



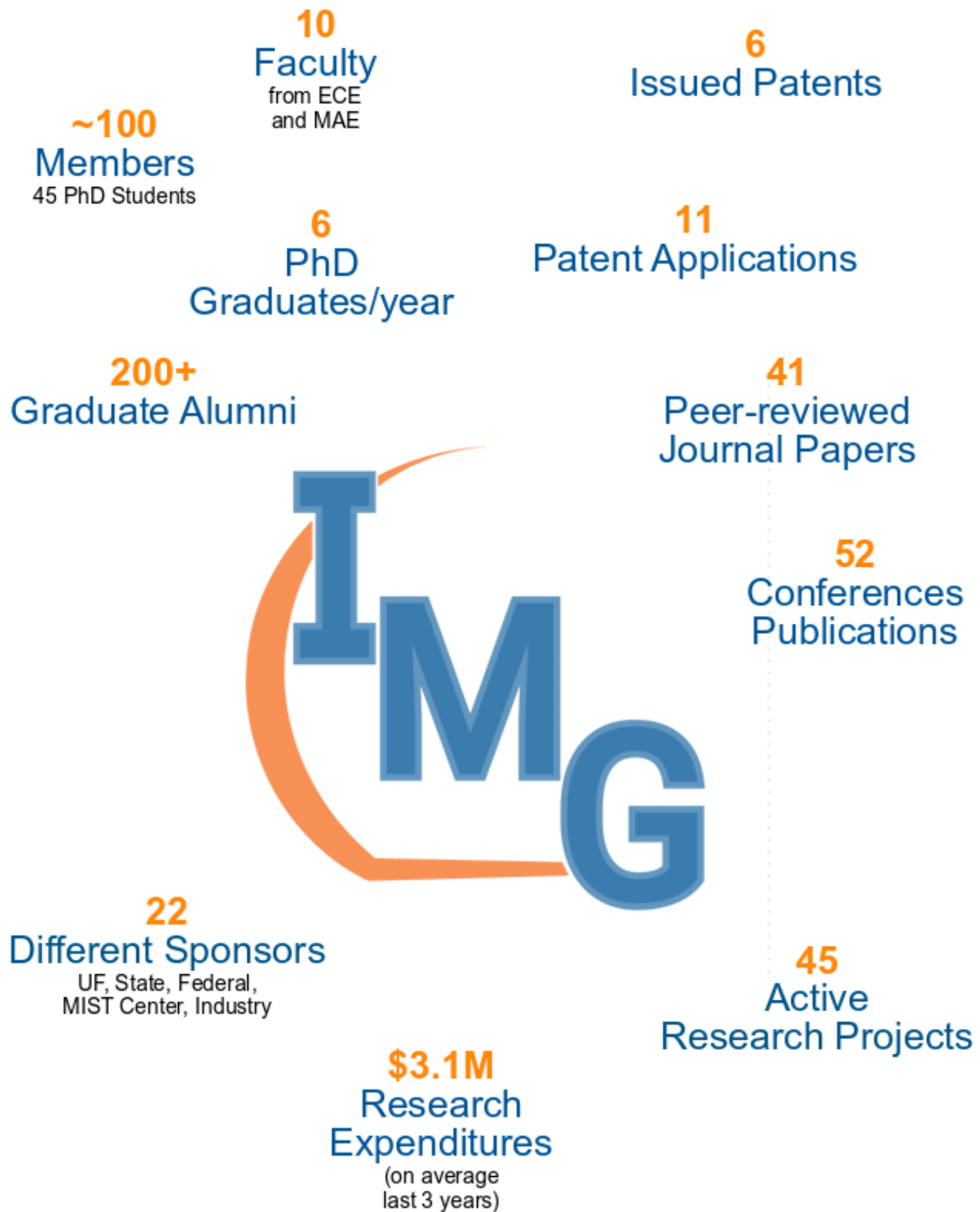
Interdisciplinary Microsystems Group

Annual Report 2018

2018 Year End Highlights.....	3
Introduction	4
Faculty Spotlight.....	5
<i>David P. Arnold.....</i>	<i>5</i>
<i>Z. Hugh Fan.....</i>	<i>6</i>
<i>Alexandra Garraud</i>	<i>7</i>
<i>Jack Judy.....</i>	<i>8</i>
<i>Saeed Moghaddam</i>	<i>9</i>
<i>Toshikazu (Toshi) Nishida</i>	<i>10</i>
<i>Mark Sheplak.....</i>	<i>11</i>
<i>Roozbeh Tabrizian</i>	<i>12</i>
<i>Huikai Xie</i>	<i>13</i>
<i>Y.K. Yoon</i>	<i>14</i>
Finance	15
<i>State Sponsorship</i>	<i>15</i>
<i>Federal Sponsorship</i>	<i>15</i>
<i>Industry Sponsorship (including NSF I/UCRC MIST Center Sponsorship)</i>	<i>17</i>
<i>Internal Sponsorship.....</i>	<i>18</i>
<i>Finance Summary</i>	<i>19</i>
2018 Courses offered by the IMG Faculty	21
<i>Spring 2018</i>	<i>21</i>
<i>Fall 2018.....</i>	<i>21</i>
<i>Microsystem Technology Certificate.....</i>	<i>22</i>
Personnel Accomplishments	23
<i>Prof. David Arnold</i>	<i>23</i>
<i>Prof. Z. Hugh Fan</i>	<i>23</i>
<i>Prof. Alexandra Garraud.....</i>	<i>23</i>
<i>Prof. Jack Judy</i>	<i>23</i>

<i>Prof. Saeed Moghaddam</i>	23
<i>Prof. Toshikazu Nishida</i>	23
<i>Prof. Roozbeh Tabrizian</i>	24
<i>Prof. Huikai Xie</i>	24
<i>Prof. Yong-Kyu Yoon</i>	24
<i>Students Awards</i>	24
<i>Graduation</i>	25
<i>New Alumni</i>	25
IMG Seminars Series	27
Publications	28
<i>Editorial Advisory Boards</i>	28
<i>Reviewers for Scholarly Journals</i>	28
<i>International peer-reviewed journals (41)</i>	29
<i>Conferences (52)</i>	31
<i>Book/Book chapters (3)</i>	35
<i>Patents (7)</i>	35
<i>Patent Applications (11)</i>	36

2018 Year End Highlights



Introduction

The Interdisciplinary Microsystems Group (IMG) is a college-wide multi-departmental education and research program of the College of Engineering at the University of Florida. IMG operates under the direction of Mark Sheplak, Hugh Fan, and Saeed Moghaddam of the Department of Mechanical and Aerospace Engineering and Toshikazu Nishida, Huikai Xie, David Arnold, Y.K. Yoon, Jack Judy, Roozbeh Tabrizian and Alexandra Garraud of the Department of Electrical and Computer Engineering.

IMG research focuses on micro- and nanosystems for healthcare, energy, security, aerospace, transportation, consumer electronics, and other industries. Efforts include design, fabrication, characterization, and ultimately deployment of micro and nanotechnologies for a wide variety of applications.

Founded in 1998, IMG has steadily grown in size, scope, and impact. Since its inception, IMG faculty have participated in 368 sponsored research projects valued at \$99M (IMG portion was \$54M). Of these, 236 projects (64%) were led by an IMG faculty member as PI, and 73 (25%) included more than one IMG investigator.

Over the past three years (2016-2018), IMG has collectively averaged \$3.1M/year in research expenditures, 41 journal publications/year, 50 conference papers/year, and 9 graduated PhD students/year. IMG has a diverse track record of fundamental and applied research for government, defense, and industry sponsors. IMG's research and graduate/undergraduate student training record have been fueled by true interdisciplinary research and strong internal and external collaborations.



Faculty Spotlight

David P. Arnold

Professor

David P. Arnold is the George Kirkland Engineering Leadership professor in the Dept. of Electrical and Computer Engineering at the University of Florida. He also holds an affiliate appointment in the Dept. of Materials Science and Engineering. He is currently Director of the Interdisciplinary Microsystems Group (IMG) and also Deputy Director of the NSF Multi-functional Integrated System Technology (MIST) Center.



He received dual B.S. degrees in electrical and computer engineering in 1999, followed by the M.S. degree in electrical engineering in 2001, from the University of Florida, Gainesville. He received the Ph.D. degree in electrical engineering at the Georgia Institute of Technology, Atlanta in 2004. His research focuses on magnetic thin/thick films and magnetic micro/nanostructures; magnetic microsystems and electromechanical transducers; and compact (<100 W) power/energy systems.

Dr. Arnold is an active participant in the magnetics and MEMS communities, serving on conference committees for the MEMS, PowerMEMS, Hilton Head, Transducers, Sensors, MMM, and Intermag meetings. He was the technical program co-chair of the 2009 PowerMEMS and is currently on the editorial board of J. Micromechanics and Microengineering and Energy Harvesting and Systems. His work has been recognized with several prestigious awards, including the 2008 Presidential Early Career Award in Science and Engineering (PECASE) and the 2009 DARPA Young Faculty Award. Dr. Arnold is the current UF chapter faculty advisor and member of the Eta Kappa Nu ECE engineering honor society. He is also a Senior Member of IEEE and a member of Tau Beta Pi.

Beyond his passion for research and teaching, he most enjoys spending time with his wife and three children.

Education

Graduation Year	Degree	University	Program of study
2004	Doctorate	Georgia Institute of Technology	Electrical Engineering
2001	Master of Science	University of Florida	Electrical and Computer Engineering
1999	Bachelor of Science	University of Florida	Electrical Engineering
1999	Bachelor of Science	University of Florida	Computer Engineering

Z. Hugh Fan

Professor

Dr. Hugh Fan is a professor of the Department of Mechanical and Aerospace Engineering, J Crayton Pruitt Family Department of Biomedical Engineering, and Department of Chemistry at the University of Florida (UF). He currently holds UF Term Professorship and is a member of UF Health Cancer Center. Dr. Fan was an E.T.S. Walton visiting professor in Biomedical Diagnostics Institute at Dublin City University, Ireland in 2009. Prior to joining UF in 2003, Dr. Fan was a Principal Scientist at ACLARA BioSciences Inc. (Mountain View, CA) and was previously a Member of the Technical Staff at Sarnoff Corp. (Princeton, NJ).



Dr. Fan's research interests include microfluidics, BioMEMS (Biomedical MicroElectroMechanical Systems), sensors, and bioengineering. His research focus is to develop microfluidics and BioMEMS technologies and apply them to biological applications. Microfluidics is promising to reach the holy grail of "lab-on-a-chip". In analogy to shrinking a computer from the size of a room in the 1950s to a laptop today, instruments for chemical and biological analyses may be miniaturized using modern microfabrication technology. Potential applications of the portable, miniaturized devices may include point-of-care testing (e.g., in emergency rooms), environmental monitoring, and detection of biowarfare agents in the field.

Dr. Fan is a recipient of Fraunhofer-Bessel Research Award from Alexander von Humboldt Foundation. He is a Fellow of the American Association for the Advancement of Science (AAAS) and the American Society of Mechanical Engineers (ASME), an editor of *Microsystems and Nanoengineering* (Nature Publishing Group), and an editorial board member of *Scientific Report* (Nature Publishing Group). He received his B. Sc. from Yangzhou Teachers' College (now a part of Yangzhou University) in China and his Ph.D. from the University of Alberta in Canada. Dr. Fan worked as a postdoctoral fellow at Ames Laboratory of US Department of Energy at Iowa State University. He joined UF in 2003 after more than eight years of industrial experience.

Education

Graduation Year	Degree	University	Program of study
1994	Doctorate	University of Alberta	Chemistry
1985	Bachelor	Yangzhou Teachers' College	Chemistry

Alexandra Garraud

Research Assistant Professor

Alexandra Garraud is currently a research assistant professor in the Electrical and Computer Engineering department at the University of Florida. Her research interests include the fabrication, the development and the characterization of ferromagnetic and ferroelectric materials and microsystems for power and low-power memories applications.

She received the B.S. degree in electrical engineering in 2005, and the M.S. degree in applied physics in 2008, from ENS Cachan and Paris-Sud University (France). She received the Ph.D. degree in electrical engineering from Montpellier 2 University (France) in 2011, with a support from a ENS Cachan fellowship.

During her postdoctoral position, from 2012 to 2015, in the Electrical and Computer Engineering and the Biomedical Engineering departments, she has acquired significant multidisciplinary experience by working on multiple sponsored research projects (particle beam physics, biomedical engineering).



Education

Graduation Year	Degree	University	Program of study
2011	Doctorate	Montpellier University	Electrical Engineering
2008	Master of Science	Paris-Sud University	Electrical Engineering
2005	Bachelor of Science	Paris-Sud University	Electrical Engineering

Jack Judy

Professor

Dr. Jack Judy is the Intel Endowed Chair of Nanotechnology and the Director of the Nanoscience Institute for Medical and Engineering Technology. Dr. Judy was formerly a program manager in the Microsystems Technology Office of the Defense Advanced Research Projects Agency (DARPA) and Professor at UCLA. While at UCLA, he served as Director of the NeuroEngineering Program, the Nanoelectronics Research Facility, and the Microfabrication Laboratory. Dr. Judy has received the prestigious National Science Foundation Career Award and the Okawa Foundation Award. He received his B.S.E.E. degree with summa cum laude honors from the University of Minnesota in 1989, and an M.S. and Ph.D. from the University of California, Berkeley, in 1994 and 1996, respectively.



Education

Graduation Year	Degree	University	Program of study
1996	Doctorate	University of California, Berkeley	Electrical Engineering
1994	Master of Engineering	University of California, Berkeley	Electrical Engineering
1989	Bachelor of Science	University of Minnesota	Electrical Engineering

Saeed Moghaddam

Professor

Saeed Moghaddam, Ph.D., is Knox T. Millsaps Professor of Mechanical and Aerospace Engineering at the University of Florida. Before joining the University of Florida in 2010, he was a postdoc (2007-2010) in Chemical and Biomolecular Engineering Department at University of Illinois at Urbana-Champaign. His academic background is in micro-/nanoscale transport, interfacial science, micro-/nanoeengineering, and ionic liquid membrane-based absorption process. Dr. Moghaddam has made significant contributions in the field of phase-change heat transfer through invention of a new measurement technique that has enabled resolving the thermal field at the interface of a heated wall and a boiling liquid with unprecedented spatial and temporal resolutions. This work has led to addressing decades old fundamental questions regarding the underlying physics of the process at microscales. Dr. Moghaddam is also the inventor of semi-open absorption cycle that has been successfully tested in ORNL in 2017. He has developed the world's first membrane-based IL hybrid absorption cycle for energy efficient exchange of latent and sensible heats. Dr. Moghaddam's work on nanoengineered membranes and their transport characteristics has been highlighted in Nano Science and Technology Institute (NIST) Innovation Spotlight, Nature Nanotechnology, New Scientist magazine, Heat Pumping Technologies Magazine and 2010 Guinness World Records. His research is published in nearly 100 peer-reviewed papers, 14 patents, and one book chapter. Dr. Moghaddam's research has been supported by ARPA-A, DARPA, DOE, NSF, ONR, NIH, SRC, ORNL, and private companies.



Education

Graduation Year	Degree	University	Program of study
2006	Doctorate	University of Maryland at College Park	Mechanical Engineering

Toshikazu (Toshi) Nishida

Professor and Associate Dean

Dr. Nishida is a professor in the Department of Electrical and Computer Engineering and affiliate professor in the Department of Mechanical and Aerospace Engineering. He serves as Associate Dean of Academic Affairs in the Herbert Wertheim College of Engineering. He is a Term Professor and an Alan Hastings Faculty Fellow. Dr. Nishida received his Ph.D. (1988) and M.S. degrees in Electrical and Computer engineering and B.S. degree in Engineering physics at the University of Illinois at Urbana-Champaign. With colleagues and students, he has published over 170 refereed journal and conference papers and received three best paper awards. He also received the 2003 College of Engineering Teacher of the Year award. He holds 13 U.S. patents. He is a senior member of IEEE.



Dr. Nishida's research interests include the development of reliable, high performance, multi-functional semiconductor devices, sensors, and actuators for microsystems employing strained Si, SiGe, GaN, ferroelectrics, and polymers and enabling multi-functional integrated system technology for smart systems.

Dr. Nishida is the Director of the NSF Industry/University Cooperative Research Center on Multi-functional Integrated System Technology (MIST).

Education

Graduation Year	Degree	University	Program of study
1988	Doctorate	University of Illinois at Urbana-Champaign	Electrical and Computer Engineering
1985	Master of Science	University of Illinois at Urbana-Champaign	Electrical and Computer Engineering
1983	Bachelor of Science	University of Illinois at Urbana-Champaign	Engineering Physics

Mark Sheplak

Professor

Mark Sheplak is currently a Professor holding joint appointments in the Department of Mechanical and Aerospace Engineering and the Department of Electrical and Computer Engineering at the University of Florida. Prior to joining UF in 1998, he was a postdoctoral associate at the Massachusetts Institute of Technology's Microsystems Technology Laboratories, Cambridge, MA from 1995-1998. He received a BS degree in 1989, a MS degree in 1992, and a Ph.D. degree in 1995 in Mechanical Engineering from Syracuse University, Syracuse, NY. During his Ph.D. studies he was a GSRP Fellow at NASA-LaRC in Hampton, VA from 1992-1995. His current research focuses on the design, fabrication, and characterization of high-performance, instrumentation-grade, MEMS-based sensors and actuators that enable the measurement, modeling, and control of various physical properties. Specific applications include technology development to enable large-channel count micromachined directional microphone arrays for aeroacoustic noise source localization and miniature skin-friction sensors for aerodynamic drag characterization and flow control.



He is a member of the Multi-functional Integrated System Technology Center (MIST) and the Florida Center for Advanced Aero-Propulsion (FCAAP). He is member and past chair of the AIAA Aerodynamic Measurement Technology Technical Committee. He is also an associate editor for Journal of the Acoustical Society of America (JASA) and JASA Express Letters. He is an associate fellow of AIAA and a fellow of the Acoustical Society of America.

Outside of work, he enjoys time with his wife and two children.

Education

Graduation Year	Degree	University	Program of study
1995	Doctorate	Syracuse University	Mechanical Engineering
1992	Master of Science	Syracuse University	Mechanical Engineering
1989	Bachelor of Science	Syracuse University	Mechanical Engineering

Roozbeh Tabrizian

Assistant Professor

Roozbeh Tabrizian received his B.S. in Electrical Engineering from Sharif University of Technology, Tehran, Iran, in 2007, and Ph.D. in Electrical and Computer Engineering from Georgia Institute of Technology, 2013. In 2014, he joined the Department of Electrical Engineering, University of Michigan as a Postdoctoral research fellow. In August 2015, he joined the Department of Electrical and Computer Engineering, University of Florida as an Assistant Professor.



His research at the University of Florida involves linear, nonlinear, and nonreciprocal nano-acoustic devices, RF M/NEMS, mixed-domain nanosystems for time-keeping / transfer, frequency reference, and spectroscopy applications, and micro- / nano-fabrication technologies. Dr. Tabrizian is the recipient of DARPA Young Faculty Award (2019) and NSF CAREER award (2018). His research has resulted in more than 50 journal and conference papers, 2 book chapters, 3 published patents and 10 patent applications. He and his students are the recipients of outstanding paper awards at the IEEE International Conference on Micro Electro Mechanical Systems (MEMS) and International Conference on Solid-State Sensors, Actuators, and Microsystems (Transducers).

Graduation Year	Degree	University	Program of study
2013	Doctorate	Georgia Institute of Technology	Electrical and Computer Engineering
2007	Bachelor of Science	Sharif University of Technology	Electrical Engineering

Huikai Xie

Professor

Huikai Xie is currently a professor at the Department of Electrical and Computer Engineering at the University of Florida. He received his master's degree in electro-optics from Tufts University in 1998 and his Ph.D. degree in electrical and computer engineering from Carnegie Mellon University in 2002. He also holds BS and MS degrees both in electronic engineering from Beijing Institute of Technology. He was a research faculty at the Institute of Microelectronics at Tsinghua University, Beijing, China.



His research is mainly focused on development of innovative optical and acoustic MEMS devices and their applications in various beam steering microsystems and endoscopic imaging modalities. The goal is to develop enabling micro/nanofabrication technology and build innovative integrated microsystems with improved performance, functionality and affordability for medical, industrial, space and consumer electronics applications. His current research activities include optical MEMS, micromirrors, microactuators, piezoelectric MEMS microspeakers and ultrasonic transducers, biophotonics, optical endomicroscopy, optical coherence tomography (OCT), photoacoustic microscopy, two-photon microscopy for in vivo brain imaging, micro LiDAR, and microspectrometers.

Education

Graduation Year	Degree	University	Program of study
2002	Doctorate	Carnegie Mellon University	Electrical and Computer Engineering
1998	Master of Science	Tufts University	Electro-Optics
1992	Master of Science	Beijing Institute of Technology	Microelectronics
1989	Bachelor of Science	Beijing Institute of Technology	Electronic Engineering

Y.K. Yoon

Associate Professor

YK Yoon is currently an Associate Professor in the Department of Electrical and Computer Engineering at the University of Florida, Gainesville, FL. His current research interests include three dimensional (3-D) micromachining and nano fabrication; design and implementation of metamaterial for radio frequency (RF) and microwave applications; micromachined millimeter wave and terahertz antennas and waveguides; bio/microfluidic systems for the lab-on-a-chip applications; wireless telemetry systems for biomedical applications; and ferroelectric material development for high density memory devices and/or tunable RF devices.



He received his BS and MS degrees in electrical engineering from Seoul National University in Korea. He also earned an MSEE degree from the New Jersey Institute of Technology, Newark, NJ in 1999 and the Ph.D. degree in electrical and computer engineering from the Georgia Institute of Technology, Atlanta, GA in 2004. He held a postdoctoral position in the Microelectronics Research Center of Georgia Institute of Technology from 2004 to 2006. In 2006, he joined the faculty of the University at Buffalo, the State University of New York as an Assistant Professor in the Department of Electrical Engineering, where he directed the Multidisciplinary nano and Microsystems (MnM) laboratory until 2010. He received the NSF Early Career Development Award (CAREER) in 2008 and the Young Investigator Award from the University at Buffalo in 2009. He has more than 90 peer reviewed publications. He is a member of IEEE society. He actively participates in multiple technical conferences including Microelectromechanical systems (MEMS), Transducers, Hilton Head, micro total analysis systems (μ TAS), American Vacuum Society (AVS), International Microwave Symposium (IMS) and Antenna Propagation Symposium (APS).

Education

Graduation Year	Degree	University	Program of study
2004	Doctorate	Georgia Institute of Technology	Electrical and Computer Engineering
1999	Master of Science	New Jersey Institute of Technology	Electrical and Computer Engineering
1994	Master of Science	Seoul National University	Electrical Engineering
1992	Bachelor of Science	Seoul National University	Electrical Engineering

Finance

State Sponsorship

Title of Grant	Grant PI	Funding Agency	Faculty's Portion (Funding Period)	Expenditures (Reporting Period)
Laminated Paper-based Analytical Devices for Detecting Exposure to Secondhand Smoke	Fan	FL Department of Health	\$125,000	\$40,690
Multiplexed Detection Platform for Point-of-Service Testing of Virus	Fan	FL Department of Health	\$449,886	\$58,360
University of Florida (UF) Testbed Initiative – Transit Components	Yoon	FL Department of Transportation	\$112,447	\$71,112
		Total	\$687,333	\$170,162

Federal Sponsorship

Title of Grant	Grant PI	Funding Agency	Faculty's Portion (Funding Period)	Expenditures (Reporting Period)
Magnetic Thick Films for Integrated Microwave Devices	Fan	DARPA	\$615,604	\$128,321
Rapid, Portable Detection of Coliforms and E. coli. in Drinking Water	Arnold	Defense Health Agency	\$42,049	\$31,424
Collaborative: Controlling Large Microbot Teams by Phy...	Arnold	NSF	\$295,191	\$51,169
Multi-Functional Integrated System Technology I/UCRC	Nishida	NSF	\$392,864	\$100,572
Characterization of Critical Two-Phase Flow regimes for Design and Reliable Operation of Compact Naval Energy Systems	Moghaddam	DOD	\$408,377	\$51,708
Plasma clearance of water soluble and albumin bound toxins using graphene oxide nanoengineered laminates	Moghaddam	NIH	\$413,129	\$231,260
Ferroelectric HfO ₂ on Germanium Tunnel Junctions Towards Sub-Femto Joule Switching	Nishida	NSF	\$128,779	\$45,122
Probing interfacial phase-change transport events in flow boiling on micro- and	Moghaddam	NSF	\$306,019	\$0

nanotextured surfaces				
Ionic Liquid Membrane-Based Polymer Absorber	Moghaddam	DOE	\$95,446	\$45,937
Directionally Controlled Time-of-Flight Sensors: Algorith...	Xie	DOD	\$105,332	\$42,273
Subcontract for A Multimodal Imaging System and Targeted Nanoprobes for Image-Guided Treatment of Breast Cancer	Xie	NSF	\$193,814	\$137,783
MEMS-based Fiber-optic Two-photon Microscopy Probe for Re-al Time In vivo 3D Neural Imaging in Freely Behaving Animals	Xie	NSF	\$258,468	\$23,313
RI: Medium: Collaborative Research: Novel Depth Sensor D	Xie	NSF	\$205,703	\$36,051
Cell Free Protein Synthesis (CFPS) Device Development	Fan	NIH	\$69,999	\$19,336
CAREER: Active Nano-Acoustic Waveguide Matrix to Tackle..	Tabrizian	NSF	\$500,000	\$103,116
Magnetic Thick Films for Integrated Microwave Devices	Yoon	DARPA	\$102,854	\$13,032
IRES Track I: Collaborative Research: Interdisciplinary Research in Korea on Applied smart systems (IRiKA) for Undergraduate Students	Yoon	NSF	\$213,000	\$0
AOI 3 – High-Temperature Sapphire Pressure Sensors for Harsh Environments	Sheplak	DOE	\$850,571	\$39,866
Novel instrumentation for extracting and modeling of flow structure in turbulent boundary layers	Sheplak	NSF	\$69,351	\$61,244
Examination of Pressure and Velocity Fields and Their Relationships to Radiated Noise in a Jet	Sheplak	NSF	\$164,963	\$128,034
SBIR – High Channel Count, High-Density Microphone Array ...	Sheplak	NASA	\$99,995	\$30,734
Tissue Engineered Electronic Neural Interface (TEENI)	Judy	DARPA	\$1,032,102	\$33,022
Ferroelectric HfO ₂ on Germanium Tunnel Junctions Towards Sub-Femto Joule Switching	Nishida	NSF	\$400,000	\$130,206
		Total	\$6,963,610	\$1,217,706

Industry Sponsorship (including NSF I/UCRC MIST Center Sponsorship)

Title of Grant	Grant PI	Funding Agency	Faculty's Portion (Funding Period)	Expenditures (Reporting Period)
Arnold MIST Portion	Arnold	Multiple Sponsors	\$189,607	\$18,186
Garraud MIST Portion	Garraud	Multiple Sponsors	\$37,500	\$8,176
Fan MIST Portion	Fan	Multiple Sponsors	\$138,691	\$23,249
Moghaddam MIST Portion	Moghaddam	Multiple Sponsors	\$30,169	\$12
Xie MIST Portion	Xie	Multiple Sponsors	\$50,000	\$6,119
Sheplak MIST Portion	Sheplak	Multiple Sponsors	\$561,500	\$117,846
Yoon MIST Portion	Yoon	Multiple Sponsors	\$263,016	\$13,997
Tabrizian MIST Portion	Tabrizian	Multiple Sponsors	\$22,500	\$4,937
Nishida MIST Portion	Nishida	Multiple Sponsors	\$229,573	\$50,834
Sensor Technology Usage on Personal Items	Tabrizian	Discover Financial Services	\$40,735	\$39,931
Thermo-Acoustic Engineering of GaN Micromechanics	Tabrizian	CA INST OF TECH JET	\$55,000	\$37,051
Active-FinBAR Resonator Building Block for Configurable	Tabrizian	INTEL Corp.	\$150,000	\$29,267
RF Bulk Acoustic Wave Fin Resonators and Filters with Si...	Tabrizian	OEM Group	\$140,000	\$18,583
New Generation Ultra-Efficient Air-Conditioning Systems	Moghaddam	Micro Nano Technologies (MNT)	\$123,970	\$28,035

IPPD 2017-2018 Primary...	Garraud	Miscellaneous Donors Industry Funds	\$16,500	\$16,500
Engineered silica for high-frequency circuit boards	Yoon	Corning	\$50,000	\$1,315
Glass vs Incumbent Materials in RF Passives and Antenna	Yoon	Corning	\$96,830	\$92,944
Modeling of a Diplexer – Glass vs LTCC vs Polymer	Yoon	Corning	\$10,000	\$9,144
Energy Dense and High Rate Electrochemical Capacitors: Advanced Nanomanufacturing	Yoon	Mainstream Engineering	\$107,447	\$51,491
SBIR-Phase III- Calibration Advances to Increase Comm...	Sheplak	IC2	\$25,000	\$24,999
High Frequency Calibration System for Sensors Used in Hi...	Sheplak	IC2	\$51,000	\$28,203
STRR Phase II- Highly Resolved Wall Shear Stress Measurement in High Speed Flows	Sheplak	IC2	\$225,000	\$57,332
Miniaturized Dynamic Pressure Sensor Arrays for Cross Flow Transition	Sheplak	IC2	\$50,000	\$1,747
		Total	\$2,664,038	\$679,898

Internal Sponsorship

Title of Grant	Grant PI	Funding Sponsor	Faculty's Portion (Funding Period)	Expenditures (Reporting Period)
Electrodynamic Wireless Power Transmission Prototype	Arnold	UF OTL	\$25,526	\$8,304
Development of Wirelessly Rechargeable Battery Technology	Arnold	UF OTL	\$24,850	\$1,434
Colorectal Cancer Screening Project	Fan	UF Foundation	\$299,285	\$54,507

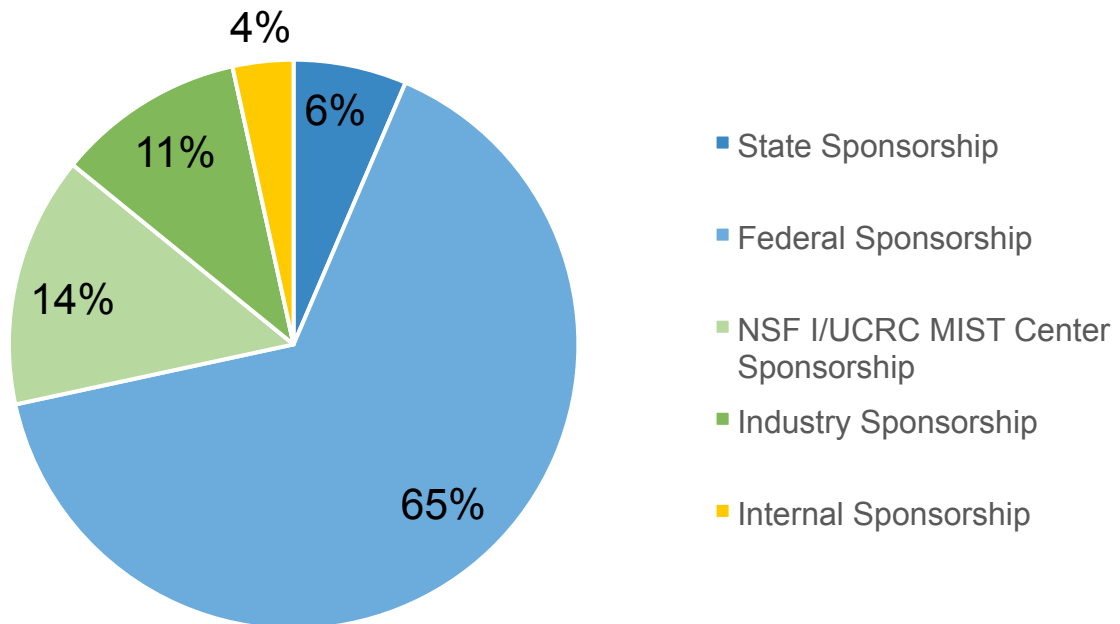
SMRT Mouth Development	Sheplak	UF Foundation	\$9,750	\$828
DSR Match NSF Fellow: Keister	Sheplak	UF Division of Sponsored Research Matching Funds	\$8,999	\$3,624
		Total	\$368,410	\$68,697

Finance Summary

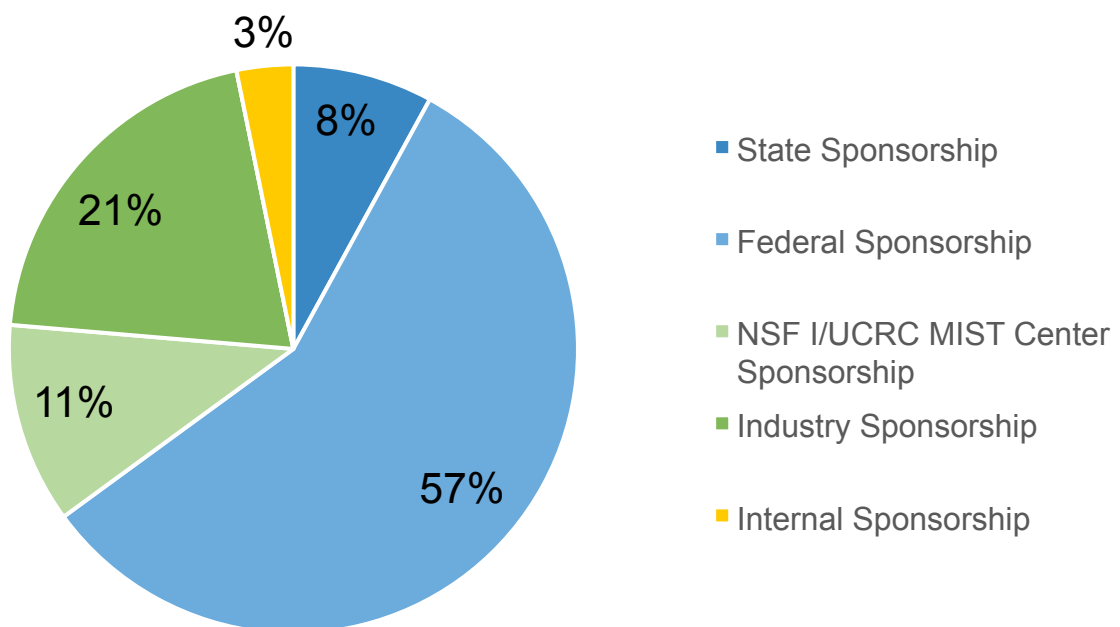
Total Funding

	Faculty's Portion (Funding Period)	Expenditures (Reporting Period)
Total	\$10,683,391	\$2,136,463

Faculty's Portion (Funding Period)



Expenditures (Reporting Period)



2018 Courses offered by the IMG Faculty

Spring 2018

Instructor	Course Number	Course Name	Enrolled
Arnold, David	EGN 6933	Engineering Faculty Development	21
Arnold, David	EEE 6465	Design of MEMS Transducers	12
Fan, Hugh	ENG 3353	Fluid Mechanics	167
Sheplak, Mark	EEE 4720	Acoustics	9
Sheplak, Mark	EEE 5725	Acoustics	4
Tabrizian, Roozbeh	EEE 4222 EEE 5225	Resonant MEMS	12 3
Xie, Huikai	EEE 5354L	Semiconductor Device Fabrication	22
Xie, Huikai	EEE 4210 EEE 5216	Introduction to Biophotonics	13 6

Fall 2018

Instructor	Course Number	Course Name	Enrolled
Arnold, David	EEL 3008	Physics of Electrical Engineering	87
Fan, Hugh	BME 5580	Microfluidics and BioMEMS	9
Judy, Jack	EEL 5225	Principles of MEMS Transducers	7
Moghaddam, Saeed	EML 6154	Conduction Heat Transfer	30
Sheplak, Mark	EML 5224	Acoustics	8
Tabrizian, Roozbeh	EEL 3112	Circuits 2	99
Yoon, Y.K.	EEE 5354L	Semiconductor Device Fabrication Lab	19
Yoon, Y.K.	EEE 5467	Micro/Nano Mechined Metamaterials	8

Awarded Certificates in 2018:

Microsystem Technology Certificate

In 2016, IMG has developed a new graduate certificate program in "Microsystem Technology."

Certificate Description: The Microsystem Technology certificate prepares students for the complex, interdisciplinary development of microsystem technologies such as microactuators, microsenors, microfluidic devices, micropower systems, microoptical devices, and other microelectromechanical systems (MEMS).

Requirements for Admission: A bachelor's degree or equivalent from a regionally accredited institution. Students must be registered in a graduate degree program in the College of Engineering and maintain a 3.0 GPA.

Requirements for Completion: Students must complete the following courses (9 credits total) with a grade of B or higher:

1. Required:

EEE 5405 Microelectronic Fabrication Technologies

2. Any two of the following:

EEE 5354L Semiconductor Device Fabrication Laboratory

Semester	Certificates Awarded
Spring 2018	0
Fall 2018	0
Total	0

Personnel Accomplishments

Prof. David Arnold

- *Faculty Accomplishments*
 - George Kirkland Engineering Leadership Professorship 2016-present
 - UF Research Foundation Professorship 2016-2019
 - Graduate Recruiting and Admissions Committee, Chair 2015-present
 - Eta Kappa Nu, ECE Honor Society, Faculty advisor 2005-present
 - UF Anderson Scholar Faculty Honoree 2018
- *International Conference Leadership*
 - General Co-Chair, 2018 PowerMEMS Conference 2018
 - Local Arrangements Chair, Transducers 2021 2019-2021
- *International Conference Technical Program Committee*
 - Transducers 2019
 - PowerMEMS 2019

Prof. Z. Hugh Fan

- *Faculty Accomplishments*
 - University of Florida Term Professorship 2017-2023
 - American Society of Mechanical Engineers (ASME) Fellow 2018-present
 - George N Sandor Faculty Fellow 2015-2018
 - American Association for the Advancement of Science (AAAS) Fellow 2016-present
- *International Conference Technical Program Committee*
 - Executive TPC, μ TAS 2018-2020

Prof. Alexandra Garraud

- *International Conference Leadership*
 - PowerMEMS School Chair, 2018 PowerMEMS Conference 2018

Prof. Jack Judy

- *Faculty Accomplishments*
 - NIMET Director 2013-present
- *International Conference Leadership*
 - Co-Chairman: Gordon Research Conference on Neuroelectronic Interfaces 2022
 - General Chairman: Transducers 2021 2021

Prof. Saeed Moghaddam

- *Faculty Accomplishments*
 - Guest Melchor Associate Professor at Notre Dame University 2017-2018
- *International Conference Leadership*
 - Chair, 16th ASME ICNMM 2018

Prof. Toshikazu Nishida

- *Faculty Accomplishments*

- Associate Dean of Academic Affairs 2017-present
- UF Term professorship 2017-2020
- Alan Hastings Faculty Fellow Award 2017-present

Prof. Roozbeh Tabrizian

- *Faculty Accomplishments*
 - DARPA Young Faculty Award (YFA) Class of 2019 2019-2022
 - 2018 National Science Foundation (NSF) CAREER Award 2018-2023
 - UF Research Foundation Professorship 2019-2022
 - Professor of the Year Award, ECE Department 2019
 - Teaching Excellence Award, ECE Department 2018
- *International Conference Technical Program Committee*
 - Transducers 2019
 - IEEE IFCS 2019
 - Hilton Head Workshop on Microsystems 2020

Prof. Huikai Xie

- *Faculty Accomplishments*
 - 2018 SPIE Fellow 2018-present
 - 2018 IEEE Fellow 2017-present
 - Best Paper, IEEE NEMS 2018
- *International Conference Leadership*
 - Co-Chair, 208 SPIE/CSOE Conference on Micro Optics and MOEMS 2018
- *International Conference Technical Program Committee*
 - Session Chair, IEEE NEMS 2018
 - Session Chair, Optical MEMS and Nanophotonics 2018
 - Session Chair, IEEE Sensors Conference 2018

Prof. Yong-Kyu Yoon

- *Faculty Accomplishments*
 - UF Term professorship 2017-2020
 - Doctoral Dissertation Advisor/Mentor Award, HWCOE 2017
- *International Conference Leadership*
 - Executive TPC, μ TAS 2018-2020
- *International Conference Technical Program Committee*
 - Hilton Head Workshop 2018

Students Awards

- Seahee Hwangbo, **Gator Engineering Attribute Award**
- Keisha Castillo-Torres, **Dr. J Michael Rollo Diversity Impact Award**
- Xiao Jiang, **IMG Excellence for Research Award (2018)**
- Nicolas Garraud, **IMG Excellence for Service Award (2018)**
- Richard Rode, **IMG Excellence for Service Award (2018)**
- Mayur Ghatge, **ECE Graduate Research Excellence Award (2018)**

PhD Graduates (6)

Graduate student	Advisor	Title
Chen, Kangfu	Fan, Hugh	Flow and interaction patterns between tumor cells and microfabricated structures
Garraud, Nicolas	Arnold, David	Characterization of the Rotational Dynamics of Magnetic Particles in Suspension
Hwangbo, Seahee	Yoon, Y.K.	Advanced Millimeter Wave Antenna Module for Modern Wireless Communications Using 3D System-In-Packaging
Jiang, Xiao	Fan, Hugh	Development of laminated paper-based RNA amplification devices for detection of virus and virus aerosols
Peng, Chang	Moghaddam, Saeed	Physical Mechanisms of Direct Contact Ultrasonic Cloth Drying Process
Schmid, Michael	Moghaddam, Saeed	Analysis of New Generation Absorption Cycles and the Design and Manufacturing of their Membrane-based Absorber Heat and Mass Exchanger

New Alumni

Alumnus	Degree	Advisor	Company
Chen, Kengfu	Doctorate	Fan, Hugh	University of Florida
Dulal, Anthony	Master of Science	Xie, Huikai	
Garraud, Nicolas	Doctorate	Arnold, David	CEA LETI, France
Hwangbo, Seahee	Doctorate	Yoon, Y.K.	Intel Corporation
Jiang, Xiao	Doctorate	Fan, Hugh	GoDx
Pabon, Rommel J.	Doctorate	Sheplak, Mark	University of Florida
Peng, Chang	Doctorate	Moghaddam, Saeed	NCS, Postdoc
Schmid, Michael	Doctorate	Moghaddam, Saeed	MNT, President

Velez, Camilo	Post-doctorate	Arnold, David	Carnegie Mellon University
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IMG Seminars Series

Supported by the IMG Alumni fund

Date	First speaker	Second speaker
January, 26	Dr. Alexandra Garraud – <i>Extending the range of wireless power transmission for bio-implants and wearables</i>	Todd Schumann (Dr. Y.K Yoon) – <i>Solely calcine controlled ferroelectric/memristor behavior in barium titanate</i>
February, 9	Yuzheng Wang (Dr. Arnold) – <i>Electrodeposition of Thick CoPt Magnetic Films</i>	Xiao Jiang (Dr. Fan) – <i>Zika Virus Detection with 3D printed/paper based Device</i>
March, 2	Dr. Alex Phipps (Dr. Nishida Alumni) – <i>S&T in a Navy lab: A non-attributional rant on power electronics, microelectronic research, and how to work with the government.</i>	
March, 23	Haocheng Zhou (Dr. Sheplak) – <i>MEMS-Based Five-Hole Probe with Optical Pressure Transducers</i>	Dingkang Wang (Dr. Xie) – <i>Integrated Forward-View 2-Axis MEMS Scanner for Compact 3D Lidar</i>
April, 6	Dr. Y.K. Yoon – <i>Put the IoT Where the Mouth is – Smart Mouthguard and its Prospects</i>	
April, 20	Camilo Velez (Dr. Arnold) – <i>Integrating microfabricated magnetic materials in 5G telecommunication systems</i>	Dr. Cary Kuliasha (Dr. Judy) - <i>Tissue-Engineered Electronic Neural Interfaces (TEENI): Fabrication, in vitro assessment, and in vivo performance</i>
September, 14	Mark Yanchisin (EH&S) Invited – <i>Non-traditional Safety</i>	Kangfu Chen (Dr. Fan) – <i>A filter array regulated microflow (FARM) chip for circulating tumor cell isolation</i>
September, 28	Dr. Alina Zare (ECE, UF) – <i>Addressing spatial uncertainty during remote sensing data analysis</i>	
October, 12	Dr. Erin Patrick (ECE, UF) – <i>Applied Computational Modeling: More-than-Moore Devices to Neurotechnology</i>	
November 9	Dr. Chelsea Simmons (MAE, UF) – <i>Cells as Microsystems</i>	Jacob Amontree (Dr. Fan) – <i>Capillary Force Driven Single-Cell Spiking Aparatus for Studying Circulating Tumor Cell</i>

Publications

Editorial Advisory Boards

- David Arnold: Editorial Board, *J. Micromechanics and Microengineering* 2013-present
- David Arnold: Associate Editor, *Energy Harvesting and Systems* 2013-present
- Z. Hugh Fan: Editorial Board, *Scientific Reports* 2013-present
- Z. Hugh Fan: Editor, *Microsystems and Nanoengineering* 2017-present
- Toshi Nishida: Editorial Board, MDPI Sensors 2015-present
- Mark Sheplak: Associate Editor: *JASA Express Letters* 2011-present
- Huikai Xie, Editor, *Sensors and Actuators: A* 2018-present
- Huikai Xie, Editor, *IEEE Sensors Letters* 2016-present
- Huikai Xie, Editor, *Micromachines* 2017-present
- Huikai Xie, Associate Editor, *the International Journal of Optomechatronics* 2011-present
- Y.K. Yoon, Editor, *Micro and Nano Systems Letters* 2017-present
- Y.K. Yoon, Associate Editor, IEEE Transactions on Components, Packaging and Manufacturing Technology 2018-present

Reviewers for Scholarly Journals

- ACS Sensors
- ACS Applied Nano Material
- Advanced Materials Technology
- AIAA Journal
- Analytical Chemistry
- Angewandte Chemie International Edition
- Applied Energy
- Applied Physics Letter
- Biomedical Optics Express
- Chemical Engineering Communications
- Energy
- Experimental Thermal Fluid Science
- IEEE Electron Device Letters
- IEEE Photonic Technology Letters
- IEEE Sensors Journal
- IEEE Transactions on Biomedical Engineering
- IEEE Transactions on Electron Devices
- International Journal of Refrigeration
- International Journal of Thermal Sciences
- Journal of Applied Physics
- Journal of Biomedical Optics
- Journal of Biophotonics
- Journal of Energy Resources Technologies
- Journal of Magnetism and Magnetic Materials
- Journal of Microelectromechanical Systems
- Journal of Micromechanics and Microengineering
- Journal for the Acoustical Society of America
- Journal of Nanoparticle Research
- Microfluidics and Nanofluidics
- Microsystem Technologies
- Nature Microsystems and Nanoengineering
- Nature Scientific Reports
- Optics Express
- Optics Letters
- Science and Technology for the Built Environment
- Scientific Reports
- Sensors and Actuators A
- Theranostics
- Translational Research

International peer-reviewed journals (41)

- M. J. Bauer, X. Wen, P. Tiwari, D. P. Arnold, and J. S. Andrew, "[Magnetic field sensors using arrays of electrospun magnetoelectric Janus nanowires](#)," *Microsyst. & Nanoeng.*, vol. 4, 37, 2018.
- H. C. Burch, A. Garraud, M. F. Mitchell, R. C. Moore, and D. P. Arnold, "[Experimental generation of ELF radio signals using a rotating magnet](#)," *IEEE Trans. Antennas Propag.*, vol. 6, no. 11, pp. 6265-6272, 2018.
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- J. Ewing, Y. Wang, D. P. Arnold, "[High-current-density electrodeposition using pulsed and constant currents to produce thick CoPt magnetic films on silicon substrates](#)," *AIP Adv.*, vol. 8, no. 5, 056711, 2018.
- S. G. Sawant, B. George, L. S. Ukeiley, and D. P. Arnold, "[Microfabricated electrodynamic synthetic jet actuators](#)," *J. Microelectromech. Syst.*, vol. 27, no. 1, 2018.
- C. Peng, H. Lai, M. Orazem and S. Moghaddam, "[Microstructure of Clay Fabric in Electrokinetic Dewatering of Phosphatic Clay Dispersions](#)," *Applied Clay Science*, vol. 158, pp. 94-101, 2018.
- G. Walters, A. Shekhawat, N. Rudawski, S. Moghaddam and T. Nishida, "[Tiered Deposition of Sub-5 nm Ferroelectric Hf1-xZrxO2 Films on Metal and Semiconductor Substrates](#)," *Applied Physics Letters*, vol. 112 (19), art. 192901-pp. 1-5, 2018.
- M. Mortazawi, A. Fazeli, S. Moghaddam, "[Scalable Bonding of Nanofibrous Polytetrafluoroethylene \(PTFE\) Membranes on Microstructures](#)," *Journal of Micromechanics and Microengineering*, vol. 28, art. 015001-pp. 1-6, 2018.
- P. Deepu, C. Peng, and S. Moghaddam, "[Dynamics of Ultrasonic Atomization of Droplets](#)," *Experimental Thermal and Fluid Science*, vol. 92, pp. 243-247, 2018.
- DL Wang, YQ Hao, FX Zhai, K Yang, HQ Liu, Q Chen, H Xie, "[Endoscopic Optical Doppler Tomography Based on Two-Axis Scanning MEMS Mirror](#)," *Chinese Physics Letters* 35 (12), 120701, 2018.
- P. Struk, S. Bargiel, Q. Tanguy, F. Garcia Ramirez, N. Passilly, P. Lutz, O. Gaiffe, H. Xie, and C. Gorecki, "[Swept-source optical coherence tomography microsystem with an integrated Mirau interferometer and electrothermal micro-scanner](#)," *Opt. Lett.* 43, 4847-4850, 2018.
- Y. Liu, Y. Feng, X. Sun, L. Zhu, X. Cheng, Q. Chen, Y. Liu, and H. Xie, "[Integrated tilt angle sensing for large displacement scanning MEMS mirrors](#)," *Optics Express*, 26 (20), 25736-25749, 2018.
- W. Liao, E. Zhang, M. Alles, A. Sternberg, C. Arutt, D. Wang, S. Zhao, P. Wang, M. McCurdy, H. Xie, D. Fleetwood, R. Reed, R. Schrimpf, "[Total-ionizing-Dose Effects on Al/SiO2Bimorph Electrothermal Microscanners](#)," *IEEE Transactions on Nuclear Science* 65 (8), 2260-2267, 2018.
- L. Guan, S. Li, L. Zhai, S. Liu, H. Liu, W. Lin, Y. Cui, J. Chu, H. Xie, "[Study on Skylight Polarization Patterns over the Ocean for Polarized Light Navigation Application](#)," *Applied Optics*, 57 (21), pp. 6243-6251, 2018.

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- S. Luo, L. Zhou, D. Wang, C. Duan, H. Liu, F. Y. Zhu, G. Li, H. Zhao, J. Tang, Y. Wu, X. An, X. Li, Y. Liu, H. Xie, L. Huo, “[A Miniature Endoscopic Optical Coherence Tomography Probe Based on C-Lens](#),” *IEEE Photonics Journal* 10 (5), pp. 1-10, 2018.
- D. Wang, H. Liu, J. Zhang, Q. Chen, W. Wang, X. Zhang, H. Xie, “[Fourier transform infrared spectrometer based on an electrothermal MEMS mirror](#),” *Applied Optics*, 57 (21), 5956-5961, 2018.
- W. Qi, Q. Chen, H. Guo, H. Xie, and L. Xi, “[Miniaturized optical resolution photoacoustic microscope based on a MEMS scanning mirror](#),” *Micromachines*, 9, 288, 2018.
- S. Luo, D. Wang, J. Tang, L. Zhou, C. Duan, D. Wang, H. Liu, Y. Zhu, G. Li, X. An, L. Huo, and H. Xie, “[Circumferential-scanning endoscopic optical coherence tomography probe based on a circular array of six 2-axis MEMS mirrors](#),” *Biomed. Opt. Express*, 9, 2104-2114, 2018.
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- H. Xie, “[Editorial for the Special Issue on MEMS Mirrors](#),” *Micromachines*, 9 (3), 99, 2018.
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- H. Chen, M. Li, Y. Zhang, H. Xie, C. Chen, Z. Peng, and S. Su, “[H[∞] Robust Control of a Large-Piston MEMS Micro-mirror for Compact Fourier Transform Spectrometer Systems](#),” *Sensors*, 18, 508, 2018.
- S. Luo, Q. Guo, H. Zhao, X. An, L. Zhou, H. Xie, J. Tang, X. Wang, H. Chen, and L. Huo, “[Noise Reduction of Swept Source Optical Coherence Tomography via Compressed Sensing](#),” *Photonics Journal*, vol. 10, 3800109, 2018.
- J. Cheng, W. Liu, Q. Chen, N. Xu, Q. Sun, Y. Liu, W. Wang, H. Xie, “[A MEMS variable optical attenuator based on a vertical comb drive with self-elevated stators](#),” *Sensors and Actuators A: Physical*, Vol. 271, 398-408, 2018.
- X. Jiang, J. C. Loeb, C. Manzanar, J. A. Lednický, Z. H. Fan, “[Valve-enabled Sample Preparation and RNA Amplification in a Coffee Mug for Zika Virus Detection](#),” *Angewandte Chemie International Edition*, 57, 17211–17214, 2018.
- K. Sondhi, S. Hwangbo, Y.-K. Yoon, T. Nishida, and Z. H. Fan, “[Airbrushing and surface modification for fabricating flexible electronics on polydimethylsiloxane](#),” *Journal of Micromechanics and Microengineering*, 28, 125014, 2018.
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 - Seahee Hwangbo, Arian Rahimi, and Yong-Kyu Yoon, “[Cu/Co Multilayer based High Signal Integrity and Low RF Loss Conductors for 5G/Millimeter Wave Applications](#),” *IEEE Transactions on Microwave Theory and Techniques*, vol. 66, no. 8, pp. 3773 – 3780, 2018.
 - John E. Rogers, Yong-Kyu Yoon, Mark Sheplak, and Jack W. Judy, “[Erratum to a Passive Wireless Microelectromechanical Pressure Sensor for Harsh Environments](#),” *IEEE/ASME Journal of Microelectromechanical Systems (MEMS)*, vol. 27, no. 2, pp. 375 – 375, 2018.
 - John E. Rogers, Yong-Kyu Yoon, Mark Sheplak, and Jack W. Judy, “[A Passive Wireless Microelectromechanical Pressure Sensor for Harsh Environments](#),” *IEEE/ASME Journal of Microelectromechanical Systems (MEMS)*, vol. 27, no. 1, pp. 73 – 85, 2018.
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 - Qi Yang, Hyunsu Park, Tran NH Nguyen, Jeffrey F Rhoads, Albert Lee, R Timothy Bentley, Jack W. Judy, Hyowon Lee, “[Anti-biofouling implantable catheter using thin-film magnetic microactuators](#),” *Sensors and Actuators B: Chemical*, vol. 273, pp. 1694-1704, 2018.

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- C. Velez, J. Ewing, S. Hwangbo, K. Sondhi, T. Schumann, Y. K. Yoon, and D. P. Arnold, “Low-temperature micropatterning of thick-film BaFe₁₂O₁₉ composites on semiconductor substrates for integrated millimeter wave devices,” *Proc. IEEE*

- MTT-S International Microwave Workshop Series on Advanced Materials and Processes 2018 (IMWS-AMP 2018)*, Ann Arbor, MI, 2018.
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 - P. Struk, S. Bargiel, QAA Tanguy, C. Gorecki, H. Xie, R. Chutani, N. Passilly, and A. Billard, "The SS-OCT endomicroscopy probe based on MOEMS Mirau micro-interferometer for early stomach cancer detection," *Optical Micro-and Nanometrology VII 10678*, 1067807, 2018.
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 - G. Walters, P. Chojceki, A. Garraud, S. Summerfelt, J. A Rodriguez, A. G Acosta, T. Nishida “[High-Temperature and High-Field Cycling Reliability of PZT Films Embedded within 130 nm CMOS](#)” *Proceedings of IEEE IRPS 2018*, San Francisco, CA, USA, 2018
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 - M. Ramezani, A. R. Newsome, M. Ghatge, S. Bhunia, and R. Tabrizian, “A Nano-Mechanical Identification Tag Technology for Traceability and Authentication Applications,” *Solid-State Sensors, Actuators, and Microsystems Workshop (Hilton Head 2018)*, Hilton Head Island, SC, pp. 109-113, 2018.
 - M. Ghatge, V. Felmetsger, and R. Tabrizian, “High kt2.Q Lamb-Wave ScAlN-on-Silicon UHF and SHF Resonators,” *Solid-State Sensors, Actuators, and Microsystems Workshop (Hilton Head 2018)*, Hilton Head Island, SC, pp. 58-62, 2018.
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