



## Wireless Integrated MicroSensing & Systems

*Partnering With Industry in Microsystems Research*

### WIMS<sup>2</sup> Researchers Deliver 4 Papers at the 2017 Transducers Conference



T. Nagourney, J. Cho, B. Shiari, A. Darvishian and K. Najafi, **"259 Second Ring-down Time and 4.45 Million Quality Factor in 5.5 kHz Fused Silica Birdbath Shell Resonator,"** (*Transducers*) IEEE International Conference on Solid-State Sensors and Actuators, United States of America, July 2017, pp. 790-793.

N. Vellaluru, Y. B. Gianchandani and T. Li, **"Facile Batch Mode Process for High Capacity Rechargeable Nickel-zinc Microbatteries,"** (*Transducers*) IEEE International Conference on Solid-State Sensors and Actuators, United States of America, July 2017, pp. 1867-1870.

R. Nambisan, S.R. Green, Stein and Y. B. Gianchandani, **"In situ Acoustomagnetic Interrogation of a Glaucoma Valve with Integrated Wireless Microactuator,"** (*Transducers*) IEEE International Conference on Solid-State Sensors and Actuators, United States of America, July 2017, pp. 383-386.

J.-K. Woo, C. Boyd, J. Cho and K. Najafi, **"Ultra-low-noise Transimpedance Amplifier for High-performance MEMS Resonant Gyroscopes,"** (*Transducers*) IEEE International Conference on Solid-State Sensors and Actuators, Taiwan, Republic of China, July 2017, pp. 1006-1009.

## WIMS<sup>2</sup> News and Events

### New WIMS<sup>2</sup> Member Partners

Two major, 1st tier automotive suppliers joined the Center this past year. Denso International in Japan, and Dana, Inc. in Toledo, are both leaders in their respective markets. Both major companies have joined the Center to investigate how WIMS<sup>2</sup> technology and research can help them address the vast challenges in the automotive market.

Both companies recognize the acceleration in the trend to "sensorize the transportation infrastructure."

**DENSO**  
Crafting the Core



### Anonymous Alumnus Endows Award in Recognition of EECS Professors



Ken Wise



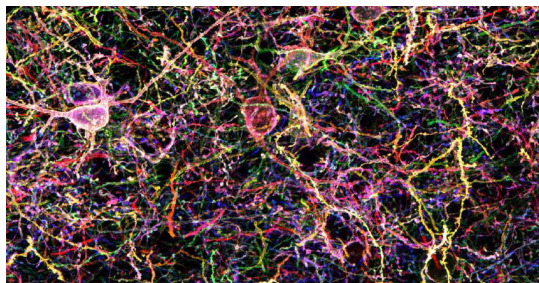
Khalil Najafi

An anonymous alumnus of the MEMS/ECE program and his spouse (who also attended U-M) have generously provided a gift to endow the Wise-Najafi Prize for Engineering Excellence in the Miniature World. The donors have established this award in recognition of U-M College of Engineering Profs. Kensall D. Wise and Khalil Najafi and their pioneering

work in the field of microelectromechanical systems (MEMS) over many decades.

The Wise-Najafi Prize for Engineering Excellence in the Miniature World will recognize and incentivize outstanding research and scholarship related to engineering at the meso-scale, micron-scale, nano-scale and beyond. Faculty from across campus who have shown exceptional creativity in the science and engineering of miniaturization are eligible for consideration of this distinguished prize.

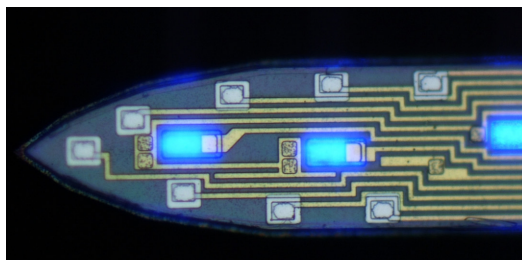
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## NSF Grant for Mapping Circuits in the Brain

Tools developed by a new NSF Tech Hub aim to advance our understanding of the brain. Developers funded by the Tech Hub are coming together to demonstrate and share these new tools. "We want to put our technology into the hands of people who can really use it," said Prof. Euisik Yoon, leader of the project and professor of electrical engineering and computer science at the University of Michigan.

Over the last decade or so, several new tools have emerged that, together, can enable the mapping of circuits within the brain. The most recent, from U-M, is an implant that uses light to stimulate specific neurons in genetically modified mice or rats and then records the response from other neurons with electrodes.



To share these new tools, the team will bring in neuroscientists for annual workshops and then provide them with the hardware and software they need to run experiments in their own labs. For the tools that prove to be most useful, they will seek commercialization opportunities so that they remain available after the project ends.

The project is called Multimodal Integrated Neural Technologies (MINT) and has been awarded as a 5-year National Science Foundation NeuroNex Technology Hub. [\[More\]](#)

## WIMS<sup>2</sup> Faculty Win Three IARPA Grants

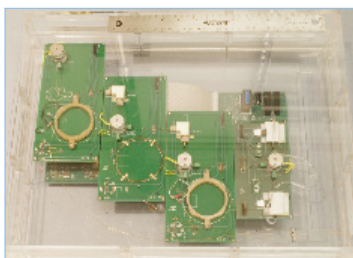


"The Intelligence Advanced Projects Agency (IARPA)'s MAEGLIN program intends to develop an ultra-low power chemical analysis system for remote site detection and identification of explosives, chemical weapons, industrial toxins and pollutants, narcotics, and nuclear materials in the presence of significant background and interferents."

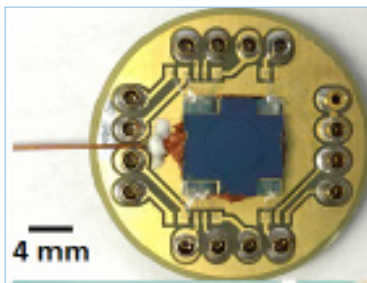
Of the nine IARPA project grants under this program, WIMS<sup>2</sup> Center faculty teams won 3 projects, more than any other research organization.



Profs. Sherman Fan and Katsuo Kurabayashi aim to develop an automated multi-channel, multi-dimensional, portable gas chromatography device. Preliminary results show that the portable GC is able to provide the peak capacity and peak capacity production (peak capacity over time) that are the same as or even better than large benchtop GC instruments. The team also invented a microfluidic photo-ionization detector (PID) that has 20X sharper peak width than the commercial PIDs.



Prof. Yogesh Gianchandani, and assistant research scientist Yutao Qin aim to develop a sub-system for vapor collection and chromatographic separation using a novel progressive cellular architecture (PCA), comprised of a series of heterogeneous cells, which provides partial separation during vapor collection. This facilitates analyses covering a wide range of vapors in an energy efficient manner. This approach substantially reduces the need for column heating, thereby providing massive energy savings.



Prof. Ted Zellers and adjunct research scientist Joe Potkay aim to develop a two-stage micro collector injector ( $\mu$ COIN) with unprecedented low-power operation and flexibility. The first stage is a passive sampler, which diffusively collects mixtures of volatile and semi-volatile organic compounds spanning a wide structure and volatility range. The second stage is a focuser-injector that accepts the vapors (actively) transferred from the first stage. This generates a narrow injection band, which is critical for efficient separations in  $\mu$ GC columns. The ultimate result is a design that reduces ( $>10\times$ ) the required desorption flow rate, increases flow uniformity, and minimizes energy consumption.



## Becky Peterson Received 2018 Henry Russel Award

Prof. Becky Peterson, assistant professor in Electrical and Computer Engineering, has received a University of Michigan



Henry Russel Award for her extraordinary record of accomplishment in scholarly research, as well as excellent record of contributions as a teacher. This

award, established in 1925, is considered the University's highest honor for faculty at the early to mid-career stages of their career.

Prof. Peterson directs the PetersonLab, which is developing new thin film technologies and devices to enable "Electronics on Anything." One goal of her research is roll-to-roll fabricated large-area flexible e-skins, displays or detectors at low cost using environmentally-friendly methods. This work has applications in electronics cybersecurity and low-power environmental monitoring.

In addition, she is developing new alloys of oxide semiconductors for the next generation of high-power electronics and deep ultraviolet optoelectronic devices, with specific applications in renewable energy and health care.

[\[More\]](#)

## WIMS<sup>2</sup> Seminar



**Jaesung Park**  
*Engineering for  
Extracellular Vesicle  
Analysis*  
February 22, 2018

## Jerome Lynch Named Chair of Civil and Environmental Engineering

Beginning July 1, 2017, Prof. Jerome Lynch was named the Donald Malloure Department Chair of Civil and Environmental Engineering. Lynch, who has been on the U-M faculty since 2003, is known for working at the interfaces of traditional civil engineering and other engineering disciplines, such as electrical engineering, computer science and materials science. He directs the Laboratory for Intelligent System Technologies, which works to convert traditional civil infrastructure into more intelligent and reactive systems by integrating sensing, computing and actuation technologies.



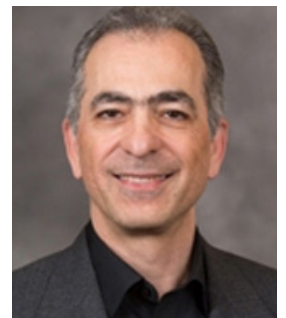
With a distinguished academic track record crossing disciplinary boundaries, and a solid presence in the local startup community, Jerry brings new perspective into his CEE leadership role," said Alec D. Gallimore, the Robert J. Vlasic Dean of Engineering. "I look forward to his innovative approaches to elevating the department's impact.

"I am extremely honored to have been selected to serve as chair of CEE," Lynch said. "I am excited to lead this exemplary community of scholars, especially as we continue to be global leaders providing transformative solutions to the many complex grand challenges facing our society." [\[More\]](#)

## Khalil Najafi Completes a Decade of Leadership of the Electrical and Computer Engineering Division, 2008 to 2018

Prof. Najafi was named Chair of ECE in September 2008, just a few months after the new two-division structure was approved by the Regents. He was the right man at the right time to be the first Chair of the newly organized Electrical and Computer Engineering at Michigan. He was a man of ideas and an agent of change. He brought enormous research credibility to the position, combined with an abiding patience and an appreciation for both individuals and teams. Prof. Najafi will step down in July 2018.

[\[More\]](#)



# WIMS<sup>2</sup> Startups, An Update

The mission of the Center is to transfer technology to industry, by conducting research, graduating students, and engaging with industrial members. Perhaps one of the most successful means of engagement for the Center to accomplish its mission, is its support for startups. There have been 20 startups, that resulted from research conducted by WIMS<sup>2</sup> faculty. Below is a brief summary of the current status of several.



Co-founded in 2010 by WIMS<sup>2</sup> professor, David Wentzloff, Ambiq Micro

is recognized as the pioneer and leader in ultra-low power solutions. Extremely low power semiconductors are the key to the future of electronics, and are required to create and capture value in the Internet of Everything. Along with its partners, the Austin, Texas-based company has recently introduced three new products: (1) a low power voice control subsystem for portable consumer products; (2) the power and computing for a wearable health tag; and (3) the sensor and power for a new line of lightweight fitness wearables. [\[More\]](#)



ePack provides electronic packages and package assembly services to stabilize and enhance the perfor-

mance of devices including timing references, inertial sensors, optical sensors and ICs. Jay Mitchell and Sangwoo Lee used the education, training, and experience from their PhD and Postdoc work under WIMS<sup>2</sup> faculty, plus the advice and support from the WIMS Industrial Program to start ePack in 2007. They licensed university IP invented by Sangwoo Lee during his Postdoc appointment under Prof. Najafi. This formed the basis of their offering to industry in the form of unique, ruggedized packaging at the wafer and discrete levels. [\[More\]](#)



psikick was co-founded in 2012 by WIMS<sup>2</sup> professor, David Wentzloff, who is also co-CTO. Utilizing revolutionary

ultra-low-power digital and RF circuit technologies from the Universities of Virginia and Michigan, psikick builds completely self-powered sensing systems that do not require batteries or maintenance, can be deployed nearly anywhere, and unlock new data streams that generate significant value for our customers. psikick ICs, are systems-on-chips with sensor analog front-ends, programmable processing and memory, integrated power management, programmable hardware accelerators, and RF (wireless) communication capabilities across multiple frequencies. [\[More\]](#)



WIMS<sup>2</sup> professors, David Blauuw, Dennis Sylvester, and David Wentzloff, (and

others) co-founded Cubeworks in 2013 to make next-generation millimeter-scale computing available today. The company's origins come from the Michigan Micro Mote (M<sup>3</sup>) initiative, a project from the University of Michigan seeking to push the frontiers of computing. The company's platform enables the first truly autonomous wireless sensing platform measuring less than a millimeter. Their tagline is "real-life smart dust".

[\[More\]](#) [\[Article\]](#)



Muhammad Faisal and Jeffrey Fedenburg founded Movellus in 2014. The

Movellus software and IP innovations enable a novel way to build analog and mixed signal components used in System on a Chip devices. The company's technology extends digital design and verification tools to automatically implement functionality that has traditionally required months-long custom analog design. Both Muhammad and Jeff got their PhD's within the framework of the WIMS<sup>2</sup> Wireless Interfaces Thrust under Prof. Wentzloff. They licensed the technology they developed in their PhD program to form the technology base for their startup. The company also won the grand prize of \$25,000 as the best emerging company at the 2014 annual Great Lakes Entrepreneur's Quest business plan competition. [\[More\]](#)



Co-founded by WIMS<sup>2</sup> Center Director, Prof. Yogesh Gianchandani, and

a past U-M graduate and Silicon Valley entrepreneur, Sassan Teymouri, Omniscent is a company with the revolutionary goal to democratize emissions sensing through technology. Based on the research conducted by WIMS<sup>2</sup> scientist, Yutao Qin, the Omniscent service includes sensors that can differentiate between different VOCs, and reports individual gas levels separately. It also provides the back end, which provides subscribers with tools to manage, report, and integrate sensor data in the cloud. Users can examine concentration levels of each VOC and take corrective action if needed. This dramatically reduces the cost of accurate monitoring and enabling real-time data access. [\[More\]](#)

## Fall 2017 Research Review and IoT Workshop



The *Fall 2017 Research Review and IoT Workshop* in Ann Arbor was a great success. More than one hundred and twenty-five guests attended: including WIMS<sup>2</sup> industrial members, faculty, students, and alumni; regional faculty and students; MicRO Alliance members from Kyoto and Freiburg Universities; and invited guests. These events included a review of ongoing research from seven thrusts, a full day of Internet of Things-oriented research presentations, an extended poster session with awards, and a tour of Central Campus. Technical presentations and posters were provided by faculty and researchers from 8 universities: Michigan, Freiburg, Osaka, Kyoto, Wayne State, Michigan State, Western Michigan, and Iowa State. Also, last year's event included business-oriented presentations (Autonomous Vehicles, Startups, Human Performance), which were a popular complement to the technical presentations. Stay tuned for announcements of this year's events.

## WIMS<sup>2</sup> Faculty Contribute to This Year's Hilton Head



The eighteenth in the series of Hilton Head Workshops on the science and technology of solid-state sensors, actuators, and microsystems will be held on June 3-7, 2018, on Hilton Head Island, South Carolina. These workshops provided a forum for North, Central, and South American researchers to present and discuss recent advances in microfabrication technologies. Prof. Mina Rais-Zadeh has been named Technical Program Chair, and Prof. Khalil Najafi will give a plenary talk. [\[More\]](#)

## WIMS<sup>2</sup> Professor Named General Co-chair of the 2018 IEEE Sensors Conference



*IEEE Sensors Conference*, is the flagship conference of the IEEE Sensors Council, an organization currently consisting of 25 IEEE member societies. This year, it will be held in New Delhi, October 28-31. Prof. Gianchandani, WIMS<sup>2</sup> Center Director, is general co-chair of the conference. [\[More\]](#)

# SAVE the DATE

## WIMS<sup>2</sup>

# Research Review

## September 20, 2018

### U-M North Campus



# Publications

## WIMS<sup>2</sup> Conference Publications (2017-2018)

Adam Peczalski, Xu-Qian Zheng, Jaesung Lee, P.X.-L Feng, Mina Rais-Zadeh, **Effects of Heterostructure Stacking on Acoustic Dissipation in Coupled-ring Resonators**, *IEEE International Conference on Micro Electro Mechanical Systems*, Las Vegas, United States of America, 1/1/2017, pp. 954-7

Mina Rais-Zadeh, Haoshen Zhu, Azadeh Ansari, **Applications of Gallium Nitride in MEMS and Acoustic Microsystems**, *IEEE Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems*, Phoenix, United States of America

Rui Hou, Seongwoon Jeong, Kincho H. Law, Jerome Lynch, Ying Wang, **Camera-based Triggering of Bridge Structural Health Monitoring Systems Using a Cyber-physical System Framework**, *11th International Workshop on Structural Health Monitoring 2017*, Stanford, United States of America, 1/1/2017, pp. 3139-3146

Andrew R. Burton, Jerome Lynch, **Wireless Thin Film Strain Sensing Circuit for Implantable Applications**, *11th International Workshop on Structural Health Monitoring 2017*, Stanford, United States of America, 1/2/2017, pp. 802-810

Amin Sandoughsaz, Khalil Najafi, Luis P. Bernal, **A 2kPa Per Stage and 1.3sccm Flow Rate Modular Two-stage Electrostatic Gas Micropump With Stiffened Drive Electrodes**, *IEEE SENSORS Conference*, Orlando, United States of America, 1/5/2017

Milad Moosavifar, Azadeh Ansari, Mina Rais-Zadeh, **An AlN-on-Si Resonant IR Sensor Array With a Large Temperature Coefficient of Frequency**, *IEEE Sensors*, Orlando, United States of America, 1/5/2017

Katsuo Kurabayashi, Mansoor Nasir, Brian Berger, **Investigation Into the Use of Electrochemical Impedance Spectroscopy for Cellular Functional Immunophenotyping**, *IEEE Sensors*, Orlando, United States of America, 2/8/2017

Jae Yoong Cho, Tal Nagourney, Ali Darvishian, Khalil Najafi, **Ultra Conformal High Aspect-ratio Small-gap Capacitive Electrode Formation Technology for 3D Micro Shell Resonators**, *IEEE International Conference on Micro Electro Mechanical Systems*, Las Vegas, United States of America, 2/23/2017, pp. 1169-1172

Qisen Cheng, Yutao Qin, Yogesh B. Gianchandani, **A Bidirectional Knudsen Pump With Superior Thermal Management for Micro-gas Chromatography applications**, *IEEE International Conference on Micro Electro Mechanical Systems*, Las Vegas, United States of America, 2/23/2017, pp. 167-170

Yemin Tang, Amin Sandoughsaz, Khalil Najafi, **Ultra High Aspect-ratio and Thick Deep Silicon Etching (UDRIE)**, *IEEE International Conference on Micro Electro Mechanical Systems*, Las Vegas, United States of America, 2/23/2017, pp. 700-703

Scott Ryan Green, Yogesh B. Gianchandani, **Wireless Magnetoelastic Transducers for Biomedical Applications**, *Micro- and Nanotechnology Sensors, Systems, and Applications V Conference*, Anaheim, United States of America, 4/13/2017

Behrouz Shiari, Tal Nagourney, Ali Darvishian, Jae Yoong Cho, Khalil Najafi, **Numerical Study of Impact of Surface Roughness on Thermoelastic Loss of Micro-resonators**, *IEEE International Symposium on Inertial Sensors and Systems*, Kauai, United States of America, 5/30/2017, pp. 74-77

Christopher Boyd, Jong-Kwan Woo, Jae Yoong Cho, Tal Nagourney, Ali Darvishian, Behrouz Shiari, Khalil Najafi, **Effect of Drive-axis Displacement on MEMS Birdbath Resonator Gyroscope Performance**, *IEEE International Symposium on Inertial Sensors and Systems*, Kauai, United States of America, 5/30/2017

Ethem Erkan Aktakka, Jong-Kwan Woo, Khalil Najafi, **On-chip Characterization of Scale-factor of a MEMS Gyroscope Via a Micro Calibration Platform**, *IEEE International Symposium on Inertial Sensors and Systems*, Kauai, United States of America, 5/30/2017

Jong-Kwan Woo, Christopher Boyd, Jae Yoong Cho, Khalil Najafi, **Ultra-low-noise Transimpedance Amplifier for High-performance MEMS Resonant Gyroscopes**, *(Transducers) IEEE International Conference on Solid-State Sensors and Actuators*, Kaohsiung, Taiwan, Republic of China, 7/26/2017, pp. 1006-1009

Neeharika Vellaluru, Yogesh B. Gianchandani, Tao Li, **Facile Batch Mode Process for High Capacity Rechargeable Nickel-zinc Microbatteries**, *(Transducers) IEEE International Conference on Solid-State Sensors and Actuators*, Kaohsiung, United States of America, 7/26/2017, pp. 1867-1870

Ramprasad Nambisan, Scott Ryan Green, Joshua Stein, Yogesh B. Gianchandani, **In Situ Acoustomagnetic Interrogation of a Glaucoma Valve With Integrated Wireless Microactuator**, *(Transducers) IEEE International Conference on Solid-State Sensors and Actuators*, Kaohsiung, United States of America, 7/26/2017, pp. 383-386

Tal Nagourney, Jae Yoong Cho, Behrouz Shiari, Ali Darvishian, Khalil Najafi, **259 Second Ring-down Time and 4.45 Million Quality Factor in 5.5 kHz Fused Silica Birdbath**

# Publications

**Shell Resonator**, (*Transducers*) *IEEE International Conference on Solid-State Sensors and Actuators*, Kaohsiung, United States of America, 7/26/2017, pp. 790-793

Christopher Allemang, Rebecca Lorenz Peterson, **Increased Blocking Voltage in Solution Processed ZTO HVTFTs Through Drain Offset**, *75th Annual Device Research Conference, DRC 2017*, South Bend, United States of America, 8/1/2017

Farzad Asgarian, Khalil Najafi, **Time Synchronization in a Network of Bluetooth Low Energy Beacons**, *SIGCOMM*, Los Angeles, United States of America, 8/1/2017, pp. 119-120

Kyuseok Lee, Sung-Yun Park, Jihyun Cho, Euisik Yoon, **A 272.49 pJ/pixel CMOS Image Sensor With Embedded Object Detection and Bio-inspired 2D Optic Flow Generation for Nano-air-vehicle Navigation**, *IEEE Symposium on VLSI Circuits*, Kyoto, United States of America, 8/10/2017, pp. C294-C-295

Sung-Yun Park, Jihyun Cho, Euisik Yoon, **3.37  $\mu$ W/Ch Modular Scalable Neural Recording System With Embedded Lossless Compression for Dynamic Power Reduction**, *2017 Symposium on VLSI Circuits*, Kyoto, Japan, 8/10/2017, pp. C168-C169

Stavroula Tsiapoki, Omid Bahrami, Michael B. Kane, Jerome Lynch, Raimund Rolfes, **Extraction of Environmental and Operational Conditions of Wind Turbines Using Tower Response Data for Structural Health Monitoring**, *11th International Workshop on Structural Health Monitoring 2017*, Stanford, United States of America, 9/12/2017, pp. 2475-2482

## WIMS<sup>2</sup> Journal Publications (2017-2018)

Iljoo Cho, Hyungkew Lee, Sunil Chang, Euisik Yoon, **Compliant Ultrasound Proximity Sensor for the Safe Operation of Human Friendly Robots Integrated with Tactile Sensing Capability**, *Journal of Electrical Engineering and Technology*, vol. 12, 1/1/17, pp. 310-316

Muzhi Wang, Mina Rais-Zadeh, **Development and Evaluation of Germanium Telluride Phase Change Material Based Ohmic Wwitches for RF Applications**, *Journal of Micromechanics and Microengineering*, vol. 27, 1/1/17, pp. 013001-01310

Wei Lu, **A Battery Model That Enables Consideration of Realistic Anisotropic Environment Surrounding an Active Material Particle and its Application**, *Journal of Power Sources*, vol. 357, 1/1/17, pp. 220-229

Yoon Koo Lee, Jonghyun Park, Wei Lu, **A Comprehensive Study of Manganese Deposition and Side Reactions in Li-ion Battery Electrodes**, *Journal of the Electrochemical Society*, vol. 164, 1/1/17, pp. A2812-A2822

Zeta Tak For Yu, Jophin Joseph, Shirley Liu, Mei Ki Cheung, Katsuo Kurabayashi, Jianping Fu, **Centrifugal Microfluidics for Sorting Immune Cells From Whole Blood, Sensors and Actuators, B: Chemical**, vol. 245, 1/1/17, pp. 1050-1061

Hongbo Zhu, Azadeh Ansari, Wei Luo, Mina Rais-Zadeh, **Observation of Acoustoelectric Effect in Micromachined Lamb Wave Delay Lines With AlGaIn/GaN Heterostructure**, *Technical Digest - International Electron Devices Meeting, IEDM*, 1/31/17, pp. 26.6.1-26.6.4

Behrouz Shiari, Tal Nagourney, Ali Darvishian, Jae Yoong Cho, Khalil Najafi, **Anchor Loss in Hemispherical Shell Resonators**, *Journal of Microelectromechanical Systems*, vol. 26, 2/1/17, pp. 51-66

Venkatram Pepakayala, Scott Ryan Green, Yogesh B. Gianchandani, **Wireless Strain Measurement Using Ringdown Frequency Locking on a Micromachined Magnetoelastic Resonator**, *ISSS Journal for Micro and Smart Systems*, vol. 6, 2/25/17

Bin Wu, Wei Lu, **A Battery Model That Fully Couples Mechanics and Electrochemistry at Both Particle and Electrode Levels by Incorporation of Particle Interaction**, *Journal of Power Sources*, vol. 360, 3/1/17, pp. 360-372

Feng Lin, Mina Rais-Zadeh, **Continuously Tunable 0.55-1.9-GHz Bandpass Filter With a Constant Bandwidth Using Switchable Varactor-Tuned Resonators**, *IEEE Transactions on Microwave Theory and Techniques*, vol. 65, 3/1/17, pp. 792-803

Muzhi Wang, Feng Lin, Mina Rais-Zadeh, **An X-band Reconfigurable Bandpass Filter Using Phase Change RF Switches**, *IEEE Transactions on Microwave Theory and Techniques*, vol. 65, 3/1/17, pp. 792-803

Xianke Lin, Wei Lu, **A Battery Model That Enables Consideration of Realistic Anisotropic Environment Surrounding an Active Material Particle and its Application**, *Journal of Power Sources*, vol. 357, 3/1/17, pp. 220-229

Jane Cornett, Baoxing Chen, Samer Haidar, Helen Berney, Pat McGuinness, Bill Lane, Yuan Gao, Yifan He, Nian Sun, Marc Dunham, Mehdi Asheghi, Ken Goodson, Yi Yuan, Khalil Najafi, **Fabrication and Characterization of Bi<sub>2</sub>Te<sub>3</sub>-Based**

# Publications

**Chip-Scale Thermoelectric Energy Harvesting Devices**, *Journal of Electronic Materials*, vol. 46, 5/1/17, pp. 2844-2846

Sean M. O'Connor, Yilan Zhang, Jerome Lynch, Mohammed Ettouney, Peter Jansson, **Long-term Performance Assessment of the Telegraph Road Bridge Using a Permanent Wireless Monitoring System and Automated Statistical Process Control Analytics**, *Structure and Infrastructure Engineering*, vol. 13, 5/4/17, pp. 604-624

Zhengkun Cheng, Ridong Liao, Wei Lu, **Surface Stress Concentration Factor via Fourier Representation and its Application for Machined Surfaces**, *International Journal of Solids and Structures*, vol. 113-114, 5/15/17, pp. 108-117

Yuchih Chen, Hyoung Won Baac, Kyu-Tae Lee, S. Fouladdel, Kendall Teichert, Jong G. Ok, Yu-Heng Cheng, Patrick N. Ingram, Anastasios John Hart, E. Azizi, L. Jay Guo, M.S. Wicha, Euisik Yoon, **Selective Photomechanical Detachment and Retrieval of Divided Sister Cells from Enclosed Microfluidics for Downstream Analyses**, *ACS Nano*, vol. 11, 5/23/17, pp. 4660-4668

Donguk Yang, Jong-Kwan Woo, Sangwoo Lee, Jay S. Mitchell, Dorian Challoner, Khalil Najafi, **A Micro Oven-Control System for Inertial Sensors**, *Journal of Microelectromechanical Systems*, vol. 26, 6/1/17, pp. 507-518

Ali Darvishian, Tal Nagourney, Jae Yoong Cho, Behrouz Shiari, Khalil Najafi, **Thermoelastic Dissipation in Micromachined Birdbath Shell Resonators**, *Journal of Microelectromechanical Systems*, vol. 26, 7/1/17, pp. 758-772

Aram Markosyan, Scott Ryan Green, Shiyang Deng, Yogesh B. Gianchandani, Mark J. Kushner, **Miniaturized Magnet-less RF Electron Trap. I. Modeling and Analysis**, *Journal of Vacuum Science and Technology B: Nanotechnology and Microelectronics*, vol. 35, 7/1/17

Hai Wang, Zupan Hu, Wei Lu, Michael D. Thouless, **The Effect of Coupled Wear and Creep During Grid-to-rod Fretting**, *Nuclear Engineering and Design*, vol. 318, 7/1/17, pp. 163-173

Shiyang Deng, Scott Ryan Green, Aram Markosyan, Mark J. Kushner, Yogesh B. Gianchandani, **Miniaturized Magnet-less RF Electron Trap. II. Experimental Verification**, *Journal of Vacuum Science and Technology B: Nanotechnology and Microelectronics*, vol. 35, 7/1/17, pp. 42002

Youngbae Son, Alex Hann-Yun Liao, Rebecca Lorenz Peterson, **Effect of Relative Humidity and Pre-annealing Temperature on Spin-coated Zinc Tin Oxide Films Made Via the Metal**, *Organic Decomposition Route*, *Journal of Materials Chemistry B*, vol. 51, 7/22/17, pp. 8071-8081

Behrouz Shiari, Tal Nagourney, Ali Darvishian, Jae Yoong Cho, Khalil Najafi, **Simulation of Blowtorch Reflow of Fused Silica Micro-Shell Resonators**, *Journal of Microelectromechanical Systems*, vol. 26, 8/1/17, pp. 782-792

Sunil Chang, Sung-Yun Park, Euisik Yoon, **Low-power Low-noise Pseudo-open-loop Preamplifier for Neural Interfaces**, *IEEE Sensors Journal*, vol. 17, 8/1/17, pp. 4843-4852

Wenbing Hu, Rebecca Lorenz Peterson, **The Roles of Rare-earth Dopants in Solution-processed ZnO-based Transparent Conductive Oxides**, *Journal of Applied Physics*, vol. 122, 9/14/17, pp. 105301

Myungjoon Choi, Yu Sui, Inhee Lee, Ryan Meredith, Yushu Ma, Gyouho Kim, David Blaauw, Yogesh B. Gianchandani, Tao Li, **Autonomous Microsystems for Downhole Applications: Design Challenges, Current State, and Initial Test Results**, *Sensors*, vol. 17, 10/1/17, pp. 2190

Sung-Yun Park, Jihyun Cho, Kyoungwan Na, Euisik Yoon, **Modular 128-Channel - Analog Front-End Architecture Using Spectrum Equalization Scheme for 1024-Channel 3-D Neural Recording Microsystems**, *IEEE Journal of Solid-State Circuits*, 11/7/17

Youngbae Son, Rebecca Lorenz Peterson, **The Effects of Localized Tail States on Charge Transport Mechanisms in Amorphous Zinc Tin Oxide Schottky Diodes**, *Semiconductor Science and Technology*, vol. 32, 11/7/17, pp. 12LT02

Yu-Ju Lin, Sung-Yun Park, Xing Chen, David D. Wentzloff, Euisik Yoon, **4.32-pJ/b, Overlap-Free, Feedforward Edge-Combiner-Based Ultra-Wideband Transmitter for High-Channel-Count Neural Recording**, *IEEE Microwave and Wireless Components Letters*, vol., 12/7/17