Poster Competition – 1st place (2016)
Appalachian Energy Summit IMPACT Award (2016)
AES Undergraduate Research Poster Competition – 1st place (2016)
Dr. Hans H. Stadelmeier Scholarship in Engineering (2016)
ASSIST Undergraduate Research Fellowship (2016)
NC Space Grant Undergraduate Scholar (2015)
NC Chancellor's Leadership Scholarship (2014)
National Center for Women in Information Technology Award (2014)
Virginia Aerospace S&T Scholar (2013)

Publications and Citations:
Presentations:
"Waste Not, Walk On: Mechanical-to-Electrical Energy Harvesting Utilizing Reverse Electrowetting." 8 July 2016. Appalachian Energy Summit, Appalachian State University.
"Energy Harvesting Utilizing Reverse Electrowetting Phenomenon." 8 April 2015. ACC Meeting of the Minds, Syracuse University.
"A Future for the Past: Thrust Efficiency of Semi-Flexible versus Rigid Fins for Dirigible Application." 20 June 2015. Texas A&M University.
"Enabling Efficiency: AMPB Internal Resource Database Creation" 6 August 2014. NASA Langley Research Center.

H. Alex Hsain
Raleigh, NC
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hahsain@ncsu.edu

SUMMARY

3rd year undergraduate student in Materials Science & Engineering with a focus in electronic properties of materials. Two years of experience in energy harvesting system design, and one year experience in prototyping mechanical systems for wind tunnel testing and aerospace application. Knowledgeable on various electronic and surface science equipment, including potentiostat, electrometer, contact-angle goniometer, and 3D printing. Interest in pursuing Ph.D in electronic materials or electrical engineering with a project involving piezo-, ferro-, tribo-, hermoelectrics, or other alternative energy harvesting.

EDUCATION

North Carolina State University at Raleigh, NC – 3.72/4.00 GPA **May 2018**
B.Sc. in Materials Science and Engineering

- ASSIST Undergraduate Research Fellow, University Scholars Program

EXPERIENCE

Bennett Advanced Research, LLC **June 2016 – September 2016**
Engineering Research Analyst I

Project Goal: Assist in government contract acquisitions in accordance with FAR for contracts such as SBIRs, in fields including advanced materials, additive manufacturing, IT services, and robotics.

- Strategically coordinated with contracting officers, small business specialists, and government personnel in order to cater to the technical needs of the U.S. government
- Advised on emerging technology trends directly to the CEO using market research and technical feasibility studies

North Carolina State University – Chemical Engineering Dept. **September 2015 – Present**
Undergraduate Researcher, ASSIST Fellowship

Research Goal: To convert otherwise wasted mechanical energy into usable electrical energy.

- Investigated novel energy harvesting method using reverse electrowetting phenomenon in which controlled modulation of a liquid creates a double layer capacitor effect
- Optimized and studied design parameters including modifying surface hydrophobicity, dielectric layer, electrode properties, and ionic charge carriers for the purpose of maximizing energy density in an integrated system

SciBridge – NC State Materials Science and Engineering Dept. **May 2016 – Present**
Ambassador and Technical Lead

Project Goal: Connect African and U.S. scientists and engineers to develop sustainable energy research

- Designed and assembled experimental kits to study technologies like thermoelectrics, dye-sensitized solar cells, and aluminum-air batteries
- Conducted thermoelectric heat experiments to demonstrate that various ambient temperature differentials in the surrounding environment can power small electronic devices

Texas A&M University – Aerospace Engineering Dept. **June – August 2015**
Undergraduate Researcher, NSF REU

Research Goal: Adapt propulsive efficiency of flapping-fin aquatic animals to neutrally buoyant dirigibles

- Identified aerodynamic and mechanical trends in performance as functions of material and structural properties
- Improved baseline propulsive efficiency by 33% through wind tunnel testing and an iterative design process

NASA Langley Research Center – Advanced Materials and Processing Branch
June – August 2014
Research Assistant, LARSS Program

Project Goal: Integrate equipment operation expertise into one database to improve resource acquisition

- Spearheaded the development of an equipment database by interviewing operating experts, consulting technical manuals and documenting findings, enabling greater departmental efficiency
- Contributed to the development of a hydrophobic coating for increased fuel efficiency by performing polymer characterization such as gel permeation chromatography

Ishan D. Joshipura

Ph.D. Candidate, 4th year, Chemical & Biomolecular Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship ✓Full-time position

E-mail: idjoship@ncsu.edu

Project title: Energy Harvesting via Reverse Electrowetting Using Soft Materials

Project Supervisor: Dr. Michael Dickey

Project goal and Industry relevance: This work seeks to demonstrate and develop a mechanical energy harvester (~1-5 Hz) into electrical energy using reverse electrowetting (REW). This concept is based on a 'sandwich' configuration of a drop of water or sweat between two metal electrodes. Compression and release cycles of the electrode 'sandwich' create a variable capacitor to produce ~800 mV and ~100 μA/cm^2. This device requires only a small footprint (~1 cm^2) and can be made from soft materials, such as gels or elastomers. The fabrication procedures developed in this project can be utilized to create super-hydrophobic metallic coatings that are self-cleaning, anti-icing, and corrosion resistant. Unlike previous work on REW, this work does not require a load or battery to scavenge the energy and avoids toxic materials, such as mercury (Hg).

Other Relevant Information about me:

[1] Internship with MIT Lincoln Labs related to microfluidics (2015)
[2] Recruiting captain and co-organizer of Graduate Visit Weekend (Chemical Engineering, 30+ visitors) (2015)
[3] Lab safety officer, Dickey Research Group (2014-2016)
[4] President of Graduate Student Association, Chemical Engineering (2014-2015)
[5] Lead TA (Fall 2016) and Guest Lecturer (Fall 2016, Spring 2017) for Intro Chem. Engineering

Honors and Awards:

[1] **Best Poster Awards**: o 2016 International Meeting on Electrowetting, o 2015 Triangle ECS/MRS Meeting (recognition for outstanding abstract), o 2011 AIChE National Meeting
[2] Paper on patterning of liquid metals recognized as **"Hot Paper" (2015) by Royal Society of Chemistry** and featured as **Front Cover Art**
[3] **Graduate Merit Award, NC State University** (2013)

Publications and Citations:

[1] S.-Y. Tang, **I.D. Joshipura**, M.D. Dickey et al., "Liquid metal microdroplets formed dynamically with electrical control of size and rate" *Adv. Mater.* (2016)
[2] S.-Y.Tang, Y. Lin, **I.D. Joshipura,** M.D. Dickey, et al., "Steering liquid metal flow in microchannels using low voltages" *Lab Chip* (2015)
[3] **I.D. Joshipura,** H.R. Ayers, C. Majidi, and M.D. Dickey, "Methods to pattern liquid metals." *J. of Mater. Chem. C* (2015); **"Hot Paper (2015)" and Front Cover Art**

Ishan D. Joshipura
Raleigh, NC
(919) 602-9653
idjoship@ncsu.edu

SUMMARY

Seeking an internship for 2017 or full-time position starting 2018 related wearables or consumer electronics. Chemical Engineering Ph.D. candidate with experience in micro- and nano-fabrication and electrochemistry for wearable electronics and solar cells. Research experiences blend multi-disciplinary topics in Chemical Engineering, Electrical Engineering, Material Science, and Environmental Sciences involving both experiments and computation. Previously interned at Department of Defense laboratory. Strong interpersonal and organizational skills.

EDUCATION

NC STATE UNIVERSITY
Ph.D., Chemical & Biomolecular Engineering
M.S., Chemical & Biomolecular Engineering

- *Thesis topic:* Adhesion, wetting, and electrochemical phenomena of liquid metals for wearable electronics
- *Leadership*: Lab safety officer (2014-2016), Co-organizer & Recruiting Captain for Graduate Admissions Visit Weekend (2015), President of Graduate Student Association (2013-2014)
- *Lead TA and Guest Lecturer for CHE 205 (Fall 2016)*

THE UNIVERSITY OF ARIZONA
B.S., Chemical & Environmental Engineering

- *Internships:* Schlumberger Ltd. (2012, oil & gas services)**,** NASA Space Grant Intern (2010-2011)
- *Leadership:* President (2011-2012) and Secretary (2010-2011) of AIChE student chapter

EXPERIENCE

NC STATE UNIVERSITY Raleigh, NC
Graduate Research Assistant Jan., 2014 to Present

- Conduct independent and team-based research on use of liquid metals for stretchable and wearable electronics
- Lab safety officer: Created a safer and productive working environment by leading research group in lab reorganization and implementation of monthly lab cleanup
- Trained 45 users over 2 years on chemical safety and hazardous waste management.
- Mentor and supervisor for 9 undergraduate, high school, and international students
- Technical skills: electrochemistry, microfluidics, mechanical stress-strain testing, micro and nano-fabrication, surface analysis techniques (SEM, EDS TOF-SIMS, UV-Vis Spectroscopy)
- Train researchers and maintain several lab equipment: contact angle goniometer, 4 vacuum pump systems that are critical for functioning of other equipment, electrochemistry, and 5 optical microscopes

MIT LINCOLN LABORATORY Lexington, MA
Microfluidics Research Intern June, 2015 to Aug., 2016

- Worked with interdisciplinary team (Electrical Engineers, Mechanical Engineers, Material Scientists, Physicists, and Biologists) in an applied research setting for Department of Defense-funded projects; Presented findings and conclusions of research to group leadership

UNIVERSITY OF ARIZONA Tucson, AZ
Undergraduate Research Intern May, 2011 to Dec., 2011

- Synthesis and thin film deposition of semiconductors for flexible solar cells
- Implemented research findings to conduct a case study for large-scale manufacturing of solar cells with group of 4 researchers, project supervisor, and industry sponsor
- Disseminated findings at local and national conferences; Best Poster Award at 2011 AIChE Meeting

UNIVERSITY OF ARIZONA Tucson, AZ
NASA Space Grant Research Intern Jan., 2010 to Aug., 2010

- Environmental impact modeling of dry cleaning solvents using Excel VBA and MATLAB
- Surveyed patent literature to determine state-of-art and commercial standards for dry cleaning industry

Xueqing LI Postdoc at School of EECS, Penn State University

Industry interests: Mentorship ___ Internship ✓ Full-time position

E-mail: lixueq@cse.psu.edu

Project Title: Exploring Nonvolatile Memory and Processor Architectures for Self-Powered and Adaptive Health Wellness Platforms

Project Supervisor: Vijaykrishnan Narayanan

Project goal and Industry relevance: Our ongoing work on nonvolatile processors aligned with the Self-Powered and Adaptive Low Power Platform (SAP). This work has drawn significant interest and is even leading to a new benchmarking effort by the Nanotechnology Research Initiative on nonvolatile processors. The proposed work will add a new software dimension along with specialized hardware accelerators to our existing nonvolatile processors. Specifically, we will develop a new software stack that can adapt the type and precision of its operation and underlying algorithms balancing the needs of accuracy and the unreliable nature of harvested power. We also develop an architecture to dynamically adjust the processor allocation of computing and storage resources so as to achieve the maximum computing progress and energy efficiency.

Other Relevant Information about me:
I have been working on fundamentally beyond-CMOS emerging devices and circuits for energy harvesting, signal processing, memory implementations, and non-Von Neumann computing.

Honors and Awards:

- IEEE ASP-DAC Best Paper Award (2017)
- IEEE VLSI-SOC 2016 Top 10 Contributions (2016)
- IEEE Micro Top Picks (2016)
- HPCA Best Paper Award (2015)
- Beijing Excellent Student Award (2012-2013)
- Comprehensive Scholarship of Tsinghua University (Four times: 2008, 2009, 2011, and 2012)
- Excellent Student Instructor Award of Tsinghua University (twice: 2010, 2011)
- Technical Internship Scholarship for Ph.D. Students of Tsinghua University (2010)

Publications and Citations (Selection from 50+ publications)

- ***Xueqing Li***, Qi Wei, Zhen Xu, Jianan Liu, Hui Wang, and Huazhong Yang, "A 14 bit 500 MS/s CMOS DAC using complementary current sources and time-relaxed interleaving DRRZ," *Circuits and Systems I: Regular Papers, IEEE Transactions on*, vol.61, no.8, pp.2337,2347, Aug. 2014.
- Kaisheng Ma, ***Xueqing Li*,*** Yang. Zheng, Shuangchen Li, Karthik Swaminathan, Yongpan Liu, John Sampson, Yuan Xie, Vijaykrishnan Narayanan, "Nonvolatile Processor Architectures: Efficient, Reliable Progress with Unstable Power," ***IEEE Micro***, 2016 (**IEEE Micro Top Picks Award 2015**).
- Wei-Yu Tsai, ***Xueqing Li****, Matt Jerry et al, "Enabling new computation paradigms with Hyper-FET – an emerging device," *IEEE Transactions on Multi-Scale Computing Systems (TMSCS), 2016*.
- Moon Seok Kim, ***Xueqing Li****, Huichu Liu, John Sampson, Suman Datta, and Vijaykrishnan Narayanan, "Exploration of low-power high-SFDR current-steering D/A converter design using steep-slope Heterojunction Tunnel FETs," *Very Large Scale Integration (VLSI) Systems, IEEE Transactions on, 2016*.
- Kaisheng Ma, ***Xueqing Li***, Srivatsa Srinivasa et al., "Spendthrift: Machine Learning Based Resource and Frequency Scaling for Ambient Energy Harvesting Nonvolatile Processors," **ASP-DAC 2017, Best Paper Award**.
- K. Ma, Y. Zheng, S. Li, K. Swaminathan, ***X. Li,*** Y. Liu et al., "Architecture Exploration for Ambient Energy Harvesting Nonvolatile Processors," ***21st IEEE Symp. on High Performance Computer Architecture (HPCA 2015*, Best Paper Award).**
- ***Xueqing Li***, Kaisheng Ma, Sumitha George et al., "Enabling Internet-of-Things: Opportunities Brought by Emerging Devices, Circuits, and Architectures," in VLSI-SOC 2016 (**Top 10 contributions**).
- ***Xueqing Li***, Huichu Liu, Unsuk Dennis Heo et al., "RF-powered systems using steep-slope devices," *NewCAS 2014*.

Xueqing LI
State College, PA
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lixueq@cse.psu.edu

SUMMARY

My research experience mainly includes low-power high-performance analog and mixed-signal CMOS circuit design, emerging beyond-CMOS circuits and systems design and benchmarking. I have advised undergraduate and graduate students in research. I have published 15 and 27 peer-reviewed journal and conference papers, respectively.

A. EDUCATION

- **Ph.D.** Department of Electronic Engineering, Tsinghua University, Beijing, China. 08/2007-07/2013
- **B.S.** Department of Electronic Engineering, Tsinghua University, Beijing, China. 08/2003-07/2007

B. RESEARCH INTERESTS

- Emerging beyond-CMOS device: characterization and modeling
- Emerging beyond-CMOS device: circuit and system design and benchmarking
- High-performance analog and mixed-signal CMOS VLSI design

C. RESEARCH EXPERTISE

- **Emerging circuit and system** using beyond-CMOS devices, such as Tunnel FET (TFET), Ferroelectric negative capacitance FET (FeFET or NCFET), PhaseFET, etc.
  - Device feature extraction and modeling;
  - Circuit design, including rectifier, DC-DC converter, ADC, DAC, memory, amplifier, etc.
  - Nonvolatile processor (NVP), nonvolatile memory, nonvolatile latch, nonvolatile D flip-flop;
  - Emerging system benchmarking, such as battery-less energy-harvesting systems for IoT;
- **CMOS analog and digital IC design**
  - Analog circuit design, e.g. amplifier, switch-capacitance circuits, switching-current circuits, etc.
  - Digital ASIC design and verification;
  - Measurements of fabricated chips and printed circuit board (PCB) design e.g. ADCs and DACs.

D. RESEARCH AND PROFESSIONAL EXPERIENCE

- **2013-present, The Pennsylvania State University**
  Main focus: emerging device, circuit and system modeling, design and benchmarking
  - TFET: AC-DC/DC-DC converter, amplifier, current-mode logic, ADC, DAC, memory, IoT, etc.
  - NCFET and nonvolatile systems: Nonvolatile DFF/logic/memory, analog circuits, and processors
  - Correlated material and phase-transition devices, HyperFET: sense amplifier, SRAM with improved noise margin, coupled oscillators based non-Boolean computing, low-power spiking neuron
  - Other devices and designs: SymFET modeling and voltage-controlled oscillator design; SRAM design using independently-controlled FinFET gates; ferroelectric single-electron transistor based reconfigurable BDD logic architecture, NEMS based A/D conversion and image processing
- **2013, Texas Instruments, Beijing, Internship of field application and system engineering**
  - I2C communication chip product TI TCA4311A debug and test
  - Audio switch design for portal devices with TI TS3A26746E
- **2007-2016, The Pennsylvania State University & Tsinghua University**
  - High-dynamic-range D/A converter design

E. TEACHING EXPERIENCE

- CSE 577 – VLSI System Design, Co-instructor, The Pennsylvania State University, Spring 2016
- CSE 475 – Functional Verification, Co-instructor, The Pennsylvania State University, Fall 2016

F. Professional Activities

- IEEE Member, since 2013
- Reviewer of JSSC, TCAS-I/II, TVLSI, TCSVT, TCAD, TNANO, TMTT, JEDS, Access, JEDS, etc.

Michael Lim Ph.D. 5th year – Electrical Engineering (NCSU)

Industry interests: ✓ Mentorship ___ Internship ✓ Full-time position

E-mail: lim.s.michael@gmail.com

Project title: Characterization of Adsorption by QCM for Wearable Gas Sensors

Project Supervisor: Dr. Veena Misra, Dr. Bongmook Lee

Project goal and Industry relevance: Current metal oxide (MOX) gas sensor technology is often non-selective and poses significant power concerns for mobile and wearable systems due to high temperature operation. We have previously shown room temperature response to oxidizing gases on MOX, but selectivity remains an issue. Using Quartz Crystal Microbalances (QCM), we aim to provide an understanding of room temperature adsorption rates and capacities in order to select the best MOX and analyte combinations. By selecting MOX most suited for the target gas, we may optimize gas sensor arrays by reducing cross-sensitivity effects and provide more accurate readings at ppb-level concentrations. This project utilizes ultra-thin ALD films for sensing and MATLAB for data extraction and modelling.

Other Relevant Information about me:

I have gained product design and project management skills as senior design mentor for ASSIST-based projects in the ECE department (5 teams, 2 yrs). Projects last for 1 year and teams have won 1st - 3rd place in overall ECE senior design competitions. Our goal is to create novel user-friendly healthcare/wearable product designs. I also have experience building vacuum/plasma deposition systems and a passion for applications of nanotechnology in new products.

Honors and Awards:

ASSIST student mentor leadership award

Publications and Citations:

M. Lim, A. Malhotra, S. Mills, J. Muth, B. Lee and V. Misra, "Metal oxide gas sensing characterization by low frequency noise spectroscopy", 2016 IEEE SENSORS, 2016.

A. Tanneeru, S. Mills, **M. Lim**, M. Mahmud, J. Dieffenderfer, A. Bozkurt, T. Nagle, B. Lee and V. Misra, "Room temperature sensing of VOCs by atomic layer deposition of metal oxide", 2016 IEEE SENSORS, 2016.

M. Lim, S. Mills, B. Lee and V. Misra, "Application of AlGaN/GaN Heterostructures for Ultra-Low Power Nitrogen Dioxide Sensing", ECS Journal of Solid State Science and Technology, vol. 4, no. 10, pp. S3034-S3037, 2015.

S. Mills, **M. Lim**, B. Lee and V. Misra, "Atomic Layer Deposition of SnO2for Selective Room Temperature Low ppb Level O3Sensing", ECS Journal of Solid State Science and Technology, vol. 4, no. 10, pp. S3059-S3061, 2015.

Michael Lim
Cary, North Carolina
(903)-944-9637
lim.s.michael@gmail.com

SUMMARY

I am a systems-level minded device engineer with background in gas sensor design, high capacity energy storage, and system design searching for full-time opportunities in wearable systems and product innovation. I have experience with semiconductors, analytical coding, and project management. I enjoy working on the forefront of technology and learning from hands on experience, allowing me to quickly pivot into new topics.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D.., Electrical Engineering - Nanotechnology May 2017

NCSU COLLEGE OF ENGINEERING Raleigh, NC
M.S.., Electrical Engineering Dec 2012

NCSU COLLEGE OF ENGINEERING Raleigh, NC
B.S, Electrical Engineering Dec 2010

- Cum Laude, HKN member

EXPERIENCE

ASSIST NERC (NCSU) Raleigh, NC
Ph.D. Candidate 2011-Current

- Design and fabrication of plasma enhanced vacuum systems.
- Wrote background data capture and display system for resonant MEMS (MATLAB)
- Fabrication of low power wearable gas sensors for low ppb monitoring
- Utilizing noise spectroscopy for adsorption characterization for wearable monitors
- Principal mentor for multiple senior design teams on novel wireless healthcare/wearable products

Sensus Metering Systems Inc Raleigh, NC
Engineering Intern May 2010 – Sept 2010

- Wrote code for self-building feature trees and Graphical User Interface (Java)
- Created a user-friendly excel spreadsheet to dynamically build features upon each program execution
- Output a comprehensive list of product that meet the user's inputs

FREEDM Center (NCSU) Raleigh, NC
Undergraduate Research Assistant Jan 2010 – Dec 2010

- Investigated novel rapid charging schemes for Li-ion batteries
- Reviewed Li-ion carbon electrode fatigue
- Created optical isolation circuits for solid state transformer feedback

MeadWestVaco (MWV) Raleigh, NC
Technical Intern Sept 2008 – Dec 2009

- Wrote interactive program triggered by RFID tags for use in smart packaging field (Processing).
- Created electronics for innovative consumer packaging technology.
- Assisted with voice activated microcontroller products with touch screen interface

Namita Lokare Ph.D 5th Yr Electrical & Computer Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Full-time position

E-mail: ndlokare@ncsu.edu

Project title: A FRAMEWORK FOR ACTIVITY RECOGNITION AND PREDICTION OF PHYSIOLOGICAL RESPONSES: APPLICATIONS TO HEALTH MONITORING USING WEARABLE SENSORS

Project Supervisor: Dr. Edgar Lobaton

Project goal and Industry relevance: Wearable sensors are ubiquitous in daily life. They generate vast amounts of data which in turn demands the need to develop new methods that can analyze and find causalities between various physiological parameters and prediction of these parameters. We are developing a framework which predicts the respiration rate by first clustering the activities into different groups and then creating models specific to these clusters. Activity classification is performed via hierarchical analysis based on a temporal scale and this temporal scale can be identified for periodic activities by an approach called time delay embedding. The temporal analysis captures the complex dependencies that exist between these activities. We provide a novel way to select robust parameters for classification via aggregated persistence diagrams. We also propose a feature extraction method from persistence diagrams to generate robust low dimensional features from point clouds. Different linear models that capture the relationship between heart rate and respiration rate are investigated and are compared for the performance in terms of prediction.

Other Relevant Information about me: My interests include machine learning and computer vision. I will be graduating in May and I am actively looking for fulltime opportunities. Programming languages: MATLAB, C, C++, Python and R.

Honors and Awards:
[1] GLOBALSIP 2016 Travel Grant Award
[2] Student Poster Winner @ SAS Analytics Conference 2016
[3] Research Support from NSF as a part of the ASSIST Center Jan 2015 - Present

Publications and Citations:
[1] Lokare, Namita, Daniel Benavides, Sahil Juneja, and Edgar Lobaton. "Hierarchical Activity Clustering Analysis for Robust Graphical Structure Recovery." *2016 IEEE Global Conference on Signal and Information Processing (GLOBALSIP).*
[2] Dirafzoon Alireza**, Lokare, Namita**, and Edgar Lobaton. "Hierarchical Activity Clustering Analysis for Robust Graphical Structure Recovery." *2016 IEEE Global Conference on Signal and Information Processing (GLOBALSIP).*
[3] Lokare, Namita, Laura Gonzalez and Edgar Lobaton, "Comparing wearable devices with wet and textile electrodes for activity recognition," *2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Orlando, FL, 2016, pp. 3539-3542.
[4] Lokare, Namita, Qian Ge, Wesley Snyder, Zoe Jewell, Sky Allibhai, and Edgar Lobaton. "Manifold learning approach to curve identification with applications to footprint segmentation." In *Computational Intelligence for Multimedia, Signal and Vision Processing (CIMSIVP), 2014 IEEE Symposium on*, pp. 1-8. IEEE, 2014.
[5] Qian Ge, **Namita Lokare**, and Edgar Lobaton; "Non-rigid image registration under non-deterministic deformation bounds *", Proc. SPIE 9287, 10th International Symposium on Medical Information Processing and Analysis*, 92870T (January 28, 2015.

NAMITA LOKARE
Raleigh, North Carolina
Phone- 213-509-0312
ndlokare@ncsu.edu

SUMMARY

I am a fifth year PhD student in the Electrical and Computer Engineering department at NCSU. My areas of research interest are machine learning, pattern recognition and computer vision. I am currently working on a project, which involves prediction and detection by fusing kinematic and physiological sensing information. I am using state of the art machine learning and topological data analysis methods to solve the problems.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D Electrical & Computer Engineering May 2017

UNIVERSITY OF SOUTHERN CALIFORNIA Los Angeles, CA
Masters Biomedical Engineering May 2012

EXPERIENCE

SAS Cary, NC
Machine Learning Intern May 2016 - Present

- Machine Learning, Data Mining, Statistical Modeling
- Research, development, numerical validation, testing and documentation
- Working on the ``Large-scale memory based reasoning using locality sensitive hashing" project

TRUE MOTION Boston, MA
Data Scientist Intern May 2015-Aug 2015

- Digital Signal Processing
- Supervised and Unsupervised Machine Learning
- Deep Learning and various other data analysis algorithms
- Developed models to represent physical phenomenon associated with car movements and human movements that can be measured with the sensors in a smartphone

Luis J. Lopez Ruiz Ph.D 3rd year – Electrical Engineering (UVA)

Industry interests: ✓ Internship ✓ Full-time position

E-mail: ljl2wf@virginia.edu

Project title: PROFILING, MODELING AND PREDICTING ENERGY HARVESTING FOR BODY SENSOR NETWORKS

Project Supervisor: Dr. John C. Lach

Project goal and Industry relevance: We are developing a wearable platform that enables the understanding of energy harvesting from multiple sources "in the wild." This platform collects and records behavioral, physiological, ambient conditions and energy harvesting levels data, allowing us to correlate the human and environmental parameters with the energy harvesting levels. By doing this, it is possible to create energy harvesting profiles as well as accurate predictive models to provide a framework that gives body sensor networks (BSNs) researchers and designers insights into the design of energy harvesters, low-power electronics, and dynamic power management strategies so that self-powered BSNs can be realized in real-world scenarios.

Honors and Awards:

[1] Secretaria de Educacion Publica Scholarship, Mexican Government – SEP 2011 – 2012
Given by national competition to undergraduate students.

[2] TELMEX Foundation Scholarship, Telefonos de Mexico 2007 – 2011
Given by national competition for academic excellence.

Publications and Citations:

[1] D. Fan, L. Lopez Ruiz, J. Gong and J. Lach, "Profiling, Modeling and Predicting Energy Harvesting for Self-Powered Body Sensor Networks," 13th Int. Conference on Wearable and Implantable Body Sensor Networks (BSN) 2016, pp. 402-407, 2016.

LUIS J. LOPEZ RUIZ
Charlottesville, VA
434-466-2461
ljl2wf@virginia.edu

SUMMARY

I am a Ph.D. student at UVA with a good amount of experience in hardware and system design as well as developing end-to-end embedded systems. I have worked in different applications from biomedical devices to aerospace and astrophysics instrumentation. Through this development I have been able to collaborate with partners from different disciplines and gain multiple technical and communication skills.

EDUCATION

UNIVERSITY OF VIRGINIA, SCHOOL OF ENGINEERING AND APPLIED SCIENCE Charlottesville, VA
Ph.D., Electrical Engineering Expected May 2019

- Membership: Society of Hispanic Professional Engineers (SHPE), UVA Chapter

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, FACULTAD DE INGENIERIA Mexico City, MX
B.S., Electrical-Electronic Engineering June 2012

- Membership: Sociedad de Alumnos Electricos Electronicos de la Facultad de Ingenieria

EXPERIENCE

RESEARCH EXPERIENCE
INERTIA Lab – Department of Electrical and Computer Engineering, UVA Charlottesville, VA
Graduate Research Assistant July 2014 - Present

- Researched energy harvesting and its dynamics in real-world scenarios for IoT applications.
- Collaborated with different research groups to develop and implement a self-powered platform for ECG monitoring and motion detection.
- Designed, tested and debugged several wireless sensing platforms for medical research applications.

Instituto de Ciencias Nucleares – Instituto de Ingenieria, UNAM Mexico City, MX
Research Assistant August 2013 – June 2014

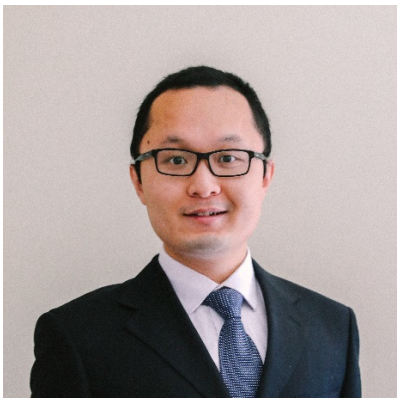
- Designed and implemented a data acquisition and monitoring system prototype for the Mini-JEM-EUSO mission to be tested in suborbital flights in collaboration with some international aerospace agencies.
- Collaborated with high-energy particles physics team for the implementation of an electronic cosmic ray detector for the Pierre Auger Observatory in Argentina.

Laboratorio de Electronica – Centro de Ciencias Aplicadas y Desarrollo Tecnologico, UNAM Mexico City, MX
Undergraduate Research Assistant August 2011 - December 2011

- Designed and implemented a low-cost 3-channel Electrocardiograph for didactic purposes.

Laboratorio de Electronica – Centro de Ciencias Aplicadas y Desarrollo Tecnologico, UNAM Mexico City, MX
Research Intern January 2010 – December 2010

- Designed and tested analog and digital modules for a data logger to be used in a fertirrigation control system.
- Collaborated in a team of two under supervision of the laboratory director.



Xiaokun Ma Ph.D. 5th year - Mechanical Engineering (PSU)
Industry Interests: Full-time position in 05/2017
E-mail: xma-me@psu.edu

Project Title: Designing Optimized Mechanical Structures for Body–Based Piezoelectric Harvesting

Project Supervisor: Dr. Chris Rahn

Project Goal and Industry Relevance:
This project takes a model-based approach to the design and optimization of mechanical structures for body-based piezoelectric energy harvesters. The goals of the project are:

- Electromechanical Modeling: Develop first principles models of PZT unimorph energy harvesters.
- Structural Design: Develop new structural design concepts for MEMS PZT/polymer structures.
- Optimization: Maximize power at the low amplitude and frequency excitations typical of human motion.
- Experimental Fabrication and Testing: Assist in device fabrication, experimentally validate models, and demonstrate improved energy harvesting performance.

This project is part of the Energy Harvesting and Storage Thrust of the ASSIST program. It builds on and expands the fundamental knowledge in energy storage and piezoelectrics while providing enabling technology in system design, optimization, and modeling. The proposed project addresses the barriers of power management and efficiency of body-based piezoelectric energy harvesting devices. Member companies will benefit from the developed technologies because they may enable new self-powered devices that require too much power for state of the art energy harvesters, including but not limited to sensory devices. This project has the potential to greatly impact the performance metrics of energy harvesting devices with significant potential applications in the medical field and beyond. Within the medical field there are many devices that could benefit from battery-free operation that can be enabled with the high performance energy harvesters developed in this project.

Honors and Awards:
[1] 2015 & 2016 IDETC/VIB Travel Award, *ASME 07/2015, 07/2016*
[2] First Prize for the 13th Mechanical Innovation Design Contest, *Tsinghua University 12/2011*
[3] Primary Engineer Certificate for Autodesk Inventor, *Autodesk 12/2010*
[4] Tsinghua Scholarship, *Tsinghua University 09/2008 - 07/2012*

Publications and Citations:
[1] **Xiaokun Ma**, Susan Trolier-McKinstry, and Christopher D. Rahn, 2016. Piezoelectric Compliant Mechanism Energy Harvesters Under Large Base Excitations. Smart Materials and Structures, 25(9), p. 095023
[2] **Xiaokun Ma**, Andrew Wilson, Christopher D. Rahn, and Susan Trolier-McKinstry, 2016. Efficient Energy Harvesting Using Piezoelectric Compliant Mechanisms: Theory and Experiment. Journal of Vibration and Acoustics, 138(2), p. 021005
[3] Hong Goo Yeo, **Xiaokun Ma**, Christopher D. Rahn, and Susan Trolier-McKinstry, 2016. Efficient Piezoelectric Energy Harvesters Utilizing (001) Textured Bimorph PZT Films on Flexible Metal Foils. Advanced Functional Materials, 26(21)
[4] **Xiaokun Ma**, Susan Trolier-McKinstry, and Christopher D. Rahn, 2016. Piezoelectric Compliant Mechanism Energy Harvesters Excited Under Large Base Accelerations. In ASME 2016 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, pp. V008T10A049
[5] **Xiaokun Ma** and Christopher D. Rahn, 2015. Efficient Aeroelastic Energy Harvesting From HVAC Ducts. In ASME 2015 Dynamic Systems and Control Conference, pp. V002T22A003
[6] **Xiaokun Ma**, Hong Goo Yeo, Christopher D. Rahn, and Susan Trolier-McKinstry, 2015. Efficient and Sensitive Energy Harvesting Using Piezoelectric MEMS Compliant Mechanisms. In ASME 2015 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, pp. V008T13A042

Xiaokun Ma
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xkma236@gmail.com xma-me@psu.edu www.linkedin.com/in/xiaokunma

OBJECTIVE

Full-time job (05/2017) in mechanical design, vibration analysis and testing, or system modeling and simulation

SUMMARY

- Solid research experience in **structural dynamics**, **vibration analysis and testing**, **system modeling and simulation**, and **aerodynamics**;
- Extensive hands-on experience in **mechanical design**, **3D drawing**, **design for manufacturability**, and **design for assembly**.

EDUCATION

The Pennsylvania State University, University Park, PA *08/2012 - Present*
M.S., Ph.D. Mechanical Engineering (Minor: Engineering Mechanics) Expected graduation date: 05/2017

Tsinghua University, Beijing, China *08/2008 - 07/2012*
B.S. Mechanical Engineering

WORKING EXPERIENCE

- **Mechanical Engineering Intern at UTC Otis Elevator Company** *05/2016 – 08/2016*
  Supervisor: Dr. Jinho Song Mentor: Dr. James Yu MASC Team, Otis Elevator Company, Farmington, CT
  - Proposed, designed, and tested piezoelectric energy harvesters for the elevator system and proved great potential to implement this green power solution for future elevator sensors;
  - Tested and recommended portable and cheaper wireless sensors to replace PMT with comparable accuracy;
  - Collected and organized roller guide, sheave, and machine information and built noise source database with engineering team in India for component comparison and Noise & Vibration models.

RESEARCH EXPERIENCE

- **Translational Microtracking System for Concentrating Photovoltaics** *01/2016 – Present*
  Adviser: Dr. Chris Rahn Mechantronics Research Lab, Penn State University, University Park, PA
  - Designed, machined, and assembled an improved cam-based mechanical tracking system with sealed box and magnetic restoring force mechanism;
  - Designed and modeled a novel thermomechanical self-centering tracking system using SMA wire.
- **Efficient Energy Harvesting Using Piezoelectric Compliant Mechanisms** *01/2013 - 12/2015*
  Adviser: Dr. Chris Rahn Mechantronics Research Lab, Penn State University, University Park, PA
  - Modeled and experimentally tested state of the art proof mass cantilever (PMC) energy harvester;
  - Designed, modeled, and fabricated a novel piezoelectric compliant mechanism (PCM) energy harvester;
  - The PCM energy harvester was proved to generate 2x more voltage and 4x more power with the same maximum strain and improve mode shape efficiency by 4x compared with the PMC at low base excitations;
  - Developed the PCM nonlinear model including axial stretching effect at large base excitations;
  - The PCM energy harvester was experimentally demonstrated to produce 50% more power and 2x more power-strain sensitivity compared with the PMC at large base excitations.
- **Aeroelastic Energy Harvesting from HVAC Ducts** *09/2014 - 05/2015*
  Adviser: Dr. Chris Rahn Mechantronics Research Lab, Penn State University, University Park, PA
  - Proposed and modeled a novel pinned-pinned beam design which has a much higher limit cycle frequency and more efficient strain distribution compared with a traditional cantilever;
  - The pinned-pinned beam design generated 4x more power-strain sensitivity than a traditional cantilever.

SKILLS

- Hardware: shaker, laser vibrometer, accelerometer, load cell, data acquisition, laser cutter, water jet cutter, PMT;
- Software: MATLAB, MAPLE, LabVIEW, SolidWorks, CAD, Inventor, Abaqus, Arduino, C, R, LaTeX, CorelDRAW.

Marzana M. Mahmud Ph.D. 3nd year - Electrical Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship __Full-time position

E-mail: mmahmud@ncsu.edu

Project title: Mechanically Resonant Chem/Biosensor based on Capacitive Micromachined Ultrasonic Transducers

Project Supervisor: Dr. Omer Oralkan

Project goal and Industry relevance: We are developing a highly sensitive chem/bio sensing system based on a mechanically resonant mass-loading sensor coated with selective functionalization layers. These sensors consist of a physical sensor and a chemical functionalization layer. Changes in parameters like mass, capacitance, and deflection can be detected by the physical sensors. A mechanical resonator when placed in the feedback loop of an electrical oscillator is able to track these changes. Microfabricated chemical sensors are advantageous over existing benchtop chemical analyzers as they are smaller in form factor, consume less power and are low cost, and is directly compatible with CMOS electronics.

Other Relevant Information about me:

My research work involves design and fabrication of Capacitive Micromachine Ultrasonic Transducers (CMUTs) and implementing them as volatile organic compound (VOC) sensor. Polymers specific to VOCs of interest are used to functionalize the CMUT devices. The sensor testing is done in a gas test chamber which has the capability of generating NIST standard trace levels of VOCs.

Honors and Awards:

[1] Chancellor's Gold Medal, East West University, Dhaka, Bangladesh (highest CGPA in Undergraduate, conferred in Convocation '12)

Publications and Citations:

[1] **M. M. Mahmud**, J. Li, J. E. Lunsford, X. Zhang, F. Y. Yamaner, H. T. Nagle, and O¨ . Oralkan, "A low-power gas sensor for environmental monitoring using a capacitive micromachined ultrasonic transducer", in Proc. IEEE Sensors Conf., 2014, pp. 677-680.

[2] **M. M. Mahmud**, M. Kumar, X. Zhang, F.Y. Yamaner, H.T. Nagle "A capacitive micromachined ultrasonic transducer (CMUT) array as a low-power multi-channel volatile organic compound (VOC) sensor", in Proc. IEEE Sensors Conf., 2015, pp. 1-4.

[3] M.Kumar, C. Seok, **M. M. Mahmud**, X. Zhang, and Ö. Oralkan, "A low-power integrated circuit for interfacing a capacitive micromachined ultrasonic transducer (CMUT) based resonant gas sensor", in Proc. IEEE Sensors Conf., 2015, pp. 1-4.

[4] C. Seok, **M.M. Mahmud**, O. Adelegan, X. Zhang and Ö. Oralkan, "A battery-operated wireless multichannel gas sensor system based on a capacitive micromachined ultrasonic transducer (CMUT) array." in Proc. IEEE Sensors Conf., 2016, pp. 1-3.

MARZANA M. MAHMUD
Raleigh, North Carolina
(919)-793-3622
mmahmud@ncsu.edu

SUMMARY

I am a PhD candidate currently working on chem/biosensor based on mechanically resonant devices utilizing the mass-loading principle. I have experience in micromachining and implementing mechanically resonant devices as sensors by functionalizing them with polymers specific to analytes of interest. I have done sensor testing for volatile organic compounds by generating NIST standard trace level of VOCs.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D, Electrical Engineering Expected Spring, 2019

EAST WEST UNIVERSITY Dhaka, Bangladesh
B.S., Electrical Engineering May, 2011

- Chancellor's Gold Medal, East West University, Dhaka, Bangladesh (highest CGPA in Undergraduate, conferred in Convocation '12)
- Dean's list award

EXPERIENCE

North Carolina State University Raleigh, NC
Graduate Research Assistant January 2014- Present

- Demonstration of a low-power (<1mW) single channel mechanical resonant Capacitive Resonant Micromachined Transducer (CMUT) based volatile organic compound sensor specific to toluene. Sensitivity achieved 270 Hz/ppm in 10 ppb resolution.
    - The sensor comprised of a 4.5 MHz CMUT resonator polymer-functionalized with polyisobutylene (PIB) and placed in the feedback loop of a Colpitts oscillator. The CMUT resonators were fabricated using a novel process based on anodic bonding.
- Design and fabrication of high quality factor vacuum-backed CMUT arrays on borosilicate glass wafers based on anodic bonding.
    - Fabricated 6-, 8-, and 15-channel prototype arrays with a standard deviation of 1 % in the parallel resonant frequency (4.5 MHz) in a 7×9-mm^2 die area. The cavities and bottom electrodes are formed on a borosilicate glass wafer. The device layer of an SOI wafer bonded on glass forms the vibrating plate on top of vacuum-sealed cavities. This fabrication approach reduces process complexity and helps minimize parasitic.
- Demonstration of selective sensing to toluene vapor between different functionalized channels.
    - Measured the response of three sensor channels, one uncoated, one functionalized with a polyisobutylene (PIB) layer, and one with a polyvinyl alcohol (PVA) layer, to 20-ppm toluene vapor. Initial measurements show 1:13:37 ratio in the response of reference: PVA: PIB channels.

University of Asia Pacific Dhaka, Bangladesh
Lecturer, Department of Electrical and Electronic Engineering October 2011-July 2012

- Conducting basic electrical circuit classes and lab sessions for inter-departmental engineering students. Periodic assessment of students through graded quizzes and examinations.

East West University Dhaka, Bangladesh
Graduate Teaching Assistant May 2011 – August 2011

- Conducting lab sessions for basic electrical circuits. Grading lab reports and quizzes.

Idellyse Martinez Ph.D. 5th year - Electrical Engineering (PSU)

Industry interests: ✓ Mentorship ___ Internship ✓ Full-time position

E-mail: ium12@psu.edu

Project title: Multifunctional and Compact Form-factor Flexible Wearable Antennas

Project Supervisor: Dr. Douglas H. Werner

Project goal and Industry relevance: The main goal of this research project is to investigate and realize customized flexible ultra-thin and small form-factor antennas that outperforms the commercially available off the shelf (COTS) technology. The wearable antenna is going to be integrated with the wearable sensors and radio systems being developed by ASSIST. Advanced global optimization techniques (e.g., CMAES, BORG) are being used in order provide a trade-off between the parameters of the antenna and its performance. Programming languages: Python, MATLAB. Software: HFSS and CST Microwave Studio.

Honors and Awards:

[5] Sloan Scholar, Alfred P. Sloan Foundation's Minority Ph.D. (MPHD) Program, awarded in 2015- 16
[4] James R. and Barbara R. Palmer Fellowship in Electrical Engineering (2013 - 2015)-The Pennsylvania State University
[3] Recipient of University Graduate Fellowship (2012) - The Pennsylvania State University
[2] Paul F. Anderson Graduate Fellowship- The Pennsylvania State University
[1] PRIDCO Scholarship, PR

Publications and Citations:

[Book Chapter] I. Martinez, A. H. Panaretos, and D. H. Werner, "Design Synthesis of Multi- and Broad-band Gap Electromagnetic Metasurfaces," Broadband Metamaterials in Electromagnetics: Technology and Applications, (Ed. D. H. Werner), Pan Stanford Publishing, (to be released).

[6] I. Martinez, and D. H. Werner, "Multilayer stacked-patch antenna optimized for on-body communications," *2016 IEEE Antennas and Propagation Society International Symposium*, 26 June – 1 July 2016, Fajardo, Puerto Rico.

[5] I Martinez and D. H. Werner, "Application of the Port-Reduction Method in the Design Synthesis of EBGs for Antenna Systems, "*2015 IEEE Antennas and Propagation Society International Symposium*, July 19-24, 2015, Vancouver, BC, Canada.

[4] S. H. Martin, I. Martinez, J. P. Turpin, D. H. Werner, E. Lier, and M. G. Bray, "The Synthesis of Wide- and Multi-Bandgap Electromagnetic Surfaces with Finite Size and Nonuniform Capacitive Loading," *IEEE Transactions on Microwave Theory and Techniques*, Vol. 62, No. 9, pp. 1962-1972, Sept. 2014.

[3] I. Martinez, and D. H. Werner, "Reconfigurable Beam Steering Metasurface Absorbers," *2014 IEEE Antennas and Propagation Society International Symposium*, July 6-11, 2014, Memphis, TN, USA.

[2] Panaretos, I. Martinez, and D. H. Werner, "Ultra-thin Wideband Absorbers Comprised of Frequency Selective Surfaces with Concentric Square Loop Elements," *2013 IEEE Antennas and Propagation Society International Symposium*, July 7-13, 2013, Orlando, FL, USA.

[1] I. Martinez, A. Panaretos, D. H. Werner, G. Oliveri, and A. Massa, "Ultra-thin Reconfigurable Electromagnetic Metasurface Absorbers," *The 7th European Conference on Antennas and Propagation (EuCAP)*, Gothenburg, Sweden, 8-12 April 2013.

IDELLYSE MARTINEZ
State College, PA
787-307-2826
ium12@psu.edu
idellyse_martinez@yahoo.com

SUMMARY

Experience in design and analysis of electromagnetic band-gap devices, absorbers, antennas, and microwave devices. Additionally, I have worked in the application of optimization algorithms for electromagnetic devices design. Furthermore, I have knowledge in MATLAB, C++, CST, HFSS, and statistical and simulation software like Minitab and ARENA.

EDUCATION

THE PENNSYLVANIA STATE UNIVERSITY COLLEGE OF ENGINEERING University Park, PA
Ph.D.., Electrical Engineering In Progress

- *Honors:* Sloan Scholar, Alfred P. Sloan Foundation's Minority Ph.D. (MPHD) Program, awarded in 2015-16, James R. and Barbara R. Palmer Fellowship in Electrical Engineering, Recipient of University Graduate Fellowship, Paul F. Anderson Graduate Fellowship
- *Leadership*: Vice- President- Boricua Grads
- *Membership*: Institute of Electrical and Electronics Engineers (IEEE)

THE PENNSYLVANIA STATE UNIVERSITY COLLEGE OF ENGINEERING San Juan, PR
M.S.., Manufacturing Engineering 2005

- *Honors:* PRIDCO Scholarship (2002- 2005)
- *Membership*: Institute of Electrical and Electronics Engineers (IEEE)

INTER AMERICAN UNIVERSITY OF PUERTO RICO Bayamon, PR
B.S. , Electrical Engineering 2002

- Honors: Inter American University of PR Annual's Dean's List (1998 – 2002) , Engineering Scholarship (1997 - 2002), Inter American University of PR Honor Roll (1997 – 2002)
- *Leadership*: Vice- President- IEEE Student Chapter

EXPERIENCE

THE PENNSYLVANIA STATE UNIVERSITY University Park, PA
Graduate Research Assistant 2012-2017

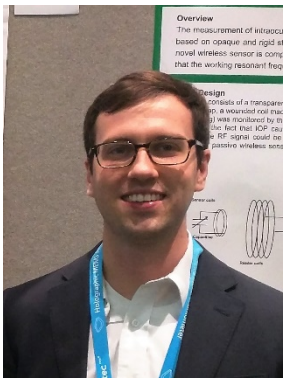
- Design of broadband isolation surfaces.
- Design of frequency selective surfaces and microwave absorbers.
- Stacked patch antenna design for on- body communications.

MECH TECH COLLEGE Vega Baja, PR
Professor of Electrical Engineering Technologies 2008 – 2012

- Experience in teaching Mathematics, Physics, Electric Circuits, Sequential Logic, Electronics, and Advanced Electronics.
- Evaluation of Curriculum.

INTER AMERICAN UNIVERSITY OF PUERTO RICO Bayamon, PR
Engineering Instructor 2005, 2001-2012

- Experience in teaching Electromagnetism II and Communications Lab (Fall 2005), Probability and Statistics, Reliability, Engineering Economy, Engineering Ethics, and Introduction to Engineering (Fall, Spring and Summer 2011-2012).



Michael D. McKnight Ph.D. 4th year – Electrical Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship __ Full-time position

E-mail: mdmckni2@ncsu.edu

Project title: Fiber-Based Sensors for Multi-modal Sensing in Biomedical Textiles

Project Supervisor: Dr. Alper Bozkurt

Project goal and Industry relevance:

We are developing fiber-based sensors, using conventional and non-conventional textile fiber production techniques, to enable multi-modal sensing. When integrated into textiles, the fibers will be capable of sensing pressure, wetness, and biopotentials. This type of sensing is enabled by utilizing novel fiber cross-sectional geometries as well as new conductive polymer materials. Alternative fiber geometries may also enable fiber-based sensing of temperature and strain. Optimization and characterization of these fiber-based sensors while integrated with conventional woven textiles can enable wearable systems capable of sensing spatial information across the body surface. Optimization and evaluation is performed using ANSYS modeling tools. Sensor characterization is primarily performed using impedance spectroscopy techniques.

Honors and Awards:

[4] NSF/IEEE Award for Young Professionals in Smart & Connected Health (2016)
[3] NSF Graduate Research Fellow (2014-2018)
[2] General Hugh Shelton Leadership Award of Excellence (2014)
[1] Dean's Doctoral Fellow (2013-14)

Journal Publications

[3] T. Latif, **M. McKnight**, M. Dickey, A. Bozkurt (under review); "In vitro electrochemical assessment of Neurostimulation Electrodes for Roach Bots"
[2] J. Dieffenderfer; H. Goodell; S. Mills; **M. McKnight**; S. Yao; F. Lin; E. Beppler; B. Bent; B. Lee; V. Misra; Y. Zhu; O.Oralkan; J. Strohmaier; J. Muth; D. Peden; A. Bozkurt, (2016) "Low Power Wearable Systems for Continuous Monitoring of Environment and Health for Chronic Respiratory Disease," in *IEEE Journal of Biomedical and Health Informatics* , vol., no.99, pp.1-1
[1] **McKnight, M**., Verderber, A., Bozkurt, A. (2014) "Early Metamorphic Insertion Technology for Insect Flight Behavior Monitoring." *Journal of Visualized Experiments*. 89. doi:10.3791/50901

Selected Conference Publications

[3] **M. McKnight**, A. Kapoor, K. Chatterjee, T. Agcayazi, H. Kausche, T. Ghosh, A. Bozkurt, "Soft, flexible 3D printed fibers for capacitive tactile sensing," *IEEE SENSORS 2016*, Orlando FL, pp 1535-1537.
[2] **M. McKnight,** T. Agcayazi, K. Kausche, T. Ghosh, A. Bozkurt, "Sensing textile seam-line for wearable multimodal physiological monitoring," *IEEE Engineering in Medicine and Biology Conference 2016*, Orlando FL, pp. 311-314. **(Best Student Paper Finalist)**
[1] **M. McKnight**, F. Lin, K. Kausche, T. Ghosh, A. Bozkurt, "Towards Paper-Based Diaper Sensors," *IEEE BioCAS 2015*, Atlanta GA.

Michael D. McKnight
Raleigh, NC
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SUMMARY

I am a 4th year Electrical Engineering Ph.D student at North Carolina State University researching the design and characterization of fiber-based biomedical sensors for smart textiles development. 3 years experience in MEMS device design, fabrication, and modeling. Futurist interested in designing for the developing world and in advanced technology policy.

EDUCATION

NORTH CAROLINA STATE UNIVERSITY Raleigh, NC
Ph.D., Electrical Engineering May 2017

- *Honors:* NSF Graduate Research Fellow, Dean's Doctoral Fellowship Recipient, Best Student Paper Finalist (IEEE EMBC), NSF/IEEE Award for Young Professionals in Smart & Connected Health, General Hugh Shelton Leadership Award of Excellence
- *Leadership*: ASSIST Student Leadership Council President, Alternative Service Breaks Advisor (2 trips)
- *Service*: NC Bugfest Volunteer, Nanodays Volunteer, Park Scholarship Application Review Committee

B.S. Biomedical Engineering/ Spanish Minor May 2012

- *Honors:* Park Scholarship (Full Merit Scholarship); Park Scholarship Grant Recipient (awarded twice)
- *Leadership:* Alternative Service Breaks Team Leader (3 trips); Acappology President (a capella group)
- *Service:* Biomedical Engineering Global Health Project Coordinator, Habitat for Humanity Shack-a-thon Team Leader

EXPERIENCE

NORTH CAROLINA STATE UNIVERSITY Raleigh, NC
National Science Foundation Graduate Research Fellow 08/2013-Present

- Design and Optimization of Fiber-based Biomedical Sensors for Smart Textile Devices
- Performed multiphysics FEA modeling of fiber sensors (ANSYS Mechanical, ANSYS Maxwell).
- Optimized fiber-based sensor design/ fabrication for multi-modal sensing (pressure, wetness, biopotentials)
- Designed, fabricated and characterized low-cost wearable paper-based screen printed sensors, and 3D printed polymer sensors.
- President (2016-17) and Education/Outreach (2015-16) Student Chair for inter-disciplinary NSF Research
- Center focusing on self-powered wearable sensor systems.
- Coordinated multiple lab outreach events including Nanodays and Engineering Open House

ENGINEERING WORLD HEALTH Durham, NC
Software Program Manager - Honduras, Volunteer 08/2012-07/2013

- Performed internal needs assessment and analysis for implementation of Healthcare Tech./ Infrastructure Mgmt. Software.
- Facilitated best-practice planning for implementation of software into national healthcare system.
- Worked internally within Honduran Ministry of Health to guide technology management initiatives for 20+ hospital healthcare system.

Miao Meng Ph.D. 3rd. year - Electrical Engineering (PSU)

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position

E-mail: mum375@psu.edu

Project title: PIEZOELECTRIC ENERGY HARVESTING CIRCUIT

Project Supervisor: Dr. Mehdi Kiani

Project goal and Industry relevance: We are developing an energy harvesting circuit to efficiently harvest energy from multiple PZT beams simultaneously to accommodate the decaying input voltage amplitude with varying envelope mostly below the required voltage across the storage supercapacitor and changing frequency. The system should also have ability to combine different boards, each supporting multiple beams and harvest energy into one same storage supercapacitor. Printed-circuit board (PCB) is used to implement the circuit with commercial off-the-shelf (COTS) components and application-specific integrated circuit (ASIC) with ultra low-power consumption will be designed and tested. ASIC design has significant role in industry. Testing the PCB and ASIC gives experience in chip and board testing, including but not limited to experimental design and equipment use.

Other Relevant Information about me:

My research interests also include integrated circuits for bio applications and ultrasound-based wireless power transfer and data communication to/with miniature implantable devices.

Honors and Awards:

[1] Nominated by department for Outstanding Teaching Assistant Awards.
[2] Dean's Honor for multiple semesters.

Publications and Citations:

Journal Papers:

[1] M. Meng and M. Kiani, "A hybrid inductive-ultrasonic link for wireless power transmission to millimeter-sized biomedical implants," *IEEE Trans. Cir. Syst. II*, 2016.
[2] M. Meng and M. Kiani, "Design and optimization of ultrasonic wireless power transmission links for millimeter-sized biomedical implants," IEEE Trans. Biomed. Cir. Syst., 2016.

Peer-Reviewed Conference Papers:

[1] M. Meng and M. Kiani, "Optimal resonance configuration for ultrasonic wireless power transmission to millimeter-sized biomedical implants," IEEE 38th Eng. Med. Biol. Conf. (EMBC), Aug. 2016.
[2] M. Meng and M. Kiani, "Design considerations for ultrasonic power transmission to millimeter-sized implantable microelectronics devices," IEEE Biomed. Cir. Syst. Conf. (BioCAS), 2015

Miao Meng
University Park, PA
608-886-7369
Mum375@psu.edu

SUMMARY

PhD student in Penn State University with strong analytical, problem solving and troubleshooting skills, as well as solid communication, team-working, and presentation skills. My research interest is low power analog/mixed-signal, energy harvesting and power management integrated circuit design for bio-applications and ultrasound-based wireless power transfer and data communication to/with miniature implantable devices.

EDUCATION

The Pennsylvania State University — University Park, PA
Ph.D in Electrical Engineering — Sept. 2014-Present

Columbia University — New York, NY
MS in Electrical Engineering — Dec. 2013

University of Wisconsin Madison — Madison, WI
B.S. in Electrical Engineering — May. 2011

EXPERIENCE

KISI, — New York, NY
Electrical Engineer Intern — Spring 2014
Developed, modified and tested the hardware of KISI smart key system

- Modified the circuit boards to fit different intercom systems according to customers' needs
- Implemented failure analysis of circuits boards to make them ready for customer to use
- Developed a feedback circuit to feed analog input into the system

IBM System and Technology Group, — Shanghai, China
IC Design Summer Intern — Summer 2012

- Participated CMOS IO driver design for IBM client, identified driver specification and presented the findings to senior technical leaders
- Optimized a 22 nm technology level shifter, and assisted in the preparation of application notes for publication
- Helped to characterize performance of the IO driver and assisted with writing datasheets
- Documented the research results on high-speed level shifters and methods of using ADXL for future reference

China Merchants Bank, — Beijing, China
Summer Intern — Summer 2009

- Provided financial consulting services for commercial bank clients
- Delivered English service to foreign clients, translation of presentations and other important documents

Steven C. Mills Ph.D. 5th year - Electrical Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position

E-mail: scmills2@NCSU.edu

Project title: Design and Fabrication of Ultra-Low Power Gas Sensors

Project Supervisor: Dr. Veena Misra

Project goal and Industry relevance:

We are developing ultra-low power gas sensors for personal environmental monitoring of air pollutants such as ozone, nitrogen oxides and volatile organic compounds to enable correlation between personal exposure data and the effects of the human body. For instance, high concentrations of ozone can significantly increase the risk of experiencing an asthma attack for many hours after the initial exposure. Low power gas sensors will become increasingly widespread and integrated into smart devices in the coming years.

Other Relevant Information about me:

While my research is focused in semiconductor fabrication and characterization, I am passionate about exposure to new technologies and fields outside my studies. I have taken every opportunity to expand my skill set through diverse internships, and leadership opportunities. This has given me experience and insight in areas including systems development, power management, tool design, programming, data analysis, modeling and statistical forecasting to name a few. In addition, I worked with the ASSIST leadership team as president of our student council to create a center that not only teaches students system level engineering, but also imparts translational skills not taught in the classroom. This experience has enriched me beyond a more traditional doctoral program. When my brain needs a rest I enjoy cycling and running and am interested in competing in triathlons.

Honors and Awards:

[2] Summa Cum Laude honor for B.S., M.S. and upcoming Ph.D. in Electrical Engineering

[1] Awarded for three years of service to the ASSIST Student Leadership Council

Selected Publications:

[3] Mills. S., et al., "Atomic Layer Deposition of SnO_2 for Selective Room Temperature Low ppb Level O_3 Sensing," *ECS J. of Solid State Sci. and Tech.*, 4 (10) S3059-S3061 (2015)

- Presented talk at Electrochemical Society's 227th meeting, Chicago (2015)

[2] Mills, S., et al., "Atomic Layer Deposited TiO_2 thin films for environmental gas sensing," *SENSORS, IEEE Proc*, pp.1-4, 3-6 Nov. (2013)

- Presented poster at IEEE Sensors, Baltimore (2013)

[1] Dieffenderfer, J., et al., "Low Power Wearable Systems for Continuous Monitoring of Environment and Health for Chronic Respiratory Disease," *IEEE J. of Biomedical & Health Informatics,* 20 (5) (2016)

Steven Mills
Raleigh, NC
540-840-1073
scmills2@NCSU.edu

SUMMARY

Systems minded electrical engineer with focus in nanoelectronics, semiconductor device fabrication and characterization. Additionally, I have broad knowledge and experience in systems development, power management, tool design, programming, data analysis, modeling, statistical analysis, health care and environmental monitoring. I am graduating this year and am interested in finding challenging full time employment.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D. Electircal Engineering, emphasis in nanoelectronics, Nanosystems Certificate May 2017

- *Honors:* Summa Cum Laude
- *Leadership*: 2 years President, 1 year as Vice President of ASSIST Student Leadership Council
- *Membership*: IEEE, Eta Kappa Nu

M.S. Electrical Engineering May 2012

- *Honors: Summa Cum Laude*

B.S. Electrical Engineering May 2010

- *Honors: Summa Cum Laude, William D. Stevenson Scholarship, Progress Energy Scholarship*
- *Leadership*: 1 year Eta Kappa Nu Treasurer

EXPERIENCE

SAS Institute Research Triangle Park, Cary NC
Graduate Intern Fellow 5/2016-present

- Proposed to senior management, implemented and optimized Time Series Motif Discovery benchmarking algorithm in SAS and Lua.
- Developed documentation and examples for time series forecasting models in SAS VIYA

Cisco Systems Research Triangle Park, Durham NC
Choice Software Intern Summer 2010

- Automated R&D testbed device verification using TCL scripting

North Carolina State University Raleigh, NC
Graduate Research Assistant August 2010-present

- Created ultra-low power metal oxide environmental gas sensors via experimental plan including tool design, fabrication, characterization, data analysis and system integration
- Improved reliability of Atomic Layer Deposited dielectrics through Weibull analysis of various deposition and annealing conditions
- Managed lab tools and supplies for four years
- Mentored and supervised three junior lab members over four years

OTHER PROJECTS

- Built COTS sensor system including embedded code, power management and data transmission
- Developed home based fall detection system for elderly from market analysis to prototype
- Designed and built inductively powered battery free wireless mouse
- Programmed ARM CortexM0 based tilt sensors and touch screen interface
- Assembled and tested function generator, linear and switching power supplies

Amanda C Myers Ph.D. 4th year – Mechanical Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position

E-mail: acmyers3@ncsu.edu

Project title: KNIT TEXTILES FOR PASSIVE THERMAL MANAGEMENT TO IMPROVE ON-BODY ENERGY HARVESTING

Project Supervisor: Dr. Jesse S. Jur

Project goal and Industry relevance: We are developing an energy harvesting map of the human body based on computational and finite element modeling and experimental human trials. This information enables market-specific design for energy harvesting wearables. In the design of the human trial experiments we have studied and modified the electronic-textile integration techniques. Using a whole garment knitting machine enables us to provide thermal management via knit structure in specific locations. With this equipment we are able to customize individual shirts to suit different needs.

Other Relevant Information about me:

I am a disciplined and dedicated worker. Running, triathlons, traveling, singing, and learning foreign languages are just some of the extracurricular activities I participate in so I have learned how to manage my time efficiently to get everything done.

Honors and Awards:

[1] Winning project (H2O) at PDMA Innovate Carolina competition 2015

[2] Graduate Fellow Academic Scholarship 2012

[3] ExxonMobil Scholarship 2011

[4] Shields Scholarship 2008-2012

Publications and Citations:

[1] S. Yao, **A.C. Myers**, A. Malhotra, F. Lin, A. Bozkurt, J.F. Muth, Y. Zhu, A Wearable Hydration Monitor with Conformal Nanowire Electrodes, Adv. Healthc. Mater. 6 (2017).

[2] **A. Myers**, R. Hodges, J.S. Jur, Human and Environment Infuences on Thermoelectric Energy Harvesting Toward Self-Powered Textile- Integrated Wearable Devices, MRS Adv. (2016). doi:10.1557/adv.2016.316.

[3] **A.C. Myers,** H. Huang, Y. Zhu, Wearable silver nanowire dry electrodes for electrophysiological sensing, RSC Adv. 5 (2015) 11627–11632. doi:10.1039/C4RA15101A.

[4] L. Song, **A.C. Myers**, J.J. Adams, Y. Zhu, Stretchable and reversibly deformable radio frequency antennas based on silver nanowires., ACS Appl. Mater. Interfaces. 6 (2014) 4248–53. doi:10.1021/am405972e.

AMANDA C MYERS
Raleigh, NC
501.951.0286
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SUMMARY

I am a mechanical engineer with a strong multidisciplinary background. During my tenure at North Carolina State University, I have acquired a skillset that supplements the multidisciplinary requirements of designing, developing, and producing wearable devices. This includes garment design and knitting, CFD modeling, and creating several new applications for flexible silver nanowire technology.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D.., Mechanical Engineering December 2017

- *Honors:* PDMA Innovate Carolina Winner 2015
- *Leadership*: ASSIST SLC President 2014-2015
- *Membership*: ASME, MRS, State Chorale

MISSISSIPPI STATE UNIVERSITY Starkville, MS
B.S.., Mechanical Engineering May 2012

- *Honors:* Summa Cum Laude

EXPERIENCE

next LAB Raleigh, NC
Graduate Research Assistant August 2014 - current

- Designed a knit shirt using Apex3 software and fabricated using a Shima Seiki WholeGarment knitting machine.
- Planned a human trials experiment to create a body map for thermal energy harvesting using the thermoelectric devices embedded into an armband, headband, and a knit shirt
- Correlated various environmental and physiological factors to determine ideal scenarios for thermal energy harvesting
- Modeled a thermoelectric device, using ANSYS FLUENT, integrated with a knit to calculate the thermal disturbance in the textile caused by the electronics

NANOMECHANICS AND NANOENGINEERING LAB Raleigh, NC
Graduate Research Assistant August 2012 – August 2014

- Developed a flexible, stretchable, dry electrode for bioelectronic sensing using silver nanowires embedded in a silicone substrate
- Characterized a stretchable patch antenna made with silver nanowire technology for both strain sensing and wireless communication
- Invented a noninvasive hydration sensor using silver nanowire technology

ARGONNE NATIONAL LABORATORY Lemont, IL
Student Researcher May 2011 – August 2011

- Implemented and expanded GREET model to study the production of biofuels from lignocellulosic feedstocks
- Applied thermodynamic models of ethanol production to examine the impact of biofuel production on the environment

ADVANCED COMBUSTION ENGINE LAB Starkville, MS
Undergrad Research Assistant May 2010 – September 2010

- Established safety procedures for the setup of laboratory equipment and experiments
- Rebuilt modified diesel engines to test dual-fuel (diesel and biofuel) mixing combustion stability and efficiency

Taylor V. Neumann Ph.D. 2nd year - Chemical Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship ✓ Full-time position

E-mail: tvneuman@ncsu.edu

Project title: Liquid Metals for Flexible Thermal Energy Harvesters

Project Supervisor: Dr. Michael Dickey

Project goal and Industry relevance: We are developing a flexible thermoelectric device designed to harvest energy through body heat. Making the device conform to the user's movement is accomplished by encasing high efficiency thermoelectric legs embedded in flexible materials. Liquid metal allows for flexible interconnects to be formed the thermoelectric legs. Computational models have been used to predict how various changes to the device can affect power output, and those changes are currently being explored to bring this device up to power output goals. Wearable energy harvesters have significant potential for use in medical fields for powering small sensors.

Other Relevant Information about me:

My research focuses on using liquid metals to design flexible and stretchable electronics. In addition to this, I have spent substantial time working with 3D printers and the software tools associated with computer aided design. During my time as a graduate student, I have taken on roles as a Safety Officer within my lab group, as an officer for the Graduate Student Association, and as a Recruiting Captain.

Honors and Awards:

[1] Graduate Merit Award

[2] ExxonMobil LOFT Fellow

[3] Society of Hispanic Professional Engineers Foundation Scholarship

[4] National Institute for Leadership Advancement graduate

Publications and Citations:

[1] Neumann, T. V. & Dickey, M. D. Recent applications of liquid metals featuring nanoscale surface oxides. Proc. SPIE 9871, Sensing and Analysis Technologies for Biomedical and Cognitive Applications (2016).

[2] Dimick, P., Yang, H., Neumann, T. et al. Promoting Efficient Adsorbent Bed Operation through Direct in-Situ Monitoring for Desulfurization of Distributed Energy Resources. Proc. AIChE (2014).

[3] Yang H., Dimick, P., Neumann, T. et al. Oxidative Sulfur Removal for Distributed Energy Resources. Proc. AIChE (2014).

Taylor V. Neumann
Raleigh, NC
256-656-6919
tvneuman@ncsu.edu

SUMMARY

After working as a co-op research engineer, I determined to pursue graduate school to gain practice in scientific research. My work thus far has focused on utilizing liquid metals and 3D printing technologies for the manufacturing of soft electronics. I have acquired an expertise in CAD modeling software, as well as in the operation and handling procedures for 3D printers and associated materials. My current collaborations are helping me to expand my knowledge of electrochemistry to aid in the design of electronics.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D., Chemical Engineering May 2017

- Research focus on the use of liquid metal to design flexible and stretchable electronics
- Lab Safety Officer, Dickey Group
- Graduate Student Association Webmaster
- Recruiting Captain

AUBURN UNIVERSITY Auburn, AL
B.S., Chemical Engineering May 2015

- Vice-President, Tau Beta Pi, Alabama Alpha
- Vice-President, Society of Hispanic Professional Engineers
- Webmaster, American Institute for Chemical Engineers

EXPERIENCE

INTRAMICRON, INC. Auburn, AL
Research Engineering Co-Op August 2012 - May 2015

- Evaluated and optimized performance of a heterogeneous oxidative desulfurization catalyst for the removal of hydrogen sulfide and simple mercaptans from natural gas, biogas, and syngas.
- Prepared sintered metallic nonwovens for use in advanced thermal management systems, specifically for controlling the temperature profile in Fischer-Tropsch synthesis reactors.
- Developed and manufactured composite materials for the rapid cooling of high discharge rate batteries using manufactured microfibrous metallic media.
- Designed and executed the scale up of a sulfur removal reactor from lab scale to pilot scale.
- Participated in the development of an in-situ fiber-optic sensor to determine adsorbent bed saturation.

BLOSSOMWOOD SWIMMING ASSOCIATION Huntsville, AL
Assistant Manager 2012

- Supervised a team of six lifeguards per shift, ensured shift rotations went smoothly, pool maintenance was maintained, and active problem solving with patron complaints, with an overall goal of safety.

Amin Nozariasbmarz Ph.D. 4th year – Electrical Engineering - Nanoelectronic (NCSU), Minor: Materials Science and Engineering

Industry interests: ✓ Full-time position

E-mail: anozari@ncsu.edu

Project title: In-situ Sintering Decrystallization of Thermoelectric Materials Using Microwave Radiation

Project Supervisor: Prof. Daryoosh Vashaee

Project goal and Industry relevance: We are developing nanostructured thermoelectric for body heat harvesting. We optimize the thermoelectric generators from raw materials to device level. We use different techniques to synthesize nanostructured materials. Our developed thermoelectric generators show 4 to 7 times higher power in comparison to the best COTS thermoelectric generators. We collaborate with ASSIST to use our thermoelectric generators in wearable devices. We use different techniques to characterize the transport properties, phase evolution and microstructure of synthesized samples.

Other Relevant Information about me:
I am currently a PhD candidate in Electrical Engineering (nanoelectronics) and with a minor degree in Materials Science and Engineering at North Carolina State University. My Bachelor and Master degrees were also in Materials Science and Engineering. I anticipate completing my PhD on March 2017.

Honors and Awards:
Graduate Assistantship Fund, Oklahoma State University (2013-2015)
Graduate Assistantship Fund, North Carolina State University (2015-now)
Financial award and research grant from Iran Nanotechnology Initiative Council (2009)

Selected Publications and Citations:

1. **A. Nozariasbmarz,** A. Agarwal, Z. A. Coutant, M. J. Hall, J. Liu, R. Liu, A. Malhotra, P. Norouzzadeh, V. P. Ramesh, Y. Sargolzaeiaval, F. Suarez, M. C. Öztürk, D. Vashaee, Thermoelectric Silicides: A Review, accepted for publication in Japanese Journal of Applied Physics (2016).

2. **A. Nozariasbmarz**, P. Roy, Z. Zamanipour, J. H. Dycus, M. Cabral, J. Lebeau, J. S. Krasinski and D. Vashaee, "Comparison of Thermoelectric Properties of Nanostructured Mg_2Si, $FeSi_2$, SiGe, and Nanocomposites of SiGe-Mg_2Si, SiGe-$FeSi_2$", APL Materials, 4 (10), 104814 (2016).

3. **A. Nozariasbmarz**, Z. Zamanipour, P. Norouzzadeh, J. S. Krasinski and D. Vashaee, Enhanced Thermoelectric Performance in Metal/Semiconductor Nanocomposite of Iron Silicide/Silicon Germanium, RSC Advances, 6 (55), (2016) 49643-49650.

4. Francisco Suarez, **Amin Nozariasbmarz**, Daryoosh Vashaee and Mehmet C. Öztürk, Designing Thermoelectric Generators for Self-Powered Wearable Electronics, Energy & Environmental Science, 9, (2016) 2099-2113.

5. P. Norouzzadeh, **A. Nozariasbmarz**, D. Vashaee, "Thermal Conductivity of Nanostructured Silicon Germanium in Amorphous Limit" Journal of Applied Physics 117 (21), (2015) 214303.

6. P. Amrollahi, A. Ataie, **A. Nozari**, E. Seyedjafari, A. Shafiee, "Cytotoxicity Evaluation and Magnetic Characteristics of Mechano-thermally Synthesized CuNi Nanoparticles for Hyperthermia", Journal of Materials Engineering and Performance 24, (2015) 1220-1225.

7. **A. Nozariasbmarz**, A. Tahmasbi Rad, Z. Zamanipour, J. S. Krasinski, L. Tayebi*, D. Vashaee, " Enhancement of Thermoelectric Power Factor of Silicon Germanium Films Grown by Electrophoresis Deposition" Scripta Materialia, 69, 7 (2013) 549-552.

8. **A. Nozari**, A. Ataie, S. Heshmati-Manesh, "Synthesis and Characterization of Nano-crystalline TiB_2 Powder by Mechanically Activated SHS Route", Materials Characterization, 73 (2012) 96-103.

Total citations: 54

Amin Nozariasbmarz
Raleigh, North Carolina
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SUMMARY

I am an expert materials scientist working on electronic materials. I have several years of expertise on fabrication nanostructured materials and thermoelectric materials. I have the experience of making high efficient thermoelectric materials generators from raw materials to device level along with characterizing transport

EDUCATION

North Carolina State University (NCSU)
Ph.D., Department of Electrical and Computer Engineering, **(2015-present)**
Minor: Materials Science and Engineering
Supervisor: Prof. Daryoosh Vashaee
Thesis Proposal:
In-situ Sintering Decrystallization of Thermoelectric Materials Using Microwave Radiation

Oklahoma State University (OSU) (Transferred to NCSU)
Ph.D., Department of Chemical Engineering/Materials Science and Engineering **(2013-2015)**
Supervisor: Prof. Daryoosh Vashaee
Thesis Proposal:
In-situ Sintering Decrystallization of Thermoelectric Materials Using Microwave Radiation

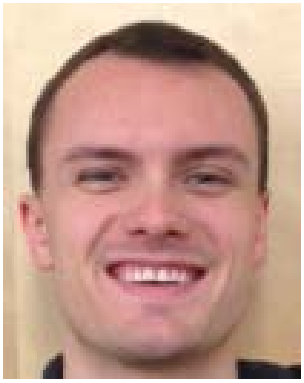
University of Tehran
M.Sc., Metallurgy and Materials Engineering **(2008-2011)**
Supervisors: Prof. Abolghasem Ataie, Prof. Saeed Heshmati-Manesh
Thesis Proposal:
Synthesis and Characterization of TiB2 Nanoparticles by Mechanical Alloying

Sharif University of Technology
B.Sc., Materials Science and Engineering **(2004-2008)**
Supervisor: Prof. Sirous Asgari
Thesis Proposal:
Effect of Double Stage Annealing on Yield Strength of Age-hardenable Alloying Steel

EXPERIENCE

INTERNSHIP COMPANY/ORGANIZATION

Research Assistant Summer 2016
Oklahoma State University – Tulsa, Oklahoma



Matthew Ridder M.S. 2nd year - Electrical Engineering (UVA)

Industry interests: ___Mentorship ___Internship ✓ Full-time position

E-mail: mjr3vk@virginia.edu

Project title: SAP Tested: Towards a Self-Powered Wearable Wireless Sensor System

Project Supervisor: John Lach

Project goal and Industry relevance: We are developing a self-powered wearable wireless sensor system for ECG and motion monitoring. This system can be used for health monitoring applications and is much more effective than traditional means of patient data collection because it can continuously capture large quantities of data from a variety of sensors for long periods of time. This can help people improve their healthcare by providing information that can help diagnose diseases, giving information on how to manage diseases, and providing just-in-time interventions through alerts to healthcare professionals. Our lab focuses on the physical integration of the COTS and ASSIST custom components to create this system. Some of the common tools we use include Altium Designer for the schematic capture and layout of our PCBs and C programming to develop the firmware for the COTS components.

Other Relevant Information about me:

- Past SECRET security clearance (2012-2013)
- U.S. Citizen

Honors and Awards:

Louis T. Rader Chairperson's Award 2015
Exceptional academic ability

Raytheon Scholar 2014
Merit-based scholarship

MATTHEW J. RIDDER
Charlottesville, VA
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mjr3vk@virginia.edu

PROFILE

I am a graduating Master's student at the University of Virginia with past security clearance that has developed a broad background in engineering through my educational learning experiences and through my practical skills developed during summer internships at the Naval Research Lab. The projects that I have been involved in have focused on hardware design and have included analog and digital circuit design, printed circuit board design and layout, and microwave and RF engineering. I am seeking an opportunity in government or industry to join an interdisciplinary team of engineers to design, develop, and deploy systems that have a real-world impact.

EDUCATION

University of Virginia Charlottesville, VA
M.S. Electrical Engineering, GPA 3.85, Aug 2017 (thesis topic: body sensor testbed system design)
B.S. Computer Engineering & B.S. Electrical Engineering, GPA 3.92, May 2015

EXPERIENCE

University of Virginia Charlottesville, VA
Graduate Research Assistant Summer 2015–Present

- Lead engineer in charge of developing the Self-Powered and Adaptive Low-Power Platform (SAP) for the Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST). This involves testing and improving a number of microelectronic components and integrating them onto a custom printed circuit board, as well as acting as a coordinator between the study developer and the engineering team. The microelectronic components include energy harvesters, a power management unit, a low-power Bluetooth radio, a real-time clock, and a custom System-on-Chip

University of Virginia Charlottesville, VA
Undergraduate Research Assistant Fall 2013–Summer 2015

- Team member working with graduate students to test and evaluate ozone sensor daughterboards
- Independently designed and laid out a printed circuit board for an analog front-end for a wheezing detection system

Naval Research Laboratory Washington, DC
Engineering Technician Summer 2012 and 2013
Tactical Electronic Warfare Division, Electronic Support Measures Branch

- Developed Matlab code to assist team in the data analysis of an antenna system
- Set up, tested, and analyzed a radar system in an anechoic chamber
- Improved the speed and user interface of software used to analyze data from a radar system

Sohini RoyChoudhury Ph.D. 3rd year - Electrical and Computer Engineering (FIU)
Industry interests: ✓Mentorship✓Internship✓Full-time position
E-mail: sroyc003@fiu.edu **Phone:** +1 (929) 249-8695

Project title: A lab-on-chip device to continuously monitor wound chronicity through an enzymatic label free electrochemical sensing platform

Project Supervisor: Dr. Shekhar Bhansali

Project goal and Industry relevance: The goal of this project is the development of a point of care label free electrochemical sensor for rapid wound diagnostics. Wound healing represents a complex process, initiated to restore tissue damage and patients need to rely on medical staff for physical inspection of the wounds, which requires repeated trips to clinics or prolonged hospitalization. This project seeks to explore the success of a wearable transdermal electrochemical wound sensor as an adjunct for implementation in wound clinical studies of diabetic patients to monitor wound healing in such affected patients. Patients will be monitored continuously to monitor wound severity, correlating healing progression through its healing stages, aiming towards efficient and effective treatment through early intervention prior to permanent tissue damage. We are working to design an in-vitro electrochemical cell based transdermal wound monitoring system performing in-vitro investigation of transdermal wound healing, correlating its chronicity with effects of changes in uric acid in wounds.

Other Relevant Information about me:

Having worked with different kinds of materials and having been exposed to approaches of enzymatic electrochemical sensing; my interests lie in the development and micro-fabrication of sensors through this approach using a label free technique. Through my studies, I have explored the chemistry and bio-chemistry of different nano-materials, their properties and their behavioral changes under different environmental conditions. Growth of various kinds of nano- material and investigating their behavior under various conditions of temperature, pressure and humidity; has also been a part of my forte. Progressing towards advancement in health diagnostics, I have a keen interest in the design and fabrication of miniaturized, lab-on-chip devices which can employ ultra low power (μW range) for continuous, point-of-care monitoring of bio-analytes in the human body. Design of a biosensor for the concerned purpose involves using the right kind of material which is bio-compatible and entails non-invasive, label free sensing techniques for continuous, repeatable, reusable and hassle-free sensing.

Publications and Citations:

[1] S. RoyChoudhury, P. Manickam, Y. Umasankar, S. Bhansali, “Enzyme functionalized metal nanostructures for enhanced electrochemical detection of lactate”, ECS Transactions, 2015, v. 69, issue 37, 7-15

[2] S. RoyChoudhury, V. Rawat, A.H. Jalal, S.N. Kale, S. Bhansali, “Recent advances in metamaterial split-ring-resonator circuits as biosensors and therapeutic agents”, Biosensors and Bioelectronics, 86, 595–608, 2016

[3] P. Manickam, S. Roychoudhury, Y. Umasankar , S. Bhansali, “Biosensor device for continuous monitoring of lactate”, 2015 Defense Innovation Summit - SBIR/STTR Summit, Dec 1-3 2015, Austin, Texas, United States

SOHINI ROYCHOUDHURY
Florida International University, Miami, FL
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SUMMARY

After schooling from Loreto House (Kolkata, India) and graduating in Electronics and Communication Engineering from Sikkim Manipal Institute of Technology (SMIT), India I have worked as a systems engineer in Tata Consultancy Services (TCS) for 3.5 years with experience in a Java/J2EE based development project of Citibank NA in the domain of banking and financial services. Presently, self is a 3rd year PhD student, pursuing graduate studies in Electrical and Computer Engineering at Florida International University (Miami, FL, USA), with interests in simulation and finite element modeling of in-vivo environments and design and micro-fabrication of point of care biosensors.

EDUCATION

FIU COLLEGE OF ENGINEERING AND COMPUTING Miami, FL
Ph.D., Electrical and Computer Engineering

- *Honors:* Graduate Assistantship
- *Leadership*: ASSIST Student Representative, Florida International University
- *Membership*: ECS Student Chapter, Florida International University

UNDERGRADUATE UNIVERSITY Sikkim, India
B.S., Electronics and Communication Engineering August 2010

EXPERIENCE

GTL Kolkata, India
Telecommunication Engineer Intern December 2013

Objective was to provide calls with good network coverage over good bandwidth to customers in a certain area, aiming at learning the working of GSM networks and on how to minimize call drop rates in a certain region over some distance with proper direction of different antennae using magnetic compasses over telecom towers, to accomplish full phased functionalities of a cellular mobile network operator. This involves reaching a favorable location through GPS while, keeping a check on the handover, congestion rate and interference which are the main factors to affect call drop rate in a certain area over a certain distance, through TEMS software. If this rate was high, analysis of its reasons were carried out, with work on rectifying it and preparing a report accordingly as to whether the site could prove to be a favorable GSM cell site or not, in order to set up the BTS. Contribution to this project entailed identification of the nearest telecom tower in the area.

Tata Consultancy Services Kolkata, India
Systems Engineer March 2011- August 2014

- Analysis of business requirement documents in existing business processes, preparation of functional and technical design documents; with system and requirement analysis of the application for development.
- Handled a small team of juniors and distributed the work well within the team
- Involved in code development activities
- Test cases/ scripts validation and integration testing, managed using the tool HP Quality Centre and simultaneously create defect logs while testing the concerned application
- Communication with various teams working on the application
- Interaction with the client on daily basis for various issues arising during the Project Life Cycle and identifying the functional gaps in a business requirement with clarifications from the business users
- Release support and assisting other teams in resolving any application related issue if found

Tahzib Safwat Ph.D. 4th year - Mechanical Engineering (PSU)

Industry interests: ✓ Mentorship ✓ Internship ___ Full-time position

E-mail: tahzib@psu.edu

Project title: CHEST STRAIN ENERGY HARVESTER

Project Supervisor: Dr. Christopher D. Rahn

Project goal and Industry relevance:

Breathing is the most consistent source of kinetic energy in the body and the human chest has a large circumferential displacement while breathing. Some of the mechanical energy associated with the expansion of the human chest can be converted to electrical energy to power biomedical sensors. The goal of this project is to develop strain energy harvesters using smart materials and electromagnetic devices. Challenges include making a device that is compliant enough to be comfortably wearable, but still generates a high amounts of power, while keeping the design durable. Mechanisms are being explored that can provide the highest amount of strain with the lowest amount of input energy. By changing the cross-sectional area or increasing the number of loops, the energy harvesting and mechanical characteristics can be modified to meet the needs of other applications as well.

Other Relevant Information about me:

I have previously worked with other smart materials applications as wearable actuators in the biomedical field. The terpolymer (i.e. P(VDF-TrFE-CFE)) actuators, made by a company called Novasentis, were studied and used to give haptic feedback to balance information to someone who uses leg prosthetics.

Publications and Citations:

[2] GE 2016 Student Research Summit. Poster Session. “Electroactive Polymer Rotary Motor.”

[1] Safwat, T., Tosto, R., Grissom, M. D., & Rahn, C. D. "*A Dynamic Model of Electrostrictive Unimorph Actuators for Haptic Devices*." ASME 2016 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. American Society of Mechanical Engineers, 2016.

TAHZIB SAFWAT
State College, PA 16801
(814) 852-8206
tahzib@psu.edu

EDUCATION

- **Penn State University, Fall 2013 – Present**
  Ph.D. in Mechanical Engineering (GPA: 3.7)
  Advanced actuators: smart materials, dynamic systems modeling, haptics, vibrations, energy harvesting
- **Stony Brook University, Fall 2006 – Spring 2011**
  B.E./M.S. in Mechanical Engineering, Magna Cum Laude (GPA: 3.8)
  Heat transfer: heat exchangers, solar thermal collectors, building energy management

EXPERIENCE

- **Graduate Research Assistant, Penn State University, 9/2014 – Present**
  Mechatronics Research Lab directed by Dr. Christopher Rahn
  - Experiment and modeling of electroactive polymer (EAP) actuators, mainly ferroelectric relaxor terpolymers, for applications in haptics feedback devices
  - A rotary motor that is powered by EAP actuators was designed and tested
  - Wearable vibrotactile arrays using EAP actuators were investigated and used to build a prosthetic foot that provides the user with balance information via haptic feedback
- **Graduate Teaching Assistant, Penn State University, 8/2013 – 12/2014**
  Graded students' work, organized labs, and held review sessions. Courses: Industrial Robotics (ME 456), Mechanical Design (ME 360), Modeling of Dynamic Systems (ME 450)
- **Design Engineer, Thomas C. Wilson LLC, 9/2011 – 8/2013, returned for the summer on 6/2014 – 8/2014**
  - Designed new industrial tools and devices to be introduced to the market from concept to manufacturing and updated designs of many existing products
  - Managed several projects and collaborated with external engineering firms to achieve project milestones
  - Planned cost effective and time effective manufacturing processes/materials for parts
  - Performed standard quality control, product testing, and investigated reasons for tool failure
  - Optimized manufacturing process routing/materials and maintained CAD drawings for existing products
  - Managed multiple new design projects while concurrently handling daily manufacturing and production issues
  - *Some completed projects (new products)*: Pneumatic tool manipulation system with tool lubricator, Electric motor torque controller, Tube cutting device with pneumatic blade activation, 3-point mechanical hole gage set
- **Graduate Research Assistant, Stony Brook University, 9/2010 – 5/2011**
  Participated in the development of a building heating system that combines geothermal (groundwater) storage and solar energy. Designed a conceptual model of the Hydronic Solar Wall—a solar thermal energy collection system proposed by Dr. Lin-Shu Wang and mathematically simulated it under various flow rate profiles and system specifications. With an optimized input, it may be possible to increase the COP of the system by storing solar thermal energy in a groundwater reservoir during the day and using the reservoir as a sink for heat pumps at night.
- **Intern/Mechanic, AR-TECH International Inc., 9/2010 – 5/2011**
  Worked with AutoCAD, helicopter parts, designed a test stand to test an APU, and performed hands-on maintenance.
- **Intern, B&B Sheet Metal, 6/2010 – 8/2010**
  Worked with AutoCAD and designed sheet metal parts used in building construction.
- **Stony Brook University Strategic Partnership for Industrial Resurgence (SPIR) Project, 11/2009 – 1/2010**
  Created a complex 3D perfume bottle design on Autodesk Inventor based on sketches by artists for rapid prototyping.

ACHIEVEMENTS \ CERTIFICATIONS

- University Graduate Fellowship, 2013, Mechanical and Nuclear Engineering, Penn State University
- Inaugural member of Tau Beta Pi Young Engineers Organization, NY Chapter, 2013
- Award of Honor for Outstanding Achievement, 2011, Mechanical Engineering, Stony Brook University
- Strategic Partnership for Industrial Resurgence (SPIR) Award, 2011, Mechanical Engineering, Stony Brook University (for SPIR Project)
- Engineer-in-Training (EIT) – Certificate No.: 088045, Issued: 8/8/2011, State: NY
- Academic Achievement Award, 2009, Stony Brook University
- FAA Aircraft Mechanic Certification in Power Plant: July 2006

Yasaman Sargolzaeiaval Ph.D. 2nd year - Electrical Engineering (NCSU)

Industry interests: ✓ Internship

E-mail: ysargol@NCSU.edu

Project title: FABRICATION OF FLEXIBLE THERMOELECTRIC GENERATORS USING METAL INTERCONNECTS

Project Supervisor: Dr. Mehmet C. Ozturk

Project goal and Industry relevance: We are working on fabrication of wearable and flexible thermoelectric generators (TEGs) to harvest body heat and generate electricity. We are investigating and developing several methods to alter the encapsulating elastomer's thermal conductivity which will increase the output power of TEGs. A model has been developed in our group for our devices which can predict the output power for different TEGs with different sizes, shapes, fill factors, and materials. We are using this model to optimize our TEGs. To make a completely flexible device, metal interconnects are used.

Other Relevant Information about me:

I am currently a PhD student in Electrical Engineering, Nanoelectronics and photonics at North Carolina State University. I did my Masters and Bachelor degrees in Electronics Engineering and worked on superconductor based photon detectors for three years as a research assistant in my Masters degree.

Honors and Awards:

[1] Graduate Assistantship fund, North Carolina State University (2015-now)
[2] Graduate assistantship fund, Sharif University of Technology, Tehran, Iran (2011-2014)
[3] Accepted for Masters program as an exceptional talented student, Sharif University of Technology, Tehran, Iran (2011)

Publications and Citations:

[1] **"Thermoelectric Silicides: A Review**", A. Nozariasbmarz**,** A. Agarwal, Z. A. Coutant, M. J. Hall, J. Liu, R. Liu, A. Malhotra, P. Norouzzadeh, V. P. Ramesh, **Y. Sargolzaeiaval**, F. Suarez, M. C. Öztürk, D. Vashaee, accepted for publication in Japanese Journal of Applied Physics 2016.

[2] **"Properties of symmetric Y-Ba-Cu-O BiCrystal Grain-Boundary short Josephson Junctions", Y. Sargolzaei Aval,** R. Mohajeri, and M. Fardmanesh, 22nd Iranian Conference on Electrical Engineering, Shahid Beheshti University, Tehran, Iran, 20 to 22 May 2014.

[3] **"Optical Response of Bicrystal and Step-edge Y-Ba-Cu-O Josephson Junctions", Y. Sargolzaeival,** R. Mohajeri, and M. Fardmanesh, International Conference on the Superconductivity and Magnetism(ICSM 2014), Side-Antalya, Turkey, 27 April- 2 May, 2014

[4] **"Fabrication and the Optical Response Measurement of YBCO Josephson Junctions",** M.S. Sharif Azadeh, F. Foroughi Abari, **Y. Sargolzaeiaval,** and M.Fardmanesh, International Conference on the Superconductivity and Magnetism(ICSM 2012), Kumburgaz-Istanbul, Turkey, 29 April-4 May, 2012.

Yasaman Sargolzaeiaval
Raleigh, NC
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SUMMARY

I am familiar with theoretical subjects in solid state devices and nanoelectronics as I spent 5 years studying in this area and took many related courses. I have some experience in device fabrication and working in a cleanroom. I am also an expert in TEG modeling and theoretical calculations.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D., Department of Electrical and Computer Engineering, Nanoelectronics and Photonics. 2015-Present
Supervisor: Mehmet C. Ozturk
Dissertation subject: Flexible and Wearable Thermoelectric Generators

SHARIF UNIVERSITY OF TECHNOLOGY Tehran, Iran
M.SC., Department of Electrical Engineering, Micro and Nanoelectronics. 2011-2013
Supervisor: Mehdi Fardmanesh
Thesis subject: Investigation of Light Emission Effects on the Characteristics of High Temperature Superconductor Josephson Junctions.

SHARIF UNIVERSITY OF TECHNOLOGY Tehran, Iran
B.SC., Department of Electrical Engineering, Electronics 2007-2011
Supervisor: Mehdi Fardmanesh
Senior design project: Design and Fabrication of High Precision Resistive Based Temperature Controller

EXPERIENCE

INTERNSHIP, PADIDE SANAT SHARIF Tehran, Iran
Researcher 2013
Design of LASER Projector

Jose M. Valero Sarmiento Ph.D. 6th year - Electrical Engineering (NCSU)

Industry interests: __ Mentorship __ Internship ✓ Full-time position
E-mail: jvalero@ncsu.edu

Project title: Injectable capsules for physiological monitoring Project Supervisor: Dr. Alper Bozkurt

Project goal and Industry relevance: Our objective is to develop recording devices to monitor physiological signals in animals, maintaining a form factor that will provide access to the subcutaneous tissue through injection. This approach will overcome the limitations of using wearable devices caused by fur and thick skin layers, creating a more convenient tool to obtain important physiological information without requiring a surgical procedure.

Awards and Professional/Honor Societies

Winner Seventh Annual Leadership & Innovation Showcase (First Place Graduate) – Poole College of Management
Student Research Award – American Academy of Dental Sleep Medicine (June 2015)
Full college scholarship from the Ministry of Education and Science of Spain (years 2005/06, 2006/07 and 2007/08)
Erasmus grant for completing bachelor's degree in a foreign institution (year 2009/10)
IEEE Student Member (since 2006)
IEEE Solid-State Circuits Society
Tau Beta Pi, engineering honor society

Publications and Presentations

P. V. Rajesh, **J. M. Valero-Sarmiento**, L. Yan, A. Bozkurt, C. Van Hoof, N. Van Helleputte, R. F. Yazicioglu, and M. Verhelst, "A 172 µW Compressively Sampled Photoplethysmographic (PPG) readout ASIC with Heart Rate Estimation Directly from Compressively Sampled Data," accepted for publication in *IEEE Transactions on Biomedical Circuits and Systems*.

P. V. Rajesh, **J. M. Valero-Sarmiento**, L. Yan, A. Bozkurt, C. Van Hoof, N. Van Helleputte, R. F. Yazicioglu, and M. Verhelst, "22.4 A 172 µW compressive sampling photoplethysmographic readout with embedded direct heart-rate and variability extraction from compressively sampled data," in 2016 IEEE International Solid-State Circuits Conference (ISSCC). IEEE, 2016, pp. 386–387.

R. Brugarolas, **J. M. Valero-Sarmiento**, A. Bozkurt, G. K. Essick, "Auto-Adjusting Mandibular Repositioning Device for In-Home Use," 2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Orlando, 2016.

J. M. Valero-Sarmiento, S. Bhattacharya, A. Krystal, A. Bozkurt, "Towards injectable biophotonic sensors for physiological monitoring of animals". IEEE SENSORS 2014, pp.503-506, 2-5 Nov. 2014.

R. Brugarolas, **J. M. Valero-Sarmiento,** and A. Brna, "Wearable SpO_2 and sleep posture monitoring system for Obstructive Sleep Apnea patients," 2015 IEEE Virtual Conference on Applications of Commercial Sensors (VCACS), Raleigh, NC, 2015, pp. 1-6.

R. Brugarolas, **J. M. Valero-Sarmiento**, G. K. Essick. "Development of an Auto-Adjusting Mandibular Repositioning Device for In-Home use". American Academy of Dental Sleep Medicine 24th Annual Meeting. AADSM, 2015, Seattle, WA. AADSM Student Research Award.

Relevant Courses

- Analog to Digital Converters
- IC Design for Wireless Communications
- Analog Electronics
- Electronic System Level and Physical Design
- VLSI Systems Design
- Digital ASIC Design
- RF Design for Wireless
- IC Technology and Fabrication

JOSE MANUEL VALERO SARMIENTO
jvalero@ncsu.edu – (919) 348-5848
www.linkedin.com/in/josemvalero

EDUCATION

North Carolina State University, Raleigh, NC
Ph.D. in Electrical Engineering (anticipated Spring 2017) – GPA: **4.0**/4.0
Graduate certificate in Nano-Systems Engineering offered by NSF Nano-systems Engineering Research Center for
Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

North Carolina State University, Raleigh, NC
Bachelor of Engineering in Electronics and Telecommunication Engineering (2010)

Polytechnic University of Valencia, **Valencia, Spain**
Exchange Student: **Aalto University – School of Electrical Engineering**, Espoo, Finland (August 2009 – June 2010)

TAPEOUT EXPERIENCE

Low-power system-on-chip for injectable device in 0.50 micron technology

- Designed full-wave rectifier, bandgap reference, and supply-independent bias for powering the system wirelessly using inductive coupling.
- Implemented chopper amplifier and Gm-C filter to cope with the low amplitude and frequency of the biopotential signals intended to be recorded.
- Created VCO with on-chip planar inductor to transmit the data using analog FM.

WORK EXPERIENCE

imec – Leuven, Belgium (March 2015 – July 2015) Biomedical Devices Group Internship

- Collaborated in the tapeout (TSMC 0.18 µm) of a readout IC for Photoplethysmography (PPG) measurements.

Analog Devices Inc. – Limerick, Ireland (Feb. 2011 – Aug. 2011)
Wafer Fab Yield Group Co-Op Placement

- Measurement and characterization of semiconductor devices, performing experiments in the wafer fab.
- Created test structures and full mask sets for shuttle lots (multi-die wafers).

ECE Department, North Carolina State University – Raleigh, NC
Graduate Research Assistant (Aug. 2011 – present) PI: Dr. Alper Bozkurt

- Created a low-power system-on-chip to record and transmit physiological signals from animals.

Graduate Teaching Assistant (Spring 2013)
ECE 712 – IC Design for Wireless Communications Instructor: Dr. Brian Floyd

- Graded homework and design projects (LNA and VCO) and assisted students during office hours.

ECE 520 – Digital ASIC Design Instructor: Prof. Paul Franzon

- Graded and assisted students in the process of learning Verilog HDL and Synopsys Design Compiler.

TECHNICAL SKILLS

CAD Tools: Cadence Virtuoso, SpectreRF, Encounter RTL-to-GDSII and Power System.
Mentor Graphics Calibre DRC/LVS/PEX, ModelSim.
Synopsys Design Compiler, PrimeTime, HSpice.
Languages: Verilog, C, Python, MatLab.

Chunkyun Seok Ph.D. 3rd year – Electrical and Computer Engineering (NCSU)

Industry interests: ✓ Mentorship ✓ Internship ___ Full-time position

E-mail: cseok@ncsu.edu

Project title: Mechanically Resonant Chemical Sensor Arrays Based on Capacitive Micromachined Ultrasonic Transducers (CMUTs)

Project Supervisor: Dr. Omer Oralkan

Project goal and Industry relevance: We are developing a Volatile Organic Compound (VOC) sensor system based on Capacitive Micromachined Ultrasonic Transducers (CMUTs). We fabricated a CMUT array and functionalized each channel with a different polymer to use the array as a multichannel resonant gas sensor that detects various kinds of a VOC. A companion front-end integrated circuit (IC) and a power-management unit (PMU) were also developed and tightly integrated into the system to enable low power consumption and make the system complete. A stand-alone battery-operated wireless system was demonstrated and is being integrated to the Health and Environment Tracker (HET).

Other Relevant Information about me:

Honors and Awards:

Publications and Citations:

[1] **C. Seok**, M. M. Mahmud, O. Adelegan, X. Zhang and Ö. Oralkan, "A battery-operated wireless multichannel gas sensor system based on a capacitive micromachined ultrasonic transducer (CMUT) array," Proc. *IEEE Sensors Conf*, 2016, pp. 1-3.

[2] M. Kumar, **C. Seok**, M. M. Mahmud, X. Zhang and Ö. Oralkan, "A low- power integrated circuit for interfacing a capacitive micromachined ultrasonic transducer (CMUT) based resonant gas sensor," in *Proc. IEEE Sensors Conf*., 2015, pp. 1-4.

[3] Y.H. Lee, **C. Seok** *et al*., "A 1.3-mW per-channel 103-dB SNR stereo audio DAC with class-D head-phones amplifier in 65nm CMOS," *IEEE Symposium on VLSI Circuits*, 2008, pp. 176-177.

[4] Y. H. Lee, **C. Seok** *et al*., "A self-calibration 103-dB SNR stereo audio DAC with true-GND class-D headphone drivers in 45nm CMOS," *International SoC Design Conference*, 2010, pp. 336-337.

Chunkyun Seok

Raleigh, NC
(919)349-1276
cseok@ncsu.edu

SUMMARY

I have 9+ years of experience in analog-mixed signal integrated circuit design. Currently, I am applying my IC-design skills to develop supporting integrated circuits for imaging and sensing applications based on Capacitive Micromachined Ultrasonic Transducers (CMUTs). I also have a broad range of skills in different areas such as IC design, prototyping a system, firmware programming and lab testing.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D., Electrical and Computer Engineering May 2018

Texas A&M University COLLEGE OF ENGINEERING Raleigh, NC
M.Eng., Electrical Engineering May 2005

- Department fellowship, 2003

Korea Advanced Institute of Science and Technology (KAIST) Daejon, South Korea
B.S. Electrical Engineering and Computer Science Aug. 2003

EXPERIENCE

SAMSUNG ELECTRONICS Hwa-seong, Gyunggi-do, South Korea
Senior Engineer Mar. 2011 – Jul. 2014

- Supervised a team of six engineers to design power management units and auxiliary circuits for a CMOS 28-nm Quad-GNSS RF IC resulting in the first 28-nm RF IC product in Samsung foundry.
- A sole design engineer for a 50Ms/s 3/5-bit asynchronous SAR ADC and a precision temperature recorder for the Quad-GNSS RF IC.
- Designed a delta sigma modulator in RTL-level for a fractional-N frequency synthesizer for a cellular RF transceiver and identified the mechanisms of moving spurious tone problem in the previous design by using Simulink and MATLAB models.
- Identified major design problems in the circuits designed by an acquired IC company also leading to modification in the design rule of a foundry.
- Design, layout and testing of a logarithmic amplifier-based RF power detector.
- Feasibility study of a continuous time bandpass delta sigma ADC for a Bluetooth transceiver.

Engineer Aug. 2005 – Feb. 2011

- Developed a stereo audio DAC IP with class-D headphones drivers in various process generations – CMOS 130-nm, 65-nm and 45-nm process - resulting in a design-win for the world's best-selling low-end mp3 player.
- Led a team of three engineers to develop audio CODECs for digital still cameras and personal devices in CMOS 130-nm and 45-nm process.

Timothy W. Shay Ph.D. 5th year – Chemical Engineering (NCSU)

Industry interests: __Mentorship __Internship ✓ Full-time position

E-mail: twshay@ncsu.edu

Project title: No-Power Microfluidic Pumping and Fluid Management for Sweat Sensing Devices

Project Supervisor: Dr. Orlin D. Velev and Dr. Michael D. Dickey

Project goal and Industry relevance: We are developing no-power microfluidic pumping systems that may enable continual sweat monitoring and sensing. Sweat contains many very useful biochemical health indicators such as glucose (diabetes), lactate (athletics performance), cortisol (stress), various salt ions (hydration) as well as many others. A large problem with current sweat sensing devices is the inability to manage fluid over long durations. We are creating microfluidic pumping systems that require no energy input, but will be able to guide the flow of sweat from the body, past a sensors and then discard it in order to enable continual sensing. Hydrogels and paper microfluidics will be utilized and analyzed in both a lab and on-subject setting. These devices can be fabricated easily using widely used fabrication processes.

Other Relevant Information about me:

I served as a member of the student leadership council (SLC) for three years where I was treasurer/SWOT analyst for two years and president for one year.

I will be completing my Ph.D. this summer (2017) and am seeking full time work in industry afterwards.

Completed the NC State class "Managerial Finance for Engineers" to better prepare for a career in industry.

Honors and Awards:

Poster Awards: NC ACS 2013 (3rd place), NC ACS 2014 (2nd place), Schoenborn Symposium 2014 (1st place), Schoenborn Symposium 2015 (1st place)

Publications and Citations:

Shay, T., Velev, O.D., Dickey, M.D., Hydrogel-Enabled Osmotic Pumping for Microfluidics: Towards Sweat Sequestering for Wearable Human-Device Interfaces. *Lab on Chip* (Submitted)

Shay, T., Velev, O.D., Dickey, M.D., Soft Liquid Metal-Hydrogel EKG Electrodes (In Preparation)

Shay, T., Velev, O.D., Dickey, M.D., Long-Term Continual Paper-Based Microfluidic Sensing Driven Through Passive Evaporation Based Pumping (In preparation)

Tim Shay
Raleigh, NC
(920) 619 - 3322
twshay@.ncsu.edu

SUMMARY

Much of my experience is in test method development and validating the results of those experiments. While my research focus is intended to be integrated with wearable devices, it is unfeasible to perform fundamentally new research on human subjects. Therefore I created multiple test methods to either simulate testing on the body or test individual components that would then be combined for a working prototype. Numerical methods were often used to quantify visual information taken from photographs and micrographs of the test setup. These results are communicated to the ASSIST center to determine how these materials will integrate into the test beds.

EDUCATION

NCSU COLLEGE OF ENGINEERING Raleigh, NC
Ph.D.., Chemical and Biomolecular Engineering May 2017

- See summary and bio for description of research performed
- *Honors:* Award winner in 4 different poster sessions (see resume)
- *Leadership*: SLC President (1 year), SLC Treasurer/SWOT Analysis (2 years)
- *Membership*: Member/presented at annual MRS (2015) and AIChE (2016) conferences

University of Wisconsin - Madison Madison, WI
B.S. Chemical and Biological Engineering/Applied Mathematics May 2012

- Characterized rheological properties of biomass materials for alternative fuels with Dr. Daniel Klingenberg.
- Analyzed simulated flow patterns using numerical methods with Matlab with Dr. Michael Graham.

EXPERIENCE

Kimberly Clark Neenah, WI
Co-op Engineer – Front End Innovation Fall 2011, Summer 2012

- Created a new method for testing and optimizing diaper designs to improve performance.
- This test method was created to allow for more robust performance testing in a lab setting.
- Lab testing can save more than $50 per test that would traditionally be performed with live infants.
- Worked on a very multidisciplinary team with backgrounds ranging from engineering to bio-sciences to fashion design experts.

Andersen Windows Stillwater, MN
Intern Engineer – Research Development and Innovation Summer 2010

- Developed a test method to monitor performance of window units during heating and cooling.
- Created a DOE to acquire performance data over windows ranging in surface area, aspect ratio, glass thickness and gap thickness.
- These results were used to verify a FEI model that would be used in future cases to analyze window performance.

City of Green Bay Green Bay, WI
Intern Engineer – Department of Public Works Sewer Division Summer 2008, 2009

- Created and implemented a plan to inspect all storm water outfalls in the City of Green Bay on a two year rotational program.
- This initiative was put forth by the EPA to ensure that there are no illicit discharges of hazardous materials into the local watershed.
- In a side project, water levels of sanitary sewer lines were discretely measured during rain events to seek elevated water levels, which would indicate possible cracks or leaks in sewer lines.

Katherine (Katie) Walker M.S. 2nd year - Electrical Engineering (NCSU)

Industry interests: __ Mentorship __ Internship ✓ Full-time position

E-mail: kdwalker@ncsu.edu

Project title: COMPUTER AIDED TRAINING SYSTEMS FOR DOGS (CATS for Dogs)

Project Supervisor: Dr. Alper Bozkurt

Project goal and Industry relevance: We are developing a system that uses computers to establish two-way communication about a dog's position and physiology in order to help the owner/handler make informed decisions regarding training purposes or for everyday interaction. We collaborate heavily with the ASSIST Center, mostly on the physiological monitoring aspect of this project. Of particular interest, electrocardiogram (ECG/EKG) and photoplethysmography (PPG) are two physiological signals that we measure. For example, just like humans, if a dog is anxious or stressed, the heart rate and respiratory rate will increase. By monitoring these signals and communicating this information to the owner/handler, he or she can make an appropriate decision, such as removing the dog from the stressful situation. Combining sensor systems with algorithms to allow the dog handler to make informed decisions is interesting for working dogs who train for search and rescue as well as the average pet learning a basic "sit" behavior.

Other Relevant Information about me:

I have been involved with this project in Dr. Bozkurt's iBionicS Lab since Summer 2014 as an undergraduate student. I triple majored in Electrical Engineering, Computer Engineering and Applied Mathematics. I completed an internship at Intel Corporation and two co-op rotations with Analog Devices, Inc. I was also an active member and club officer for the Society of Women Engineers as well as the IEEE Student Branch on campus. I became involved with ASSIST through my senior design project, which consisted of an ECG t-shirt garment that sends real-time ECG to an Android smartphone using Bluetooth Low Energy (BLE). Programming languages: Java, MATLAB, Python

Honors and Awards:

"Best Project in Show" at Senior Design Day, Spring 2015, First place among 85 senior design projects from four engineering departments at NC State University

Publications and Citations:

Brugarolas, R.; Latif, T.; Dieffenderfer, J.; Walker, K.; Yuschak, S.; Sherman, B.; Roberts, D.; Bozkurt, A., "Wearable Heart Rate Sensor Systems for Wireless Canine Health Monitoring," in *IEEE Sensors Journal*, May 15, 2016. Link: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7286734&isnumber=4427201

Gonzales, L.; Walker, K.; Keller, K.; Beckman, D.; Goodell, H.; Wright, G.; Rhone, C.; Emery, A.; Gupta, R., "Textile sensor system for electrocardiogram monitoring," *2015 IEEE Virtual Conference on Applications of Commercial Sensors (VCACS)*, 2015. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7439568&isnumber=7439560

Katherine (Katie) Walker

11424 Leesville Rd., Raleigh, NC 27613 ▪ (336) 552-4240 ▪ kdwalker@ncsu.edu

OBJECTIVE

To acquire a full-time position focusing on electrical engineering applications in the field of medicine, especially medical devices, health/fitness wearables and sensor systems.

EDUCATION

North Carolina State University, Raleigh, NC
M.S. in Electrical Engineering, Thesis Topic: T.B.D.
NC State Electrical and Computer Engineering Dept. Merit Fellowship Recipient
GPA: 3.83/4.0, Expected graduation date: May 2017

North Carolina State University, Raleigh, NC
B.S. in Electrical Engineering, B.S. in Computer Engineering, and B.S. in Applied Mathematics
University Honors Program
GPA: 3.86/4.0, Graduation date: May 2015

EXPERIENCE

iBionicS Lab (P.I.: Dr. Alper Bozkurt), NC State ECE Dept., Raleigh, NC
Research Assistant, Summer 2014—Present

- Collected and analyzed data concerning the development of an interface to incorporate electronic sensing and computational behavior modeling into canine training and physiological monitoring (ECG and PPG)

Analog Devices, Inc., Greensboro, NC
Product and Test Engineering Co-op, Summer 2013 and Spring 2014 (2 rotations)

- Assisted other engineers on hardware debug, development, and characterization of High Speed ADC products

Intel Corporation, Hillsboro, OR
Undergrad Intern Technical, Summer 2012

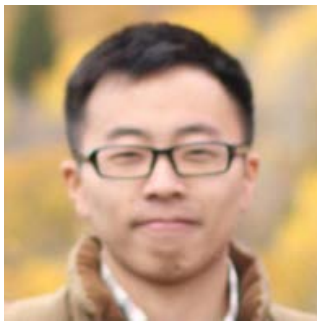
- Analyzed software performance for future processor designs

TECHNICAL SKILLS

Capable with: MATLAB, Java, Bluetooth Low Energy, Android, Python
Experience with: BeagleBone Black, C, Simulink, Assembly (LC-3, ARMv7), Verilog

HONORS & ACTIVITIES

Academic Dean's List, Fall 2009 – Spring 2015 (Every semester as undergraduate student)
ASSIST Center at NC State, ECG T-shirt senior design project, Graduate student member
Senior Award for Scholarly Achievement (NCSU ECE Dept.), Spring 2015
Fundamentals of Engineering Exam, Passed November 2014
Society of Women Engineers, Vice President of Company Relations, Webmaster, Awarded Best Website in Region (2012)
IEEE Student Branch, Webmaster, Software Chair, IEEEXtreme and SECon Participant
Member of Eta Kappa Nu, Tau Beta Pi and The National Society of Collegiate Scholars



Tiancheng Xue Ph.D. 4th year - Mechanical Engineering (UTAH)
Industry interests: __ Mentorship ✓ Internship ✓ Full-time position
E-mail: tiancheng.xue@utah.edu

Project title: Non-resonant Mechanical Energy Harvesting from Human Motion

Project Supervisor: Dr. Shad Roundy

Project goal and Industry relevance: We are developing wearable mechanical energy harvesters that utilize magnetically plucked thinfilm PZT bimorph beams to harvest energy from human motion with a target to achieve 100 µW from the wrist motion.

Software and programming skills: Matlab, Mathematica, NX Unigraphics, Solidworks, AutoCAD, ANSYS, LS_DYNA, C++, LTSpice and LaTex.

Publications and Patents:

[1] **T. Xue** and S. Roundy, "On magnetic plucking configurations for frequency up-converting mechanical energy harvesters," *Sensors Actuators, A Phys.*, vol. 253, pp. 101–111, 2017.
[2] R. Rantz, **T. Xue**, Q. Zhang, L. Gu, K. Yang, and S. Roundy, "Comparative Analysis of Wrist-worn Energy Harvesting Architectures," *J. Phys. Conf. Ser.*, vol. 773, no. 1, pp. 10–13, Nov. 2016.
[3] **T. Xue**, S. Kakkar, Q. Lin, and S. Roundy, "Characterization of Micro-Generators Embedded in Commercial-Off-the-Shelf Watches for Wearable Energy Harvesting," in *SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring. International Society for Optics and Photonics, 2016.*, 2016, vol. 9801, pp. 1–8.
[4] **T. Xue** and S. Roundy, "Analysis of Magnetic Plucking Configurations for Frequency Up-Converting Harvesters," in *Journal of Physics: Conference Series*, 2015, vol. 12098, no. 660, pp. 1–5.
[5] **T. Xue**, X. Ma, C. Rahn, and S. Roundy, "Analysis of Upper Bound Power Output for a Wrist-Worn Rotational Energy Harvester from Real-World Measured Inputs," *J. Phys. Conf. Ser.*, vol. 557, p. 12090, Nov. 2014.
[6] B. Tao, Q. Zhu, X. Cheng , W. Pan, **T. Xue**, P. Tang, C. Luo, M. Feng, Y. Hong, Y. Hu, P. Zhou and Y. Zhang. "Hot pressing device for anisotropic conductive adhesive in backing bonding equipment" CN Application 201310095073, 2013

Tiancheng Xue
Salt Lake City, State
385-722-6385
tiancheng.xue@utah.edu

SUMMARY

I do research in wearable mechanical energy harvesting and my broader interest lies in general transducer and sensing techniques. I'm trained as a mechanical engineer but has acquired skills in electrical engineering as well.

EDUCATION

University of Utah Salt Lake City, UT
Ph.D., Energy Harvesting from Human Motion Dec 2017

Huazhong University of Science and Technology Wuhan, China
B.Eng. with Honors, Mechanical Design, Manufacturing and Automation June 2013

EXPERIENCE

University of Utah Salt Lake City, UT
Graduate Research Assistant September 2013 - present

- Developed a generalized rotational inertial energy harvester model to predict the upper limit for energy generation from human motion input.
- Designed and conducted experiments to collect inertial data from human motion.
- Designed and built several wearable energy harvester prototypes demonstrating energy generation from human motion.

State Key Lab of Digital Manufacturing Equipment & Technology Wuhan, China
Undergraduate Research Assistant May 2011 – June 2013

- Led a team of six to design and build a hot pressing apparatus for anisotropic conductive adhesive in flip-chip bonding.
- Tutored students in CAD softwares and technical drawings.

Huazhong University of Science and Technology Wuhan, China
Undergraduate Research Assistant March 2010 – March 2011

- Conducted experiments in testing an adaptive high-rise escape system based on friction disks.

Hong Goo Yeo Ph.D. 7th year - Material Engineering (PSU)

Industry interests: _ Mentorship _ Internship ✓ Full-time position

E-mail: hxy162@psu.edu

Project title: MULTI-SCALE MODELING OF NEURAL SYSTEMS: FROM SYNAPSE TO NEURON

Project Supervisor: Dr. Susan Trolier-McKinstry

Project goal and Industry relevance: We are developing the fabrication of wearable mechanical energy harvesters, which can scavenge energies from human motion. In particular, I am focusing to increase the figure of merit for energy conversion through the deposition of domain-controlled $Pb(Zr_{0.52}Ti_{0.48})O_3$ (PZT) films onto metal foils utilizing rf-sputtering and chemical solution deposition. The deposition of oxide film onto metal foil offers a number of advantages in microelectromechanical systems (MEMS) and are easily machined into a wide variety of applications.

Other Relevant Information about me:

Technical skills

- Oxide/metal thin film coating by chemical solution deposition, rf-sputtering, atomic layer deposition (ALD)
- Lithography process (contact aligner, photo resist coating) and wet/dry chemical etching process
- Instrumental analysis, such as XRD, SEM, FESEM, Laser vibrometer.
- Setting measurement facility of electrical conductivity(4 probe method), Impedance analyzer, d_{33} meter, Furnace
-

Honors and Awards:

- Full scholarship for graduate research assistant from The Pennsylvania State University (2011-present)
- Scholarship for international research internship program from Korean Science and Engineering Foundation (2004-2005)
- 7 times of scholarship for 12 semesters from Changwon National University (1997-2005)

Publications and Citations:

1. **H. G. Yeo**, X. Ma, C. Rahn, and S. Trolier-McKinstry (2016) Efficient Piezoelectric Energy Harvesters Utilizing (001) Textured Bimorph PZT Films on Flexible Metal Foils. Advanced Functional Materials **26**, 5940
2. **H. G. Yeo**, and S. Trolier-McKinstry (2014) (001} Oriented piezoelectric films prepared by chemical solution deposition on Ni foils. Journal of Applied Physics **116**, 014105
3. **H. G. Yeo**, Y. S. Sung, T. K. Song, J. H. Cho, M. H. Kim and T. G. Park (2009) Donor doping effects on ferroelectric and piezoelectric properties of Pb-free $(Bi_{0.5}Na_{0.5})TiO_3$ ceramics. Journal of the Korean Physical Society **54**, 896
4. S.W. Ko, **H. G. Yeo**, and S. Trolier-McKinstry (2009) Growth and properties of chemical solution deposited $BiInO_3$-$PbTiO_3$ films. Applied Physics Letters **95**, 162901
5. Y. S. Sung, H. M. Lee, W. Du, **H. G. Yeo**, S. C. Lee, J. H. Cho, T. K. Song, and M. H. Kim (2009) Enhanced piezoelectric properties of $(Bi_{0.5}K_{0.5+x}Li_y)TiO_3$ ceramics by K nonstoichiometry and Li addition. Applied Physics Letters **94**, 062901

Hong Goo Yeo
Dielectric and Piezoeletric thin film Lab.
Department of Materials Science and Engineering
The Pennsylvania State University, University Park, PA 16802
(814)-876-2731
hxy162@psu.edu

SUMMARY

Academic background in Materials Science & Engineering. Skilled in deposition & characterization of ferroelectric/piezoelectric thin films and the fabrication of MEMS scale devices by wet/dry etching or laser cutting for piezoelectric energy harvesters.

EDUCATION

Ph.D., in Department of Material Science & Engineering Jan2011–present
The Pennsylvania State University, University Park, PA 16802
Adviser : Susan Trolier-McKinstry
Thesis title: Mechanical Energy Harvesters Utilizing (001) Textured PZT Films on Flexible Meta Foils

Ph.D., in Department of Convergence Materials and Science Engineering Mar2007–Dec2010
Changwon National University, Changwon, 641-773, South Korea
Adviser : Myongho Kim

M.S., in Department of Material Science & Engineering Mar2002–Aug2005
Changwon National University, Changwon, 641-773, South Korea
Adviser : Myongho Kim
Thesis title : A Study on the Defect Types and Electrical Conductivity of $BaTiO_3$ under Ba/Ti Ratio

B.S., in Department of Ceramic Engineering Mar1997–Feb2002
Changwon National University, Changwon, 641-773, South Korea

EXPERIENCE

INTERNSHIP

Material Research Institute, The Pennsylvania State University, University Park, PA16802, USA
Visiting Scholarship Dec2008–Jul2001

- Synthesis of $PbInO_3$-$PbTiO_3$ thin film by chemical solution deposition
- Investigation of dielectric, ferroelectric, and piezoelectric properties of $BiInO_3$-$PbTiO_3$ thin films

Ceramic Physical Properties Lab, Changwon National University, 641-773, South Korea
Research Mar2006–Mar2007

- Dependence of the ferroelectric and anti-ferroelectric phenomena of $(1-x)(Bi_{0.5}Na_{0.5})TiO_3$-$xBaTiO_3$ (x = 0 0.10, BNT-BT) ceramics on self-heating

Center for Dielectric studies, The Pennsylvania State University, University Park, PA16802, USA
Visiting Scholarship Sep2004–Aug2005

- Synthesis of nonstoichiometry $BaTiO_3$ by Pechini method
- Analysis of XRD, DSC and high temperature conductivity to figure out relation between phase equilibrium and solid-solution behavior

Ozkan YILDIZ Post Doc. – Fiber & Polymer Science (NCSU)
Industry interests: _ Mentorship _ Internship ✓ Full-time position
E-mail: oyildiz@ncsu.edu

Project title: FLEXIBLE AND BREATHABLE THERMOELECTRIC ENERGY GENERATOR DEVICES
Project Supervisor: Dr. Philip D. Bradford

Project goal and Industry relevance: We are developing a novel method to produce flexible and breathable thermoelectric energy generator (TEG) devices which can be worn on the body. Typically, TEGs are made of thermally conductive metals or graphite that are solid and often rigid, and thus do not conform to the body. To produce wearable TEGs, we work on developing textile based heat spreaders and heat sinks which are made up ultra-high aspect ratio carbon nanotubes (CNTs). Wearable TEG devices have a significant role in the industry because they can generate power on the human body by using the temperature differential between the body and the ambient air.

Other Relevant Information about me:
We are one of the few research groups in the world that can produce millimeter long carbon nanotube (CNT) arrays from which aligned CNT sheets can be continuously pulled. We are developing a new CNT-polymer composite structures that will be explored for energy absorbing applications. In addition, these unique materials are explored in wide range of applications, such as aerosol filtration media, high performance fabrics, and battery electrodes.

Honors and Awards:

2016	1st Place Best Poster, MRS/MVS Conference, Raleigh North Carolina, USA
2016	NCSU AIF Best Paper Award
2013	NCSU AIF Best Paper Award
2008	The Ministry of National Education, Republic of Turkey. Scholarship for Master and Ph.D. education in the United States of America.

Publications and Citations:

1. Faraji, S., Yildiz, O., Rost, C., Stano, K., Farahbakhsh, N., Zhu, Y. and Bradford. P Radial Growth of Multi-Walled Carbon Nanotubes in Aligned Sheets through Cyclic Deposition and Graphitization, (2017) Carbon, 111:411-418.
2. Stano, K., Faraji, S., Hodges, R., Yildiz, O., Wells, B., Akyildiz, H., Zhao, J., Jur, J. and Bradford, P. Ultralight Interconnected Metal Oxide Nanotube Networks, (2016) *Small*, 12(18):2432-2438.
3. Yildiz, O., Stano, K., Faraji, S., Stone, C., Willis, C., Zhang, X., Jur, J. and Bradford, P. High Performance Carbon Nanotube – Polymer Nanofiber Hybrid Fabrics, (2015) *Nanoscale*, 7:16744-16754.
4. Faraji, S., Stano, K., Yildiz, O., Li, A., Zhu, Y. and Bradford, P. Ultralight Anisotropic Foams from Layered Aligned Carbon Nanotube Sheets, (2015) *Nanoscale*, 7:17038-17047.
5. Cakmak, E., Fang, X., Yildiz, O., Bradford, P. and Ghosh, T. Carbon Nanotube Sheet Electrodes for Anisotropic Actuation of Dielectric Elastomers, (2015) *Carbon* 89:113-120.
6. Dirican, M., Lu, Y., Ge, Y., Yildiz, O., and Zhang, X. Carbon-confined SnO2-Electrodeposited Porous Carbon Nanofiber Composite as High-capacity Sodium-ion Battery Anode Material, (2015) *ACS Applied Materials & Interfaces* 7:18387-18396.
7. Dirican, M., Yildiz, O., Lu, Y., Fang, X., Jiang, H., Kizil, H., and Zhang, X. Flexible Binder-free Silicon/Silica/Carbon Nanofiber Composites as Anode for Lithium-ion Batteries, (2015) *Electrochimica Acta* 169:52-60.
8. Dirican, M., Yanilmaz, M., Fu, K., Yildiz, O., Kizil, H., Hu, Y., and Zhang, X. Carbon-confined PVA-derived Silicon/Silica/Carbon Nanofiber Composites as Anode for Lithium-ion Batteries, (2014) *Journal of Electrochemical Society* 161:A2197-A2203.
9. Yildiz, O., Cerkez, I., Kocer, B. H., Worley, S. D., Broughton, M. R., and Huang, T. S. N-(Hydroxymethyl) Acrylamide as a Multifunctional Finish to Cotton and Tether for Grafting Methacrylamide for Biocidal Coating, (2013) *Journal of Applied Polymer Science* 128:4405-4410.

OZKAN YILDIZ
Raleigh, NC
919 802 8906
oyildiz@ncsu.edu

SUMMARY

I am a NSF post doc research assistant in Fiber and Polymer Science under the direction of Dr. Philip Bradford. My main research interests are flexible and breathable TEG devices, CNT-polymer composites for energy absorption, and flexible energy storages. I studied CNT-polymer hybrid fabrics in aerosol filtration media and lithium-ion battery electrodes during my Ph.D. under the direction of Dr. Bradford.

EDUCATION

NCSU, FIBER & POLYMER SCIENCE Raleigh, NC
Ph.D.., High Performance Hybrid Fabrics Containing CNTs August, 2016

- ***Honors:*** 2016 MRS/MVC Conference 1st place Best Poster, 2016 AIF Best Paper Award, 2013 AIF Best Paper Award
- ***Membership*****:** Turkish Student Association, ASSIST center

AUBURN UNIVERSITY, POLYMER and FIBER ENGINEERING Auburn, AL
M.S Antimicrobial Polymers for Coating Cotton and Other Surfaces August, 2010

- ***Membership*****:** Turkish Student Association

ULUDAG UNIVERSITY, TEXTILE ENGINEERING Bursa, Turkey
B.S. June, 2006

- **Honors:** The Ministry of National Education, Republic of Turkey. Scholarship for Master and Ph.D. education in the United States of America

EXPERIENCE

Savcan Textile Bursa, TURKEY
Internship Title June, 2005

- Applied Lean 6Σ principles to improve quality of dying process, which company implemented.

Murat Yokus Ph.D. 4th year –Electrical Engineering & Fiber and Polymer Science (NC State)
Industry interests: ✓ Internship ✓ Full-time position
E-mail: mayokus@ncsu.edu

Project title: Epidermal Biosensor Platform with Variable Recognition

Project Supervisor: Dr. Michael Daniele

Project goal and Industry relevance: This project involves development of skin wearable flexible multiplexed sensors for continuous monitoring of biomarkers related to human metabolism (glucose and lactate) and respiration (oxygen). Noninvasive measurement of these biomarkers from sweat or interstitial fluid has an utmost importance not only for continuous health monitoring, but also for prevention of certain diseases such as diabetes and peripheral artery disease in biomedical, biotechnology and wearable-tech industries. The flexible epidermal sensing platform utilizes electrochemical and optical detection schemes for measurement of metabolite and arterial oxygenation levels, respectively.

Interests:

Biomedical Sensors, Bioinstrumentation, Flexible and Soft Electronics, and Polymers

Honors and Awards:

[2] "Outstanding Precollege Educator Award" from ASSIST Center, 2014.

[1] Fulbright Scholarship from Bureau of Educational and Cultural Affairs of the U.S. Department of State from 2011-2013.

Publications:

[4] **M. A. Yokus** and Michael Daniele, "Skin Hydration Sensor for Customizable Electronic Textiles," in *MRS Advances*, vol. 1, no. 38, pp. 2671-2676.

[3] **M. A. Yokus**, R. Foote and J. S. Jur, "Printed Stretchable Interconnects for Smart Garments: Design, Fabrication, and Characterization," in *IEEE Sensors Journal*, vol. 16, no. 22, pp. 7967-7976, Nov.15, 2016.

[2] **M. A. Yokus** and J. S. Jur, "Fabric-Based Wearable Dry Electrodes for Body Surface Biopotential Recording," in *IEEE Transactions on Biomedical Engineering*, vol. 63, no. 2, pp. 423-430, Feb. 2016.

[1] J. Dieffenderfer, H. Goodell, B. Bent, E. Beppler, R. Jayakumar, **M. Yokus**, J. Jur, A. Bozkurt, D. Peden, "Wearable Wireless Sensors for Chronic Repiratory Disease Monitoring," in *2015 IEEE 12th International Conference on Wearable and Implantable Body Sensor Networks (BSN)*, Cambridge, MA, 2015, pp. 1-6.

MURAT YOKUS

602 General Joseph Martin Circle · Raleigh, NC 27606
mayokus@ncsu.edu | (919) 593-8232

EDUCATION

North Carolina State University — **Raleigh, NC**
Ph.D. in Electrical Engineering · Co-major: Ph. D. in Fiber and Polymer Science — 2018

North Carolina State University — **Raleigh, NC**
M.S. in Textile Engineering **(GPA: 4.00/4.00)** — 2013

Uludag University — **Turkey**
B.Sc. Textile Engineering · Minor: Industrial Engineering — 2011
Graduated with distinction (GPA: 3.80/4.00)

EXPERIENCE

North Carolina State University, Electrical Engineering — **Raleigh, NC**
Graduate Student Researcher — 2016-present

- Simulated, fabricated and tested skin wearable flexible hydration sensors
- Fabricated and characterized amperometric glucose sensors
- Mentored three undergraduate students for development of electrochemical sensors

North Carolina State University, Fiber and Polymer Science — **Raleigh, NC**
Graduate Student Researcher — 2013-2016

- Developed and fabricated flexible and washable "smart t-shirt" for continuous electrocardiogram monitoring
- Co-inventor of stretchable interconnects for smart garments (patent application)
- Developed and tested flexible printed dry electrodes with an impedance analyzer for continuous monitoring of biopotentials
- Collaborated with CEARL in Penn State University for development and testing of wearable printed antennas on flexible substrates
- Collaborated with iBionics group in NC State University for development of a flexible ECG monitoring patch
- Investigated the dielectric properties of atomic layer deposited thin film oxides on fibrous materials for their potential use in wearable and flexible capacitors
- Mentored four undergraduate students on ECG sensors, flexible interconnects and printed antenna designs, resulting in multiple awards.

SKILLS

Acquired During Course Projects
Synopsys Sentaurus Process and TCAD, HSPICE, Cadence Virtuoso and Spectre, AWR Microwave Office, ANSYS HFSS and PSPICE

Software and Programming
LabVIEW, COMSOL Multiphysics, MATLAB, C, SolidWorks, AutoCAD and Microsoft Office

Fabrication and Material Processing
Screen-printing, ink-jet printing, clean-room fabrication tools (photolithography, spinning, vacuum thin film deposition, wet & dry etching), atomic layer deposition (ALD) etc.

Analytical
SEM, AFM, optical and confocal microscopy, contact angle, four point probe, Instron mechanical tester, LCR meter, probe station etc.

ACTIVITIES

- Industry Chair at Student Leadership Team in ASSIST Center (2016-present)
- NC Fulbright Association Board Member (2015-present)