Florida International University
Biomedical Engineering Faculty

CHANGING LIVES

FIU | Engineering & Computing

Department of Biomedical Engineering

About FIU BME

Biomedical Engineering is an ever-evolving field that uses and applies engineering principles to the study of biology and medicine in order to improve health care.

Located in Miami, Florida, Florida International University, a Top 100 public university designated Carnegie R1 is committed to high-quality teaching, state-of-the-art research and creative activity, and collaborative engagement with our local and global communities.

Our department is preparing a diverse community of biomedical engineers and is engaged in translation of research to health care applications through discovery, innovation, entrepreneurship, and community engagement.

Florida International University's Biomedical Engineering department is changing people's lives through translational research. Research conducted within the department is clustered into three major areas:

Basic Research in Tissue Engineering Model Systems
Diagnostic Bio-imaging and Sensor Systems
Therapeutic and Reparative Neurotechnology

These three areas are served by technological advancements in bio-imaging and bio-signal processing, bioinstrumentation, biomaterials, bio-nanotechnology, biophotonics, cellular and tissue engineering, computational modeling, devices and sensors, and neural engineering.

FIU BME FACULTY CHANGING LIVES

Zachary Danziger is making strides in understanding bladder control in aging and spinal cord injury.

Anuradha Godavarty is developing low-cost devices, hand-held wound healing assessment and conducting clinical studies.

Joshua Hutcheson studies cardiovascular disease mechanisms.

Shuliang Jiao's biophotonic devices help treat retinal degenerative disorders.

Ranu Jung is developing neural technologies for functional restoration in individuals with limb loss or spinal cord injury.

Chenzhong Li develops biosensors for organ on a chip and Point of Care Testings.

Wei-Chiang Lin develops smart intraoperative guidance system for surgery.

FIU BME FACULTY CHANGING LIVES

Anthony McGoron develops targeted image-guided drug-delivery for combating cancer.

Jacob McPherson is developing new treatments for neuropathic pain and motor impairments after spinal cord injury and stroke.

Raj Markondeya develops packaging of bioelectronic implants for health monitoring and curing neurological disorders.

Sharan Ramaswamy advances biomechanically-derived diagnostics and regenerative therapies for cardiovascular medicine.

Jorge Riera-Diaz is making strides in treating multiple brain disorders.

James Schummers is working to unravel the brain circuits underlying vision.

Jessica Ramella-Roman's biophotonic device is in clinical trial for premature labor and cervical cancer.

Nikolaos Tsoukias studies neuromuscular coupling.

Zachary Danziger, Ph.D.

Dr. Zachary Danziger received his Ph.D. from Northwestern University in the area of human motor learning and computational neuroscience, and his postdoctoral studies at Duke University were in electrophysiology and neurourology. Dr. Danziger's primary research interests lie at the intersection of these areas of neuroscience theory and application. His approach is to focus first on understanding the underlying behavior of the neural system, and second, to exploit that understanding to optimize the design of neural interfaces. His lab is currently developing tools to 1) understanding brain activity in motor cortex, with the goal of improving performance of brain-computer interfaces and 2) understanding nerve activity in the urinary tract, with the goal of improving efficiency of stimulation technology designed to restore bladder function.

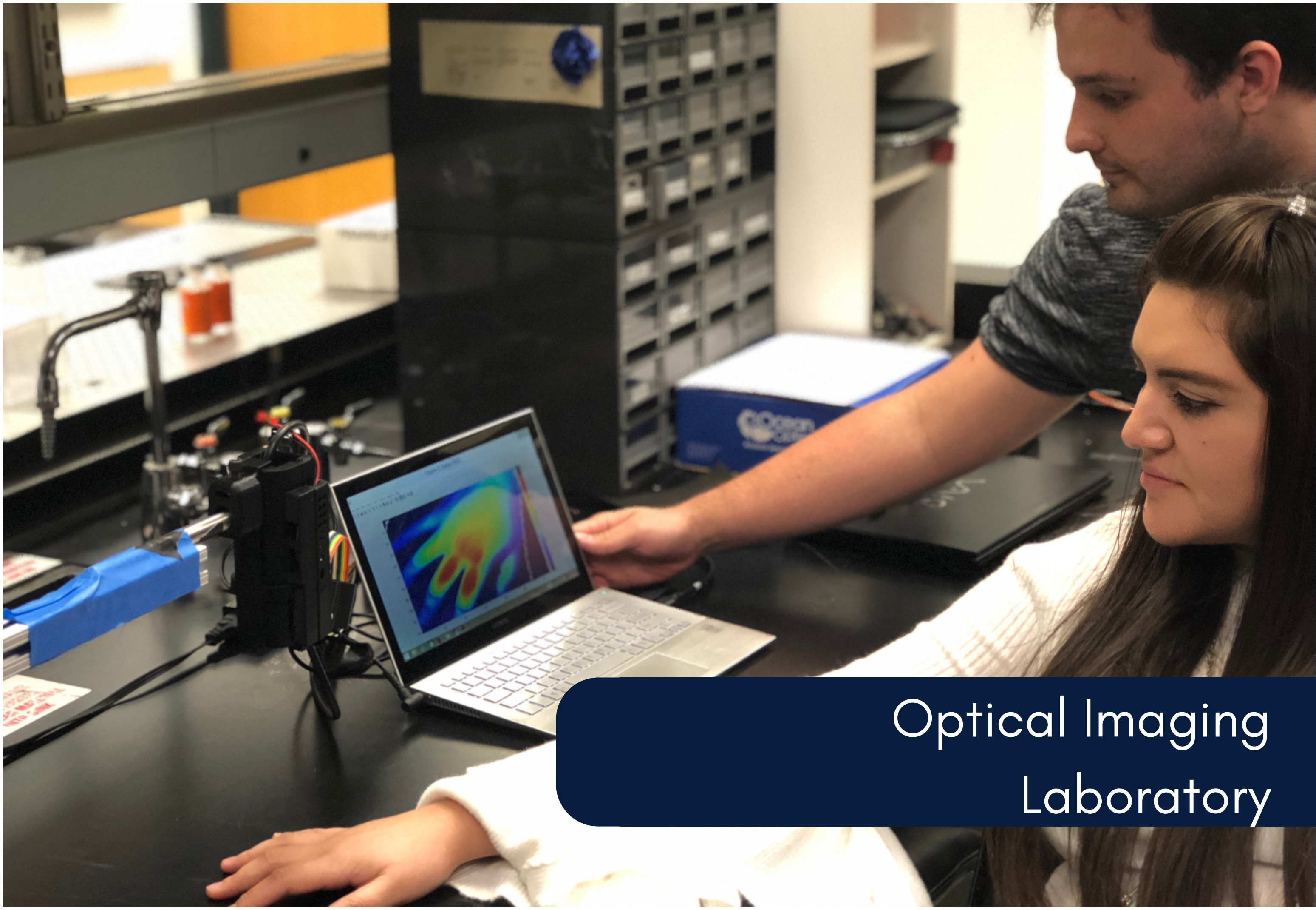
Neural interfaces have emerged as important new therapies for diseases where pharmacotherapy is not feasible or causes intolerable side effects. The work done in the Applied Neural Interfaces Lab employs quantitative approaches to solve key problems in two different areas where neural interfaces are becoming popular: brain-computer interfaces (BCIs) and lower urinary tract (LUT) neuromodulation. BCIs have the potential to restore communication and mobility to paralyzed individuals, but BCI invasiveness severely limits the development and assessment of new designs. The lab members are developing an innovative BCI analogue system that facilitates testing and optimization of BCIs. Using this paradigm has demonstrated the importance of smooth decoder updates and how to exploit visual feedback to enhance user performance. LUT dysfunction is widespread in populations suffering from neural disorders, and is often recalcitrant to medication. They are developing a novel neural stimulation device to treat urinary retention that activates urethral sensory neurons to improve the efficiency of weakened voiding reflexes. Their work includes a new mechanistic model of urethral afferents as well as a new stimulation scheme that has the potential to alleviate neuropathy-induced LUT dysfunction. These two examples illustrate the impact of principled, quantitative approaches to advance the development of neural interfaces to restore function following disease or injury.

Applied Neural Interfaces Laboratory

Anuradha Godavarty, Ph.D.

Dr. Anuradha Godavarty graduated with a PhD in Chemical Engineering from Texas A&M University in 2003. She worked as a Post-Doc at University of Vermont's Department of Computer Science in 2003-2004. In Aug 2004, Dr. Godavarty joined FIU as an Assistant Professor in Biomedical Engineering. In Aug 2010, she was tenured and promoted to Associate Professor in Biomedical Engineering at FIU. Her research interests are in optical imaging technologies towards breast cancer imaging, functional brain mapping, and wound imaging applications (both instrument development as well as computational analysis).

The research done in the Optical Imaging Lab focuses in the area of optical-based molecular imaging (diffuse optical and fluorescence-enhanced optical imaging) and tomography. Optical imaging is based on the principles of near-infrared light propagation in scattering media (such as biological tissues) and the use of external fluorescent contrast agents to better differentiate normal and diseased tissues based on the differences in their optical properties. The research work requires an understanding of transport phenomena in biological systems, application of experimental skills towards instrument development, incorporation of optimization and mathematical tools towards image reconstructions, and development of biomedical aspects of engineering towards practical applications, such as cancer diagnostics, wound imaging, functional brain mapping.

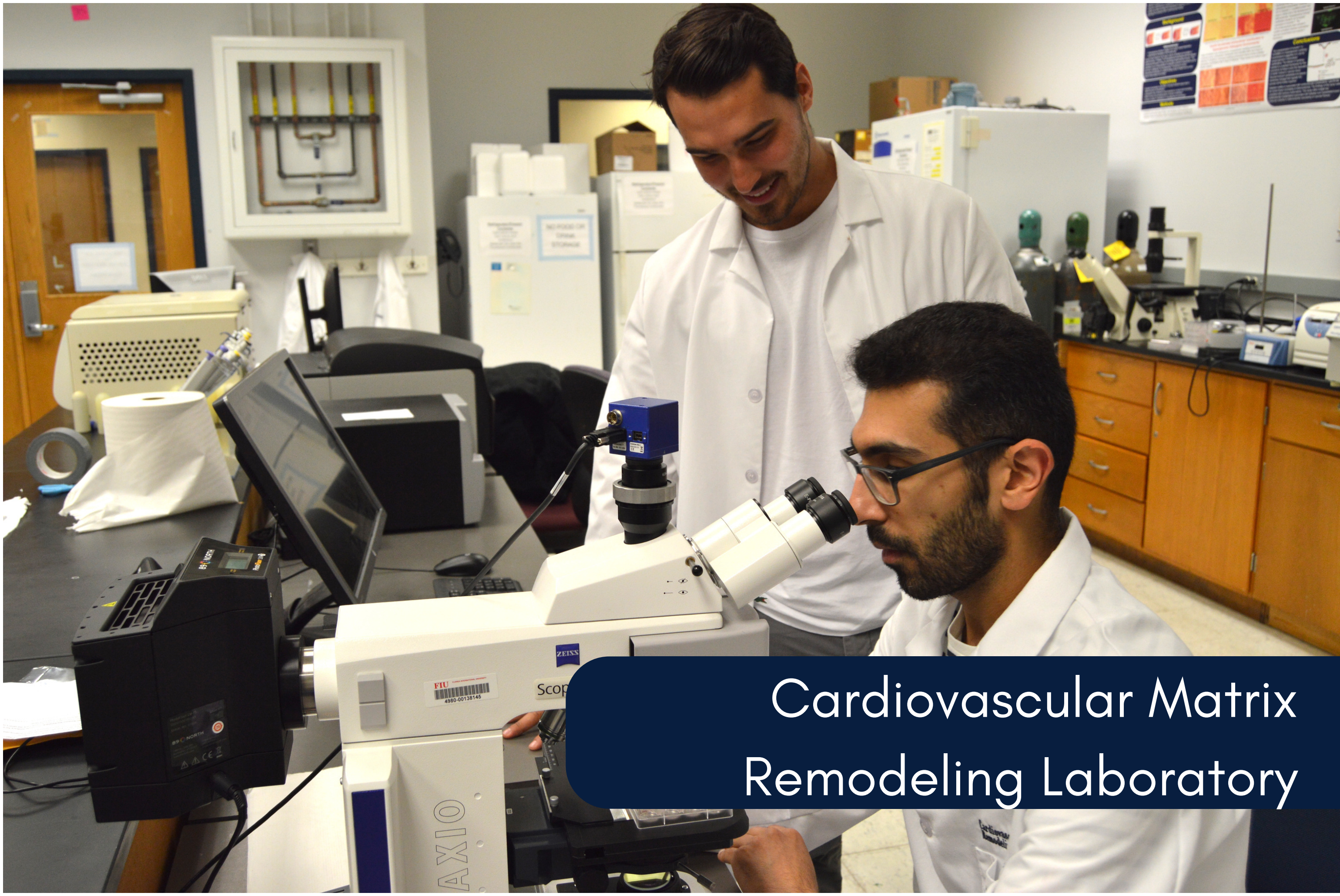


Optical Imaging Laboratory

Joshua Hutcheson, Ph.D.

Dr. Joshua Hutcheson joined the Department of Biomedical Engineering at Florida International University in August 2016. He is also an active member of the Biomolecular Science Institute at FIU. Prior to joining FIU, Dr. Hutcheson worked as a research fellow at Brigham and Women's Hospital and Harvard Medical School within the Center for Interdisciplinary Cardiovascular Sciences. Dr. Hutcheson completed his Ph.D. in Biomedical Engineering at Vanderbilt University and received his B.S. and M.S. in Chemical Engineering from the Georgia Institute of Technology. Dr. Hutcheson is passionate about teaching and researching the mechanisms of cardiovascular tissue maintenance and remodeling. His research focuses on the mechanical and molecular contributors to vascular calcification and aortic valve disease, and he is working on developing non-invasive techniques to diagnose and treat these pathologies. Dr. Hutcheson is co-founder of Thirst for Science and the Miami Heart Month, which seek to increase science enthusiasm and literacy. He also directs the Coulter Undergraduate Research Excellence (CURE) Program, which provides research and mentorship opportunities to undergraduate students in Biomedical Engineering.

Research in the Cardiovascular Matrix Remodeling Lab (CMRL) focuses on the mechanisms through which tissues are built, maintained, and remodeled. The primary thrust of the lab is on cardiovascular disease—the leading global cause of death. Researchers in the CMRL work at the interface of engineering and biology and study the mechanisms through which mechanical forces influence cell and tissue behavior. By understanding the ways that cells sense and respond to each other and to changes in their environment, the goal of the CMRL is to develop new ways to detect initiators of disease and find interventions that restore tissue to a normal state. Research in the CMRL is supported by funds from the American Heart Association.

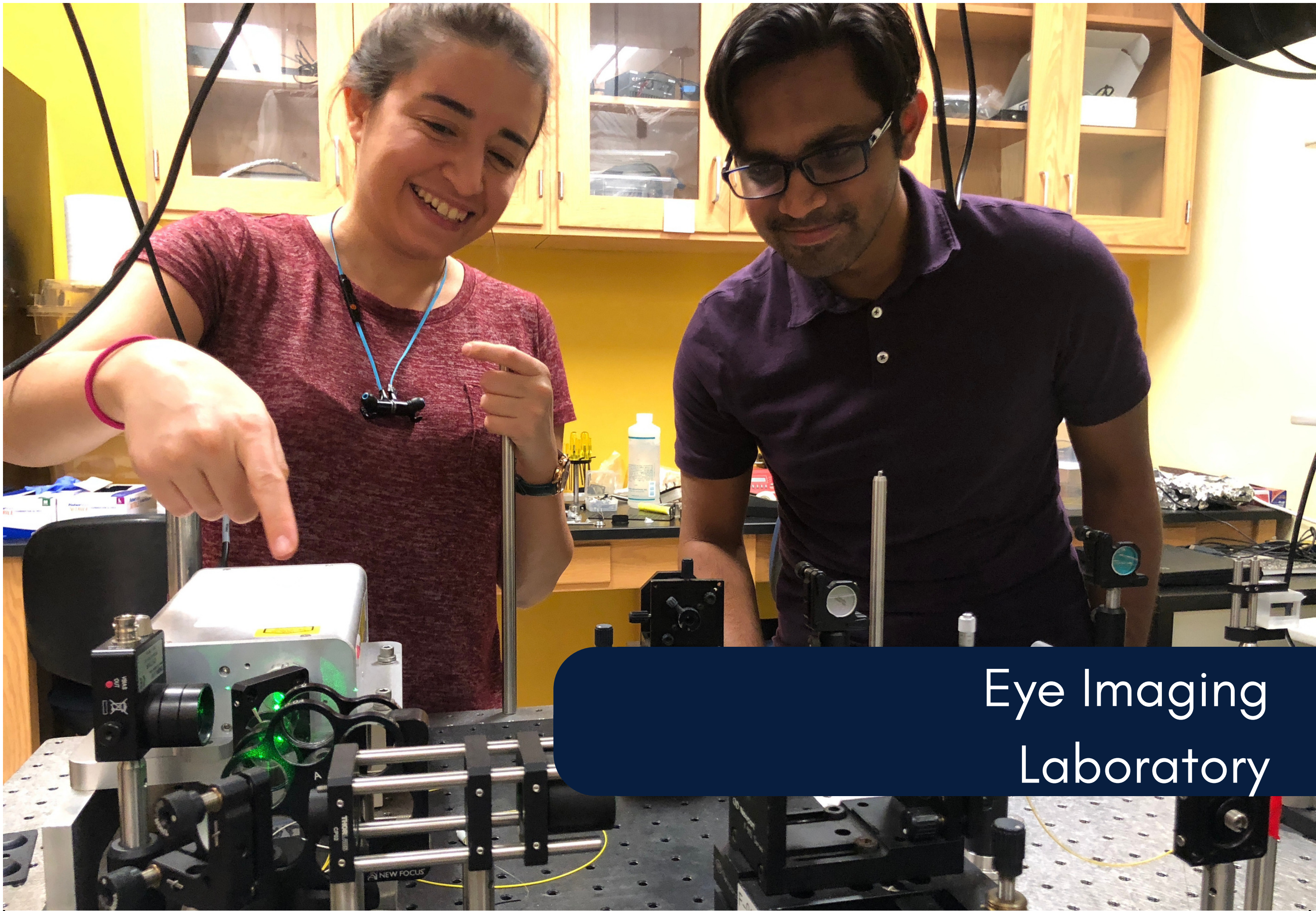


Cardiovascular Matrix Remodeling Laboratory

Shuliang Jiao, Ph.D.

Dr. Shuliang Jiao received his Ph.D from the department of Biomedical Engineering of Texas A&M University in 2003. After graduation he joined the faculty of Bascom Palmer Eye Institute of University of Miami as an assistant professor and later the Department of Ophthalmology, Keck School of Medicine of University of Southern California as an associate professor. He moved to Florida International University in the Fall of 2012. He is currently a professor in the Department of Biomedical Engineering. His research interest is mainly focused on the development of innovative technologies for imaging and treatment of blinding eye diseases. His current research includes the technological development and application of Optical Coherence Tomography (OCT), Photoacoustic Microscopy, and Multimodal Functional Imaging for the early diagnosis and treatment monitoring of major blinding diseases like age related macular degeneration (AMD), diabetic retinopathy, and glaucoma. By the summer of 2018 he holds 7 patents, one of which was licensed to a leading ophthalmic technology development company, 3 patent applications, and several invention disclosures. His research has been continuously funded by the NIH through major research grants. He has also received funding from the department of defense, the Wallace Coulter Foundation, and the JDRF.

The goal of the Eye Imaging Lab is to develop research to help prevent and cure blindness through technological innovations. The Eye Imaging Lab is dedicated to the development of novel optical technologies for 3D high resolution imaging of the anatomy and functions of the eye in vivo. The optical imaging technologies the lab currently focuses on include Optical Coherence Tomography (OCT), Photoacoustic Microscopy, and Multimodal Imaging. These technologies serve as tools for the research and diagnosis of diseases such as age-related macular degeneration (AMD), glaucoma, and diabetic retinopathy. They also provide powerful tools for monitoring the functional regeneration of photoreceptors in regenerative medicine such as stem cell therapy.



Eye Imaging Laboratory

Ranu Jung, Ph.D.

Dr. Ranu Jung holds the Wallace H Coulter Eminent Scholar endowed Chair in Biomedical Engineering at Florida International University where she is Professor and Head of the Department of Biomedical Engineering since 2011. She served as Interim Dean of the College of Engineering and Computing from 2015 to 2017. Previously she was a member of the faculty at Arizona State University and University of Kentucky. Jung is at the cutting edge between engineering and neuroscience, developing devices that lead to scientific advances with clear pathways to clinical application. Of special interest to her are biohybrid systems that merge biologically inspired technologies with humans for recovery and restoration of lost function. A champion for innovation and entrepreneurship her team developed the first wireless, implantable, neural-interface system for restoring sensations to amputees and received FDA approval to conduct a first-in-human trial. Her honors include the FIU 2016 Outstanding Faculty Torch Award, 2012 Top Scholar award, 2011 New Florida Scholar's Boost Award, 2002 Kentucky Science and Engineering Award, Whitaker Foundation Young Investigator Award, NIH National Research Service Award, AHA NE Ohio Research Fellow and appointment as commissioner, Arizona Biomedical Research Commission. Holder of 8 U.S. patents, 4 pending, founder of one R&D Company, past-President of the "Organization for Computational Neurosciences, Inc", her publications include an edited book - Biohybrid-systems:Nerves, Interfaces and Machines, and over 130 research articles and book chapters. She serves as Co-Editor-in-Chief of the Springer Encyclopedia of Computational Neuroscience, Associate Editor of Annals of Biomedical Engineering and on the Editorial board of Bioelectronics in Medicine. Jung is a Fellow of the American Institute for Medical and Biological Engineering, Fellow of the National Academy of Inventors, Senior Member of IEEE and Society of Women Engineers, and elected to the International Women's Forum. She received her Doctoral degree and Masters in Biomedical Engineering from Case Western Reserve University, USA and her Bachelors with Distinction in Electronics & Communication Engineering from National Institute of Technology, Warangal, India.

The research agenda of the Adaptive Neural Systems (ANS) Laboratory is at the intersection between bioengineering, neuroscience and rehabilitation. By applying a multifaceted approach, the laboratory investigates the effects of trauma and disorders of the nervous system to replace damaged or lost functionality or to repair the system using advanced adaptive devices and therapeutic techniques. Driven by the needs of potential users, the laboratory is designing and developing technology to offset the effects of limb amputation and spinal cord injury and understand its impact on nervous system function.

Adaptive Neural Systems Laboratory

Chenzhong Li, Ph.D.

Dr. Chenzhong Li is a full professor and the director of the Nanobioengineering/Bioelectronics Lab. He is also the program director of Biosensing program at National Science Foundation. Dr. Li is an expert in biomedical devices in particular for Point of Care Testings and cell/organ on a chip. The research activities of Dr. Li to date have resulted in 10 patents, more than 130 peer-reviewed journal papers, 2 books and 8 book chapters, over 150 presentations at conferences and about 100 keynote/invited lectures and seminars. He also led the development efforts as co-principal investigator of two newly funded NSF Engineering Research Centers (ERC) and NSF NRT project called Nanomedicine Academy, which translate cutting-edge advances in nanotechnology and biomedical engineering into an education model for low-resource institutions.

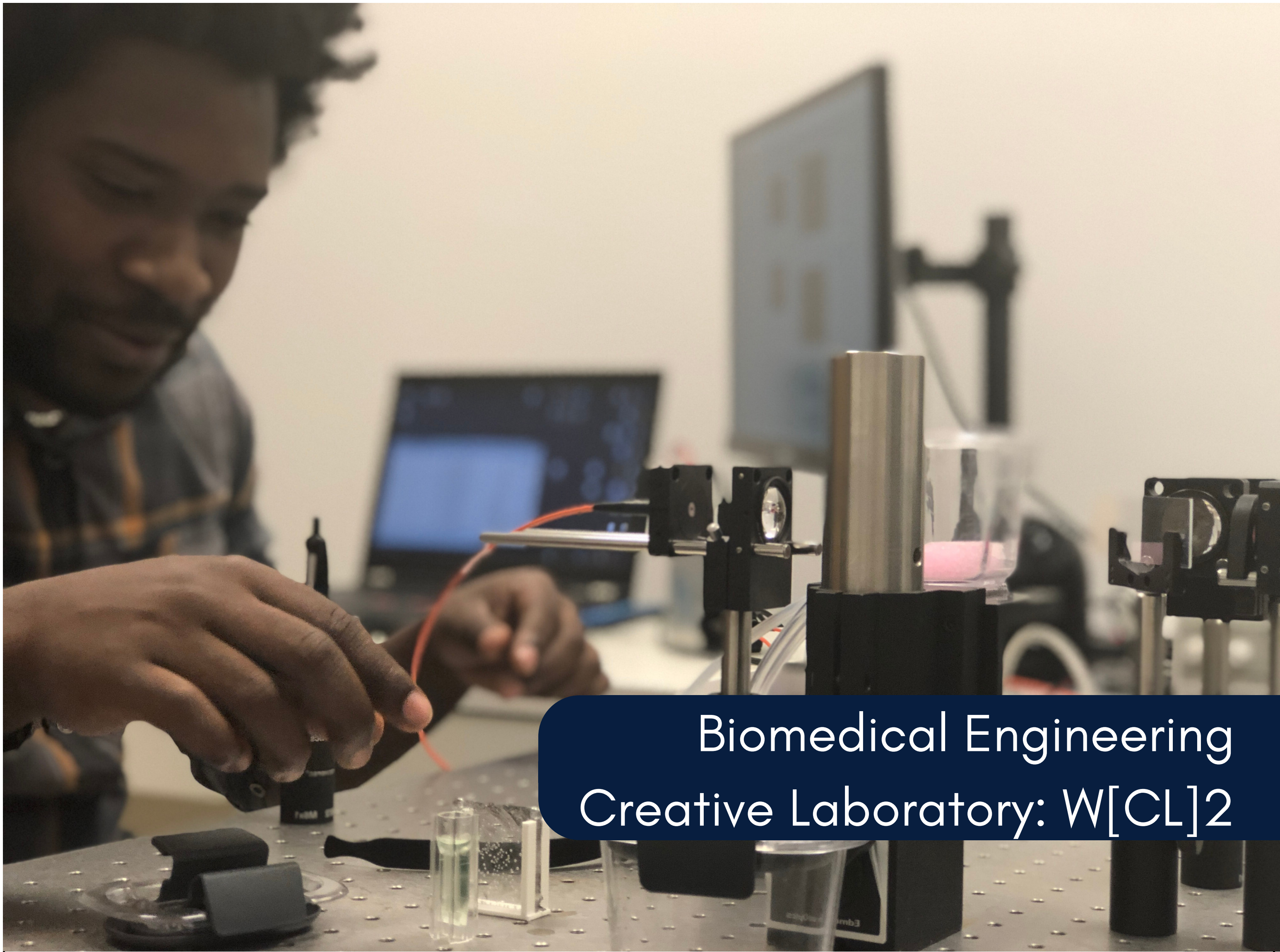
The research of the Nanobioengineering/Bioelectronics Lab interfaces with biomedical engineering, nanobiotechnology, electrochemistry, BioMEMS, biochemistry, nanomedicine, surface science, and materials science. The work done in the lab looks ahead to the next generation of nanoelectrical components such as protein nanowires, DNA transistors as well as end use electronic devices such as Lab-on-Chip, biosensors and enzymatic biofuel cells.

Nanobioengineering/ Bioelectronics Laboratory

Wei-Chiang Lin, Ph.D.

Dr. Wei-Chiang Lin is an Associate Professor of the Department of Biomedical Engineering at Florida International University, where he has been since 2004. From 2015 to 2017 he served as the interim chair of the Department. He is also the co-director of the Orthotics and Prosthetics track, a self-supporting program within the Master's Program of Biomedical Engineering.
Dr. Lin obtain his B.S. degree in Biomedical Engineering from the Chung-Yuan Christian University in Taiwan, ROC in 1987. He received his M.S. and Ph.D. degrees in Biomedical Engineering, under the supervision of Dr. A.J. Welch and Dr. Massoud Motamedi, from the University of Texas at Austin in Austin, TX. Upon completion of his Ph.D. degree in 1997, he received a postdoctoral fellowship from the W. M. Keck Foundation FEL Center and jointed the Department of Biomedical Engineering at Vanderbilt University in Nashville, TN. In 2000 he because a Research Assistant Professor in the Department of Biomedical Engineering. Dr. Lin's research focuses on developing engineering solutions for diagnosing and treating tissue disorders and injuries, with a strong emphasis on pediatric brain disorders. To date, his research projects have been funded by National Institute of Health, Department of Defense, Thrasher Research Fund, and American Heart Association.

The mission of the Creative Lab is to produce creative engineering solutions for complex problems in biomedicine. Currently, the team focuses on developing non-destructive optical and mechanical techniques that can detect disease development and tissue injuries in vivo. These techniques can be either one-dimensional (i.e., point detection) or multi-dimensional (i.e., imaging). The potential medical applications for such techniques, once developed, are abundant. For example, they may be used intraoperatively to guide tumor resection and to monitor the progression of a novel therapy.



Biomedical Engineering Creative Laboratory: W[CL]2

Anthony McGoron, Ph.D.

Dr. Anthony McGoron is a Professor of Biomedical Engineering and Associate Dean for Academic Affairs at the College of Engineering and Computing. He received his PhD in Biomedical Engineering from Louisiana Tech University and post-doctoral training in the Department of Pharmacology and Cell Biophysics at the University of Cincinnati College of Medicine. Before Joining FIU he was as Assistant Professor at the University of Cincinnati Department of Radiology, Divisions of Nuclear Medicine and Medical Physics. He is a Fellow of the American Institute for Medical and Biological Engineering (AIMBE). He served as Interim Chair of the Department of Biomedical Engineering from 2007-2010. He was National President to the Alpha Eta Mu Beta Biomedical Engineering Honor Society 2010-2014. He has over 200 journal articles, book chapters and proceeding papers. He has received funding from the NIH, NSF, DOD, AHA, and Fl-DOH as well as numerous companies.

Research in the Drug Delivery and Imaging Guided Therapy Lab focuses on image guided therapy of cancer using polymer and inorganic nanoparticles, microparticles and small molecules. Imaging is used to identify patients likely to respond to a particular therapy, to monitor the delivery of the drug and the patient's response to the therapy, and to guide surgical resection of tumors. Molecular Imaging modalities include nuclear (PET and SPECT), near-infrared fluorescence, and Surface Enhanced Raman Spectroscopy (SERS). Therapeutic approaches include chemotherapy, photo-dynamic therapy, photo-thermal therapy, and radiation therapy.

Drug Delivery and Imaging Guided Therapy Laboratory

Jacob McPherson, Ph.D.

Dr. Jacob McPherson holds a BS in Applied Sciences/Biomedical Engineering from the University of North Carolina at Chapel Hill, and MS and PhD degrees in Biomedical Engineering from Northwestern University. He completed post-doctoral fellowships in Physiology and Biophysics at the University of Washington School of Medicine and in Physical Therapy and Physical Medicine and Rehabilitation at Northwestern University Feinberg School of Medicine. Dr. McPherson has been an Assistant Professor of Biomedical Engineering at Florida International University since 2015. At FIU, Dr. McPherson directs the Plasticity, Monoamines, and Recovery of Function Laboratory, which conducts pre-clinical and clinical neurological rehabilitation, neurophysiology, and neural engineering research with a focus on spinal cord injury and stroke rehabilitation.

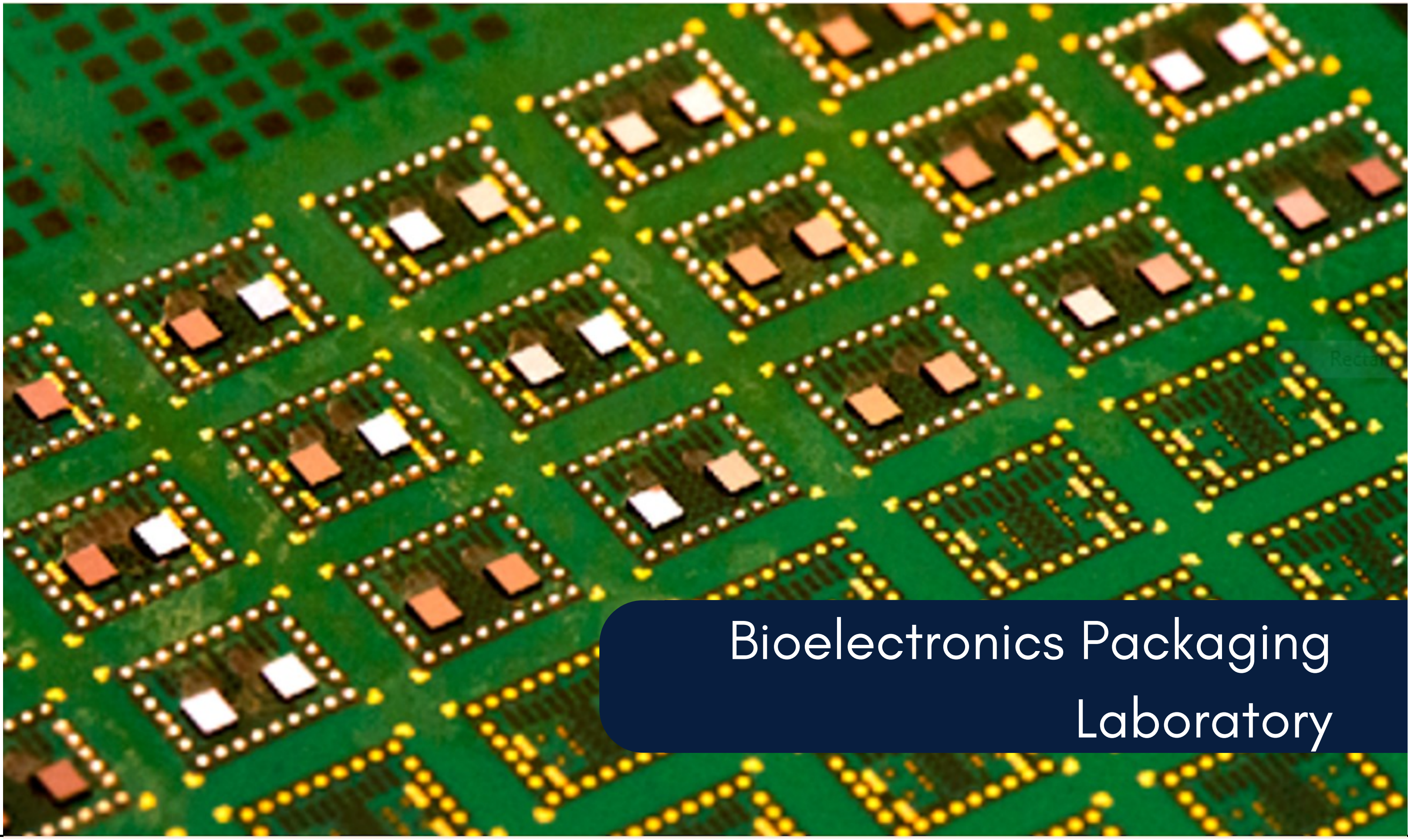
The Plasticity, Monoamines, and Recovery of Function Laboratory (PMRF Lab) conducts both animal and human-subjects neurophysiology and neurological rehabilitation research. Lab members explore interrelationships between the neural control of movement and pain processing after stroke and spinal cord injury (SCI). This work is predicated on the notion that optimal therapies for restoring function after neurological injury must be grounded in a neuromechanistic understanding of the causes of impairment, which requires an integrative view of nervous system function and an interdisciplinary approach to research. The ultimate goal of this work is to develop therapeutic strategies that leverage the interconnectivity of spinal sensory and motor networks to drive multi-modal rehabilitation. Lab members are particularly interested in strategies that facilitate and direct the intrinsic ability of the central nervous system to reorganize and repair, including strategies designed to enhance the therapeutic benefits of physical rehabilitation.

Plasticity, Monamines and Recovery of Function Laboratory

Raj Markondeya, Ph.D.

Dr. P. M. Raj 's expertise is in packaging of electronic and bioelectronic systems, power-supply and wireless component integration in flex and rigid packages, biocompatible and hermetic packaging with high-density feedthroughs. He also has a joint appointment with ECE at FIU. He is an Adjunct Professor with the Georgia Institute of Technology, ECE Department and Packaging Research Center. He co-lead several technical thrusts in electronic packaging, working with the whole electronic ecosystem, which includes semiconductor (ex. Texas Instruments, Intel, Maxim Integrated), packaging and material (NGK-NTK, Nitto Denko, Panasonic Materials, Ajinomoto, Heraeus, HCStarck), tool (AMAT, Atotech, Tango Systems), component (AVX, Murata, TDK-EPCOS, Samsung Electromechanics), and end-user companies (Qualcomm, Honeywell, Rockwell Collins, Medtronic). He is widely recognized for his contributions in integrated passive components and technology roadmapping, component integration for bioelectronic, power and RF modules, and also for promoting the role of nanomaterials and nanostructures for electronics packaging applications, as evident through his several industry partnerships, invited presentations, publications and awards.

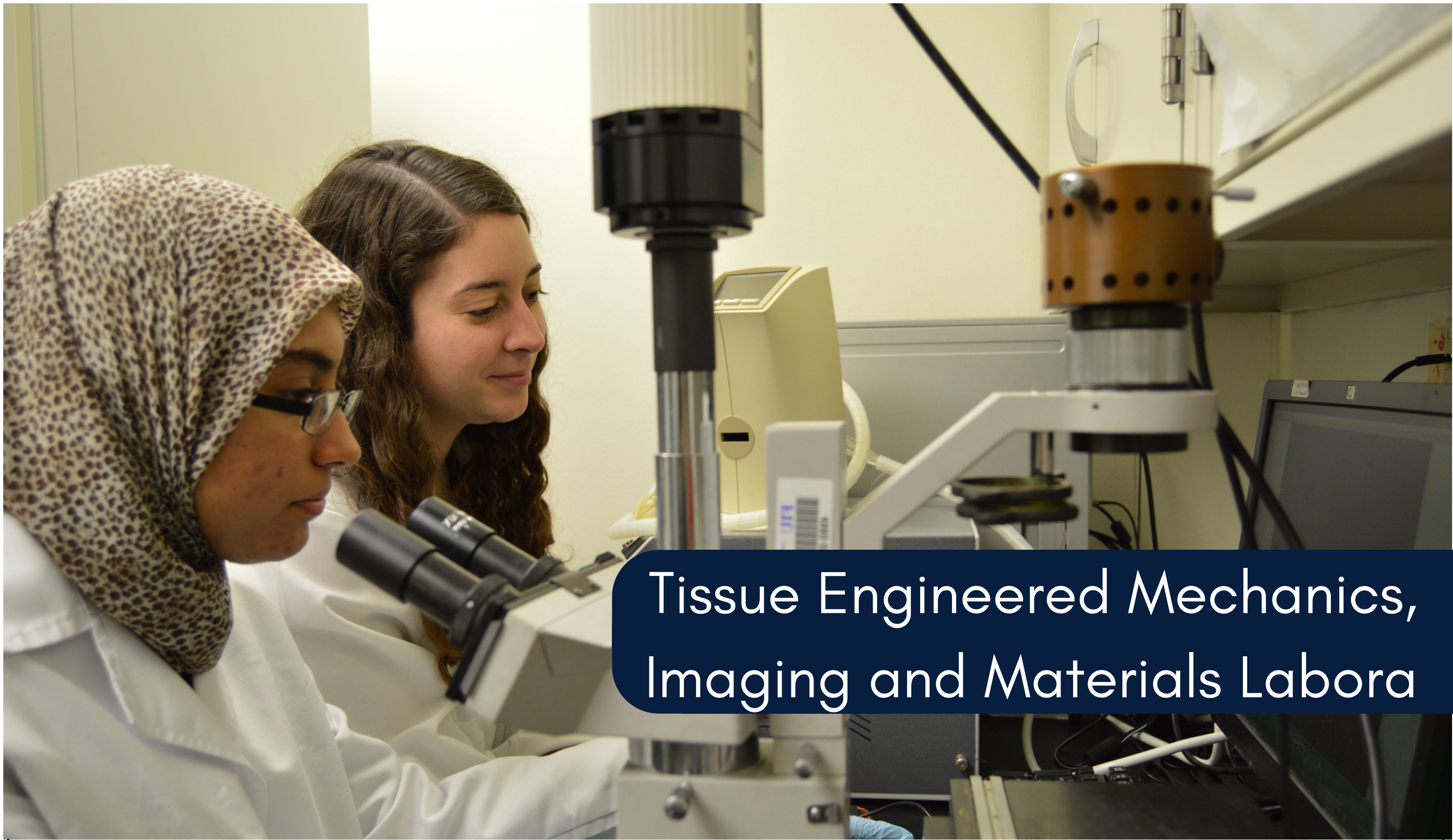
Current bioelectronic packaging approaches for neural stimulation and recording involve large enclosures with leads and connectors that are not scalable to address the need for high-channel density nerve interfaces in ultra-thin or flexible form-factors. A highly-miniaturized fully-implanted high-density electrode array that is actively powered on or close to the electrode array itself, with integrated data processing, can enable new applications and opportunities for healthcare. Realizing these systems require heterogeneous integration of several functions such as power transfer and conversion, data processing, high-density but biocompatible electrode-tissue interfaces and miniaturized hermetic packages. All these functions need to be achieved in sub-millimeter dimensions. The bioelectronic packaging group focuses on developing system components and integration solutions to realize such next-generation bioelectronic systems.



Sharan Ramaswamy, Ph.D.

Dr. Sharan Ramaswamy earned a PhD in Biomedical Engineering (BME) from the University of Iowa in 2003. Following a post-doctoral fellowship at the NIH and a research faculty position at the University of Pittsburgh, Dr. Ramaswamy joined the BME department at Florida International University (FIU) in December 2009 as an Assistant Professor. He is currently a tenured Associate Professor at FIU. His research expertise is in the areas of Cardiovascular Mechanobiology, Tissue Engineering and Mechanics. He directs the Tissue Engineered Mechanics, Imaging and Materials Laboratory (TEMIM Lab) at FIU. He has numerous scientific articles published in his discipline in leading journals, proceedings and book chapters. His work has been funded by the American Heart Association (AHA) the National Science Foundation, private industry and academia. He is a Fellow of the AHA. Dr. Ramaswamy holds a patent in the area of Tissue Engineering Bioreactors, a provisional patent in the alloying and surface treatment of Nitinol and is co-founder of a start-up company (DeNovo Biodevices LLC, Miami, FL). He is an advisor to several graduate and undergraduate students and participates in significant outreach mentorship efforts to schools in the Miami-Dade County Public School System.

The Tissue Engineered Mechanics, Imaging and Materials laboratory (TEMIM LAB) primary research focus lies in the area of cell and engineered tissue mechanics with application in cardiovascular regenerative medicine. The TEMIM lab, conducts both experimental and computational investigations in this area. A major goal of the lab is to develop functional tissue engineered heart valves (TEHVs) using 1) porcine small intestinal submucosa (PSIS) substrates and 2) mechanically regulate stem cells for the TEHV application as well as for (3) broader application in cardiovascular regenerative medicine. Concurrently the TEMIM lab is also working towards the elucidation of mechanobiological cellular and molecular mechanisms that are involved in the etiology of valve diseases, particularly aortic valve calcification. A specific project in this area involves (4) the delineation of mechanosensitive fluid and structural conditions of the aortic valve due to elastin remodeling that may serve as an early indicator of calcific aortic valve disease (CAVD). In addition, at the cellular level, the lab is interested in identifying the fluid-induced mechanobiological responses of valve endothelial cells in valve homeostasis and in the development of CAVD. The research in the TEMIM lab has been supported by the AHA, NSF, industry and academic funding sources.



Tissue Engineered Mechanics, Imaging and Materials Labora

Jessica Ramella-Roman, Ph.D.

Dr. Jessica C. Ramella-Roman received an Electrical Engineering degree (Laurea) from the University of Pavia, Italy in 1993 and worked for five years in the semiconductor industry. She returned to academia in 1999 to pursue a Ph.D. degree in bio-optics with Dr. Steve Jacques and she received a Master's and Ph.D. degree in Electrical Engineering from Oregon Health Science University in Portland, Oregon in 2004. She was a Post Doctoral Fellow at the Applied Physics Laboratory of the Johns Hopkins University from 2004 to 2005. She was then an Assistant Professor at The Catholic University of America from 2005 to 2010 and an Associate Professor from 2010 to 2013. She is a Senior Research Scientist at the National Rehabilitation Hospital in Washington DC, and an Adjunct Professor in the School of Medicine at Johns Hopkins University. Since 2013, she has served an Associate Professor at Florida International University, in the Biomedical Engineering Department and an Associate Professor on the Research Scientist Track in the Department of Cellular Biology and in the Department of Ophthalmology.

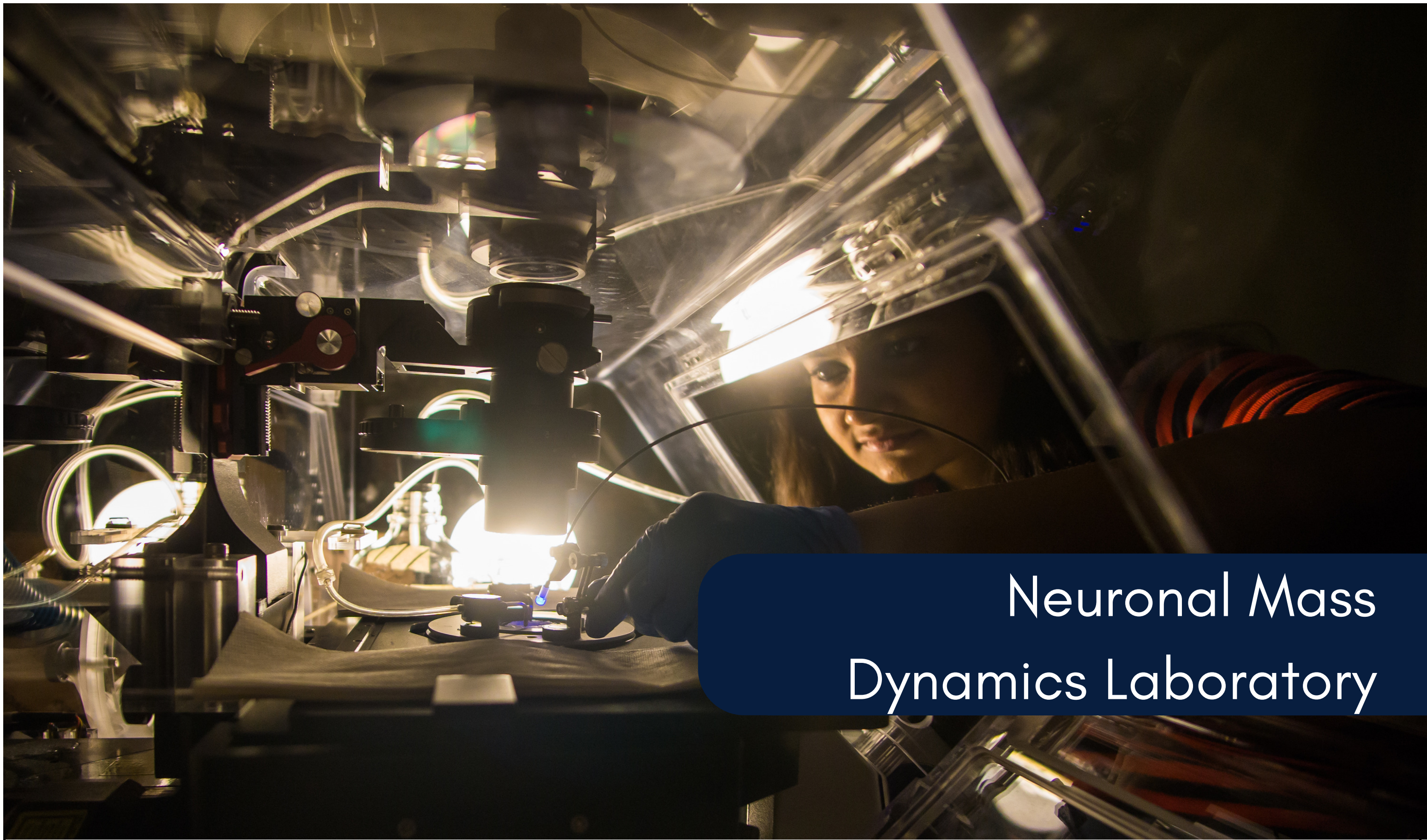
The Medical Photonics Lab conducts research in bio-photonics and focuses on the investigation of non-invasive methodologies for diagnosis of disease based on light-tissue interaction. Researchers are developing new imaging methodologies combining polarization sensitive techniques and non-linear microscopy to investigate anomalous organization of the extracellular matrix in several biological environments. They are utilizing these methodologies to investigate preterm labor a condition that affects 10 - 15 % of all pregnancies with severe consequences to mother and child. They are also researching early signs of Diabetic Retinopathy through the combination of imaging spectroscopy and Two-photon excitation phosphorescence lifetime imaging.

Medical Photonics Laboratory

Jorge Riera-Diaz, Ph.D.

Dr. Jorge Riera obtained a B.S. in Physics at the University of Havana in 1988. During 1995-1998, he was "Junior Associate" of the International Centre for Theoretical Physics, Trieste (Italy), where he completed the required credits for a master degree in biophysics. In 1999, he received the Ph.D. degree in Physics from the University of Havana. Part of his Ph.D. thesis was completed at the Pitie-Salpetriere Hospital in Paris. Dr. Riera's postdoctoral term were first at the RIKEN Brain Science Institute (Japan) and alter at NICHe, Tohoku University (Japan). In 2004, he was appointed associate professor in Tohoku University School of Medicine. From 2006-2011, his research was funded by three Japanese agencies: Japan Society for the Promotion of Science, Telecommunications Advancement Organization of Japan and Japan Science and Technology. In 2011, he joined Florida International University (FIU), first as Visiting Professor and later as Associate Professor in the Department of Biomedical Engineering. For the past ˜7 years he has directed the Neuronal Mass Dynamics (NMD) lab. He has also been appointed by the Honor College, the Herbert Wertheim College of Medicine and the STEM Transformation Institute.

Research at the Neuronal Mass Dynamics (NMD) laboratory focuses on developing strategies to integrate different modalities of brain imaging for the understanding of multicellular signaling in the neocortex. Dr. Riera's early work has been essential to understand the mechanisms of genesis of EEG/MEG and fMRI-BOLD signals in normal and pathological conditions. Based on data from humans and rodents, lab members have developed biophysical models of cortical microcircuits and neurovascular/metabolic coupling. These models underlie US-patented methods to study multi-scale cellular dynamics using brain imaging and electrophysiological techniques. Of particular interest is the development of pre-clinical rodent models to study epilepsy, migraine and dementia by means of brain mapping. Members have been working with the Nicklaus Children Hospital and the Miller School Medicine at UM for the translation of his animal studies into clinical practice to improve surgical outcomes in epilepsy. In the NMD lab, two groundbreaking techniques have been developed in collaboration with and commercialized by industrial partners: a) an EEG mini-cap (Cortech Solution) and b) a 3D microelectrode array (Neuronexus Tech.). The lab's research has been funded by NSF, NIH and the Wallace Coulter Foundation.

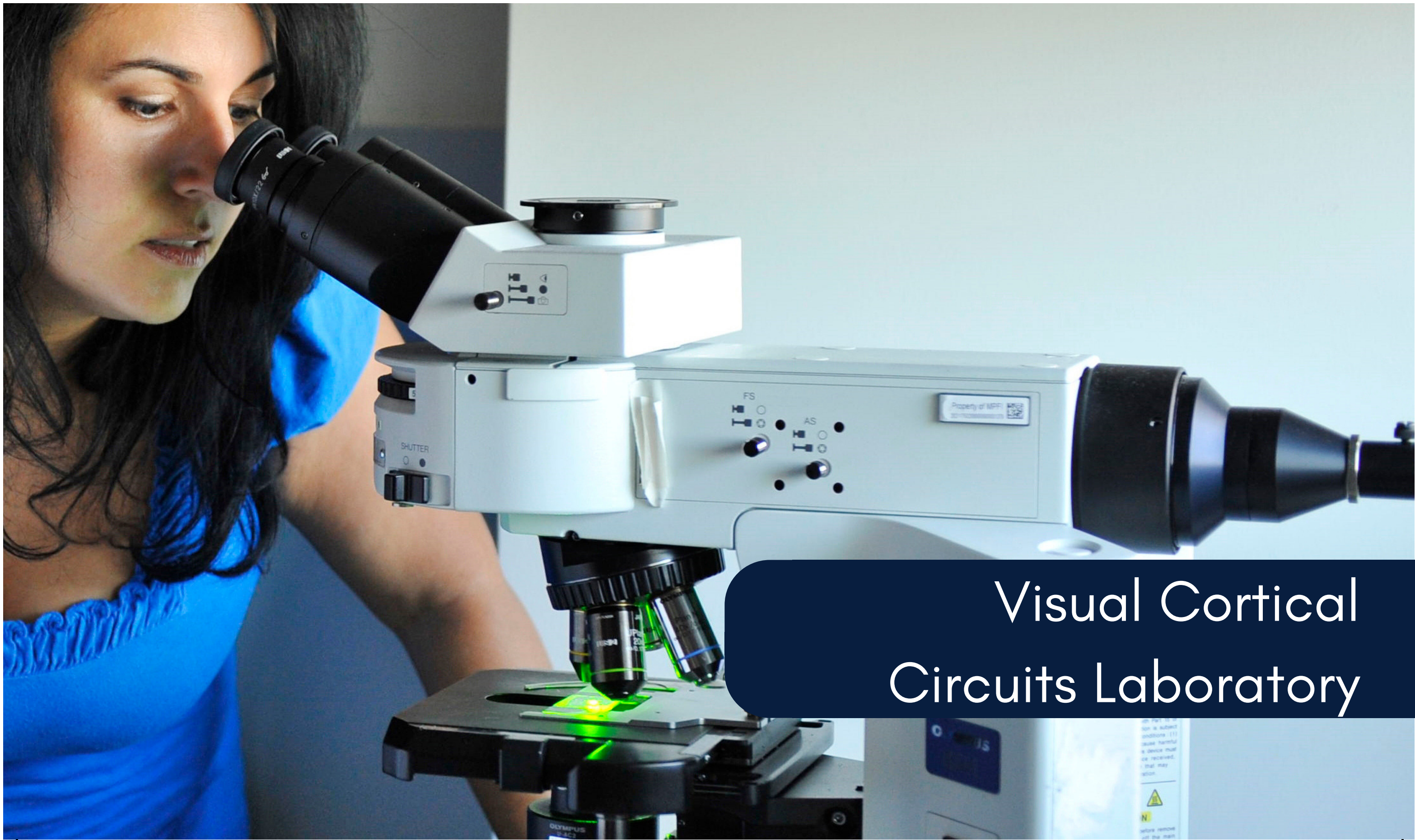


Neuronal Mass Dynamics Laboratory

James Schummers, Ph.D.

Dr. James Schummers received his B.A. in Neuroscience and Biopsychology from Oberlin College in Oberlin OH, where he studied the role of Neuropeptide Y in long-term potentiation (LTP) in the hippocampus. He was a Research Assistant at the University of Colorado Medical School in Denver CO, studying the effects of alcohol on LTP in the hippocampus. He received a Ph.D. in Systems Neuroscience from MIT, where he combined electrophysiology and imaging to understand the processing of stimulus orientation in the visual cortex. His postdoctoral work at MIT focused on using two-photon calcium imaging to study the processing of visual information by neurons and astrocytes in visual cortex. From 2011-2018, he was a Research Group Leader at the Max Planck Florida Institute for Neuroscience in Jupiter, FL. His lab there focused on the interplay between neurons and astrocytes in the representation of visual information in the visual cortex. He joined the Department of Biomedical Engineering at FIU in Fall 2018.

The research in the Visual Cortical Circuits Lab lies at the intersection of two fundamental questions about brain function: How is an external sensory stimulus encoded in the activity of brain cells in the cerebral cortex? How do astrocyte interactions with neurons contribute to information processing? To address these questions, the lab makes use of recent developments in non-linear microscopy, viral engineering and protein engineering to ask cutting-edge questions about the cellular basis of brain function. In particular, current studies apply two-photon imaging of genetically-encoded calcium indicators that have been targeted to specific brain cell types via viral vectors with specific serotypes and promoters to enable measurements of cellular and subcellular activity in both neurons and astrocytes. With these tools, we address questions about the spatial scale of visual stimulus representation, and temporal dynamics of brain activity that underlie perception. Ultimately, these studies will lay the groundwork for interventions to rescue vision in patients with compromised vision, or other neurological dysfunctions.

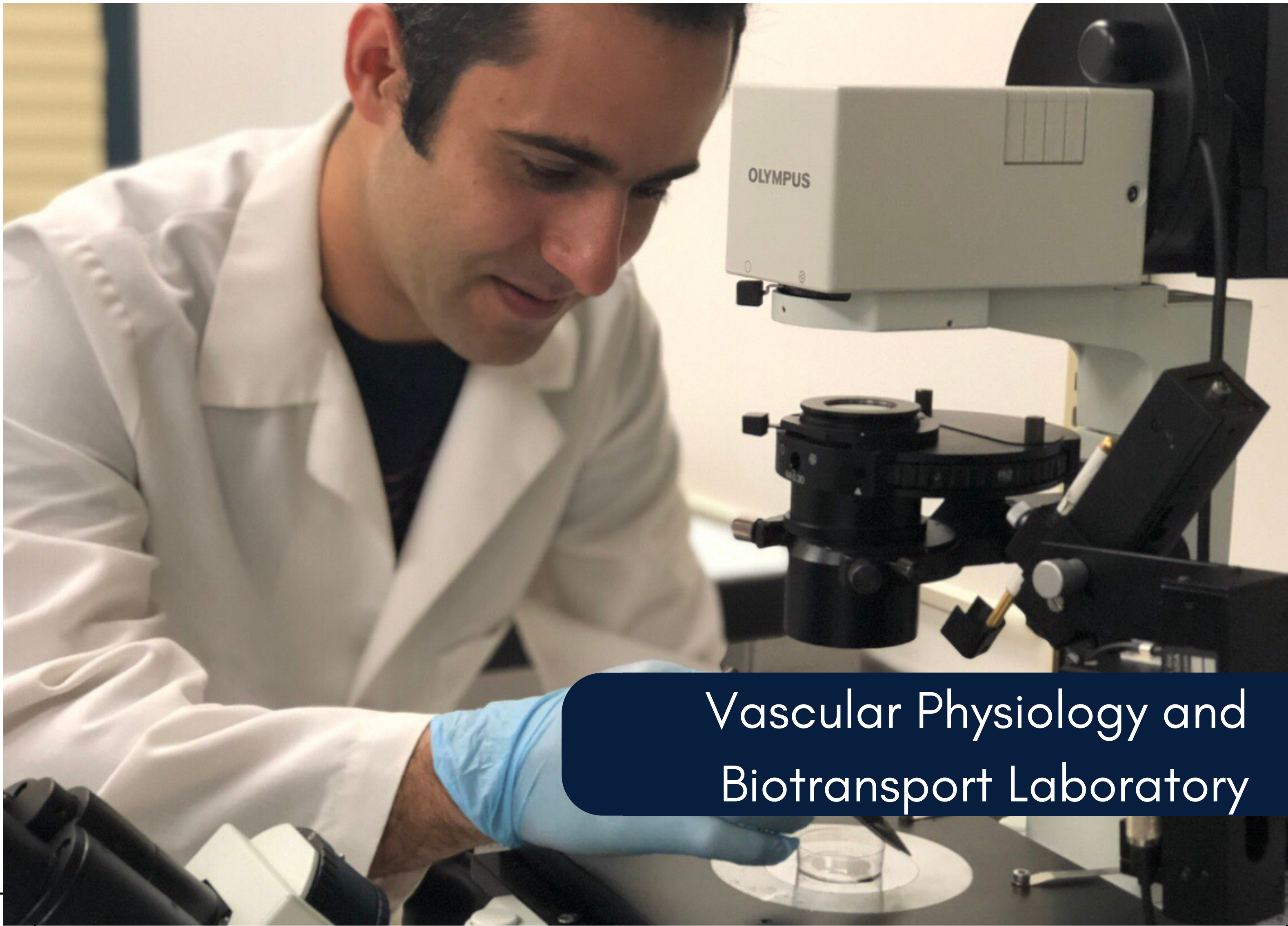


Visual Cortical Circuits Laboratory

Nikolaos Tsoukias, Ph.D.

Dr. Nikolaos Tsoukias received his B.S. in Chemical Engineering from the National Technical University of Athens, Greece in 1994. He received a doctorate in Engineering from the University of California, Irvine in 1999. Upon completion of a three-year research fellowship at the Johns Hopkins University School of Medicine, he joined Florida International University as an Assistant Professor in 2003. His research interests are in the areas of mathematical modeling, systems physiology and biotransport. Dr. Tsoukias is a regular member of the Biomedical Engineering Society, the Microcirculatory Society and the American Physiological Society. Dr. Tsoukias established the laboratory of Vascular Physiology and Biotransport at FIU in 2003. He was the 2006 recipient of the Arthur C. Gyuton award for excellence in integrative physiology. His research has been supported by the American Heart Association and the National Institutes of Health. He has authored more than 50 peer reviewed publications in archived journals, contributed more than 75 abstracts in conference proceedings and received 2 patents.

The main focus of the Vascular Physiology and Biotransport Lab is on the mechanisms that regulate blood flow and pressure in the human body. The lab investigates the physiology of the microcirculation through the parallel development of theoretical and experimental models. Mathematical modeling guides experimentation and assist in data analysis while in vitro experimental studies provide important modeling parameters and promote further model development.



Vascular Physiology and Biotransport Laboratory

Michael Brown, M.D., Ph.D.

Dr. Michael Brown graduated from the University of Notre Dame with a BS in Biology in 1982. He subsequently attended the University of Miami where he obtained a PhD in Biochemistry and a MD degree. He worked in Research at the University of Miami and Bascom Palmer Institute. He worked in the Biomedical industry in South Florida as VP of Clinical Affairs at Bioheart, Inc. supervising clinical trials in heart muscle regeneration. Dr. Brown started teaching in the recently formed Biomedical Engineering Department at FIU in 2003 as an adjunct Instructor. He was hired as a full-time Instructor in 2005, promoted to Senior Instructor in 2011 and to University Instructor in 2017. Dr. Brown received a University Faculty Teaching Award in 2012 and two College of Engineering and Computing Teaching Awards in 2011 and 2017. Dr. Brown is responsible for teaching the physiology courses in the department as well as the Clinical Rotations course which helps prepare the students to enter the Biomedical industry by visiting local companies and hospitals.

Michael Christie, Ph.D.

Dr. Michael Christie is a triple graduate from Rutgers University. He graduated with his B.S. in Mechanical Engineering, his M.S. in Mechanics and Materials Science, and his Ph.D. in Materials Science and Engineering. At FIU, he has served as an adjunct instructor, a visiting professor, and as an undergraduate advisor. He is currently a senior lecturer in the Department of Biomedical Engineering. He is the coordinator for the undergraduate Senior Design Project course. He was recognized in Legacy Magazine as a Top Black Educator. He is also the recipient of the College Excellence Award for Service, as well as a special award for advising in 2017.

FIU BME
Faculty

Changing Lives

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