



Department of Biomedical Engineering

BME @ FIU

- Established in 2003 with a \$10M endowment from the WH Coulter Foundation and the State of Florida
- The first BME department in Florida with a full slate of programs (accredited BS, MS, BS/MS and PhD)
- The only one in the nation offering these degrees at a Hispanic and Minority serving institution



BME Faculty



Research in BME @ FIU

Pathway to Success

Discover

Design

Develop

Deliver

Research in BME @ FIU

Basic Research in Engineered
Tissue Model Systems

Diagnostic Bioimaging
and Sensor Systems

Therapeutic and Reparative
Neurotechnology

Research Collaborations



FIU Colleges



Hospitals

Industry Partners



Research Collaborations



2 NSF Engineering Research Center partnerships



PATHS-UP

Precise Advanced Technologies and
Health Systems for Underserved Populations



BME Research Accomplishments

60+ patents

2 startup companies since 2014

2 i-Corps teams

4 Fellows



Multiuniversity
Partnerships/International:

2 NSF ERC proposals granted

DARPA, NIH, NSF
multiuniversity/international partnerships
funded

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

Anuradha Godavarty is developing a low-cost, 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.

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 & stroke.

Raj Markandeya develops packaging of bioelectronics implants for health monitoring and curing neurological disorders

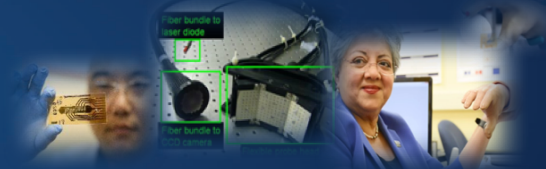
Sharan Ramaswamy advances biomechanically derived diagnostics and regenerative therapies for cardiovascular medicine.

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 pre-mature labor and cervical cancer.

Nikolaos Tsoukias studies neuromuscular coupling.





NAE GRAND CHALLENGES
FOR ENGINEERING

NATIONAL ACADEMY OF ENGINEERING

- **Cross-Cutting**

- Engineer the tools of scientific discovery
- Enhance virtual reality
- Advance personalized learning

- **Health and Well-Being**

- Engineering better medicines
- Reverse-engineer the brain
- Advance health informatics

Educating Tomorrow's Engineer Engineering for the Benefit of Humanity

exciting

creative

adventurous

rigorous

demanding

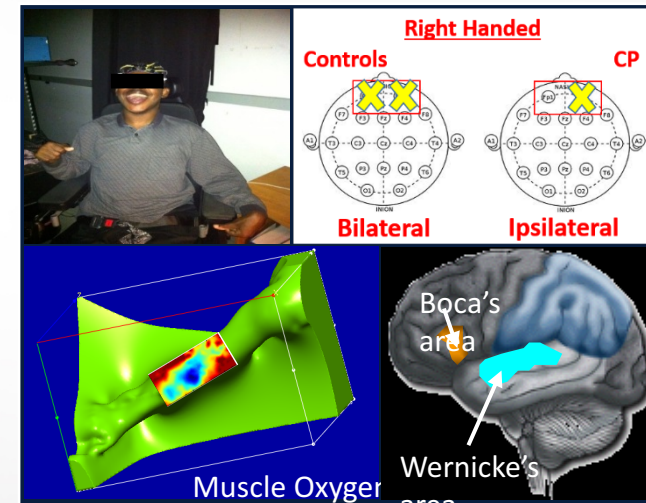
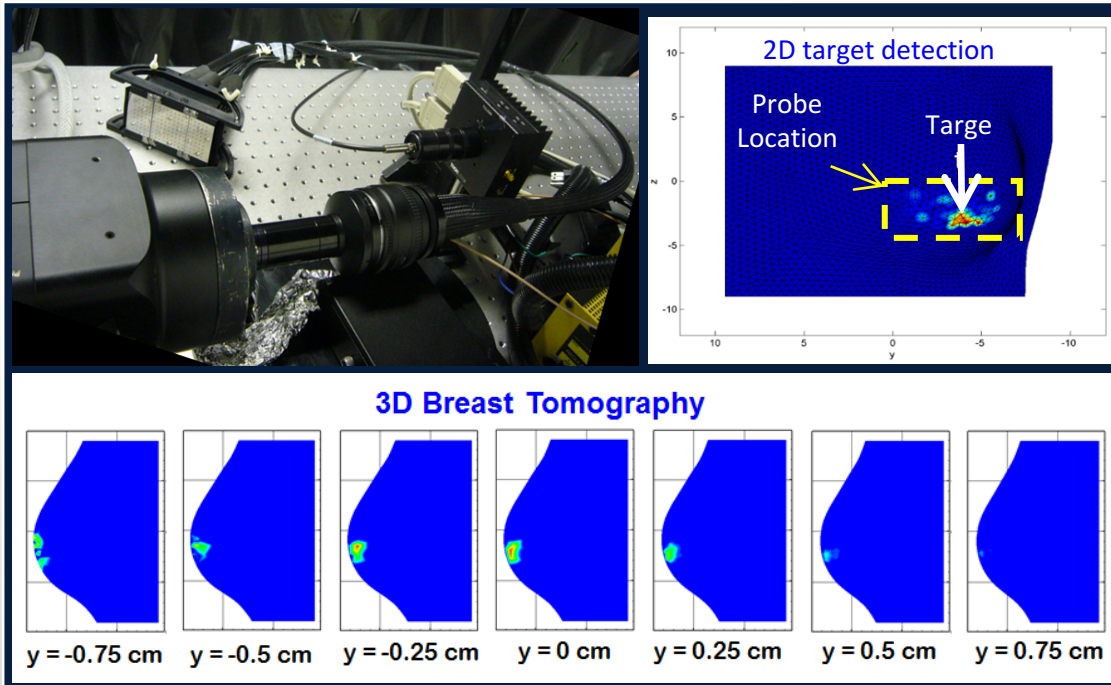
empowering



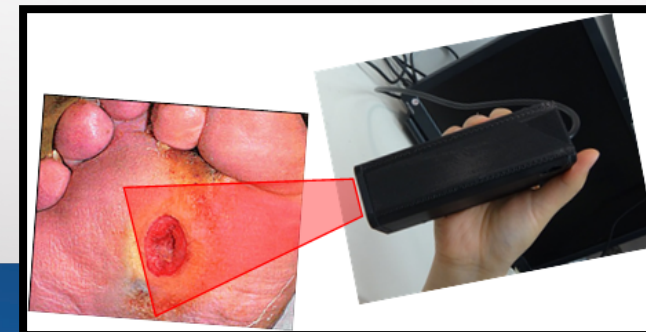
Optical Imaging Laboratory

Anuradha Godavarty, Ph.D.

Dr. Godavarty is developing a low-cost, hand-held wound healing assessment and conducts clinical studies.



Near-infrared spectroscopy for brain activity studies and muscle oxygenation measurement

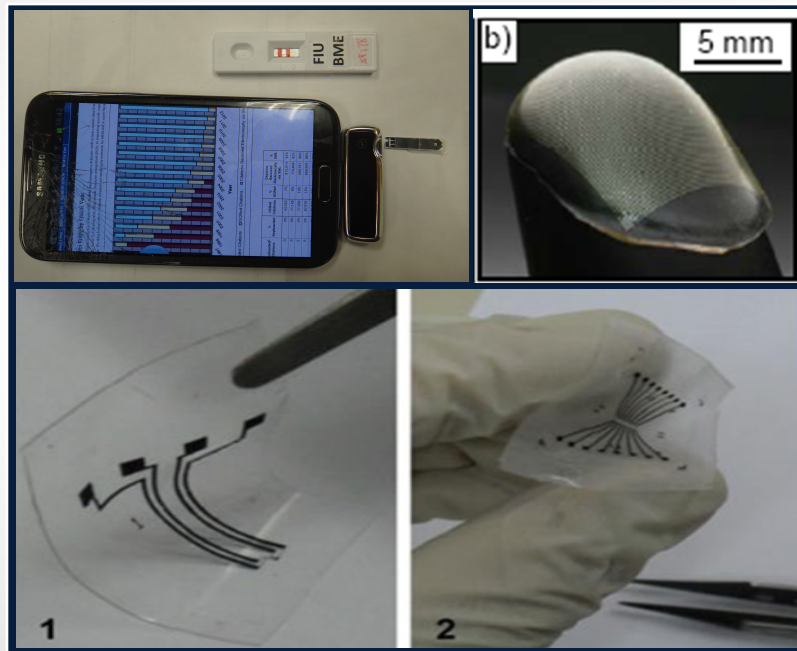




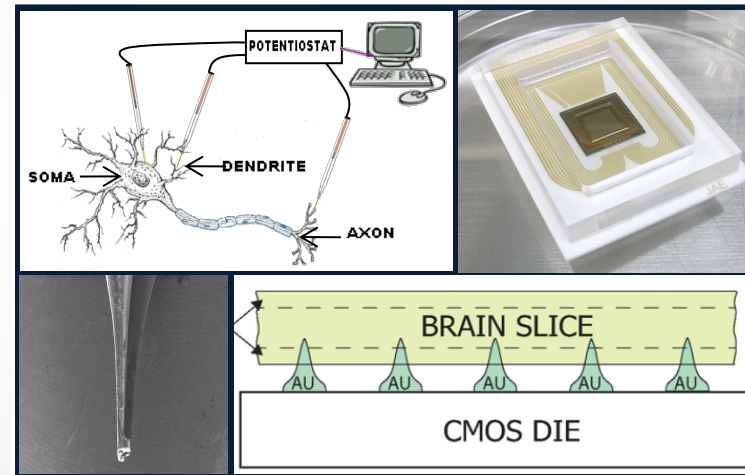
Nanobioengineering/Bioelectronics Lab

Chenzhong Li, Ph.D.

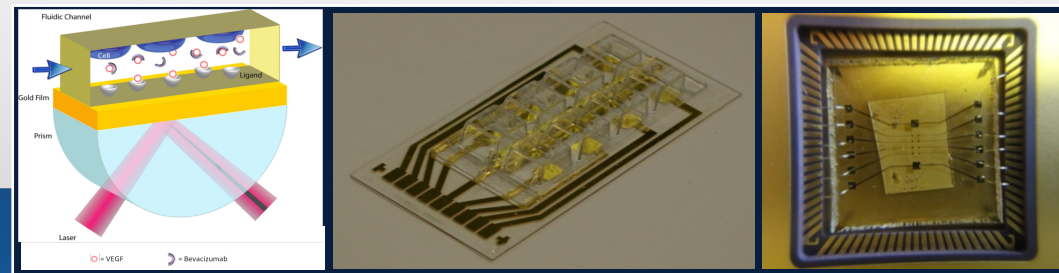
Dr. Li develops biosensors for organ on a chip and Point of Care Testings.



Point of care testings- wearable/stretchable, disposable, and tele-medicine



Neuron devices for exocytosis mapping



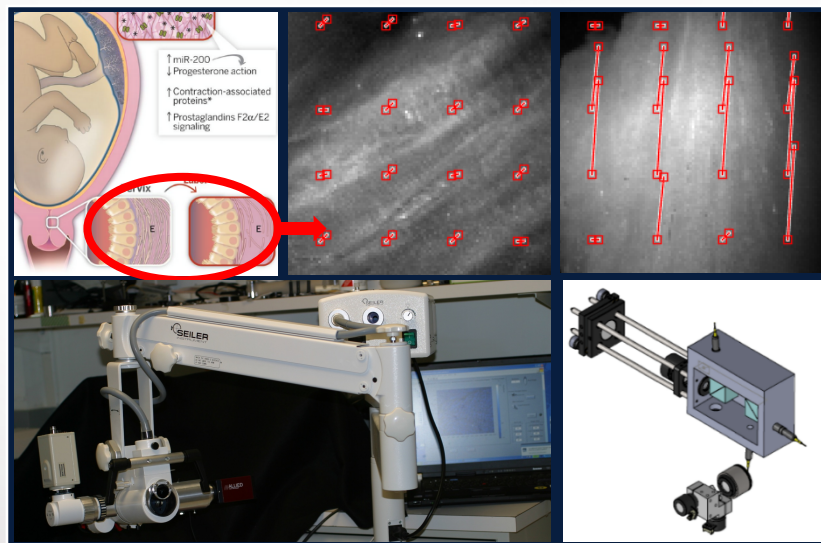
Single cell/whole cell analysis



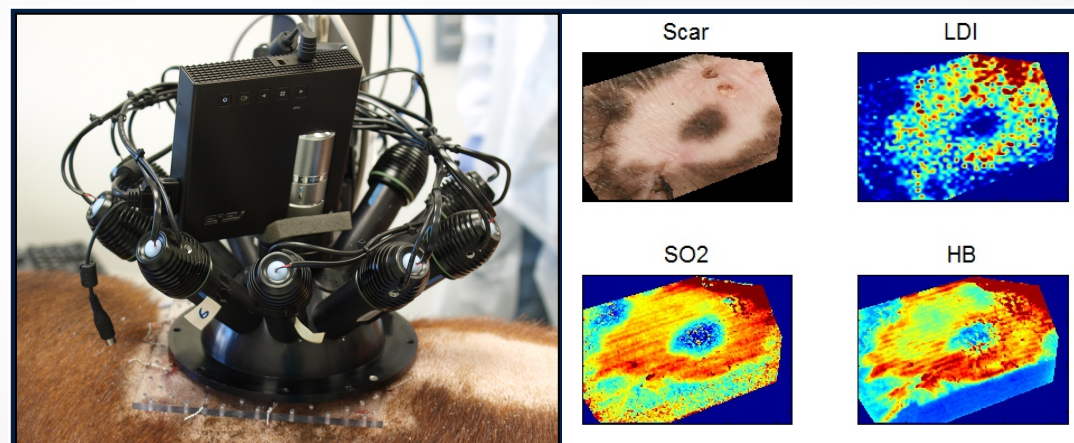
Medical Photonics Laboratory

Jessica Ramella-Roman, Ph.D.

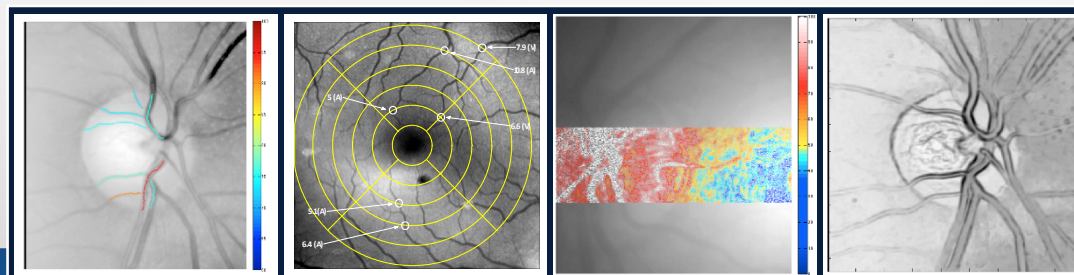
Dr. Ramella's biophotonic device is in clinical trial for pre-mature labor and cervical cancer.



Medical instrumentation for pre-term labor and cervical cancer detection in low resource setting



Spectro-polarimetric system to investigate scar and wound formation



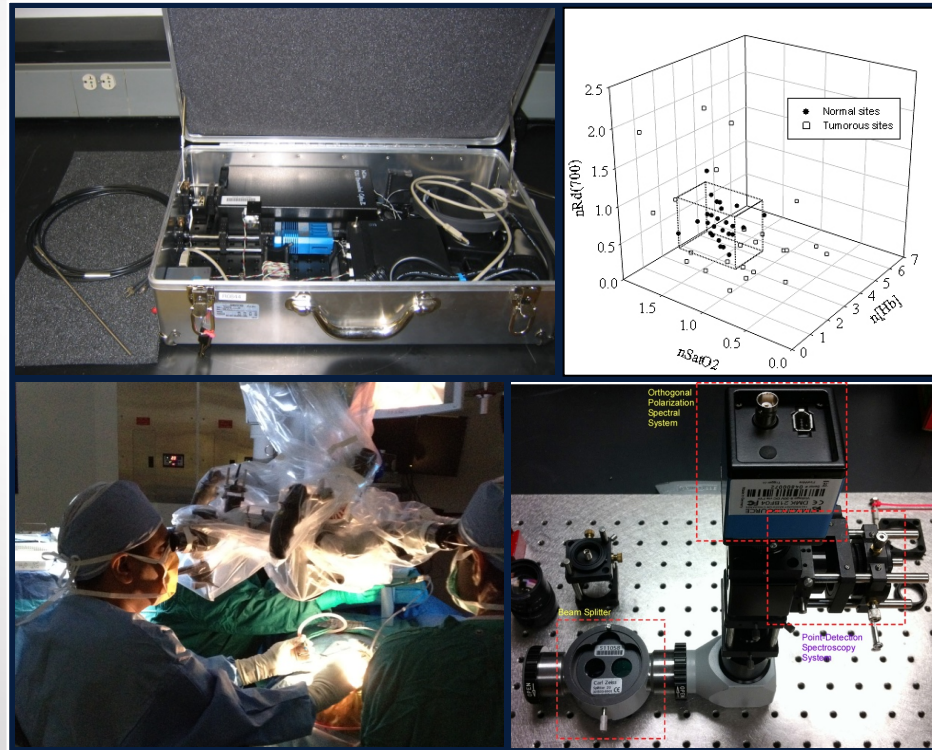
Multi-model imaging for diagnosis of diabetic retinopathy



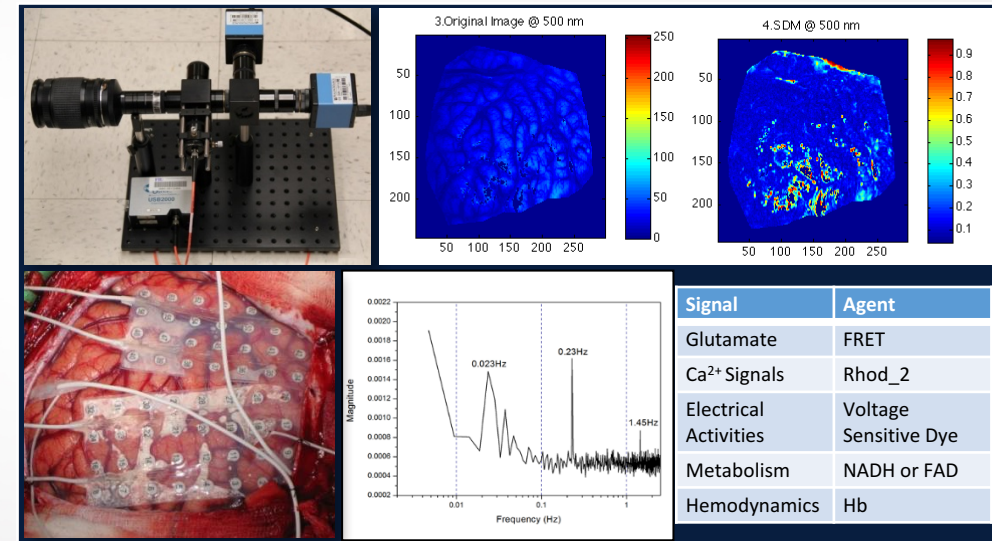
Biomedical Optics Laboratory

Wei-Chiang Lin, Ph.D.

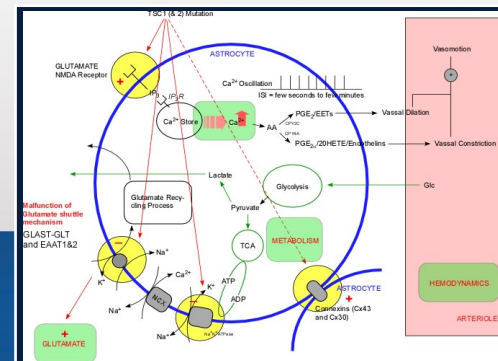
Dr. Lin develops smart intraoperative guidance systems for surgery.



Spectroscopy-based guidance system for brain tumor surgery



Multimodal imaging for *in vivo* epileptic cortex study

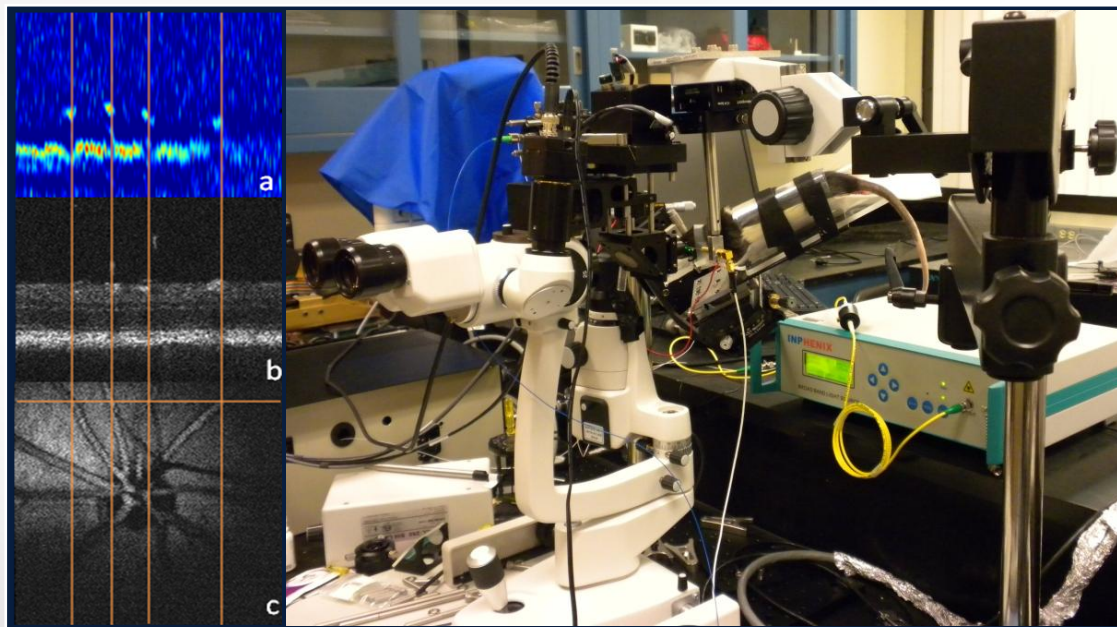




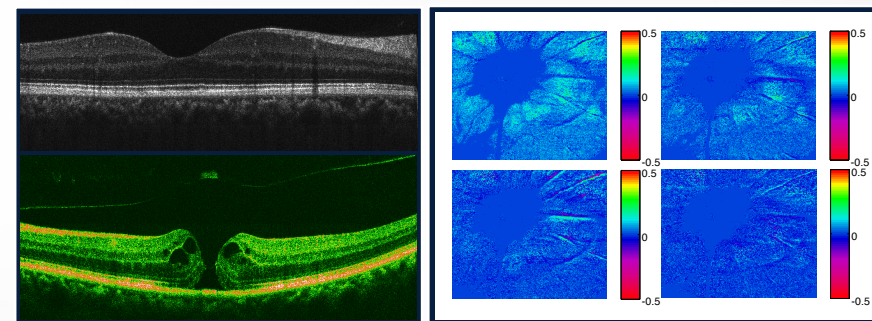
Optical Imaging Laboratory

Shuliang Jiao, Ph.D.

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

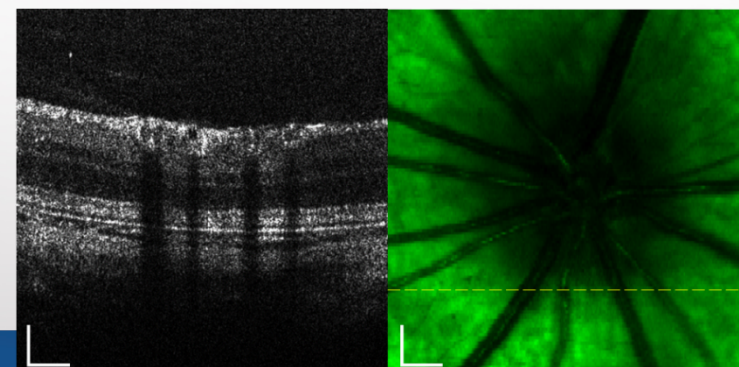


OCT-guided PAOM



OCT imaging of eyes

Imaging rhodopsin



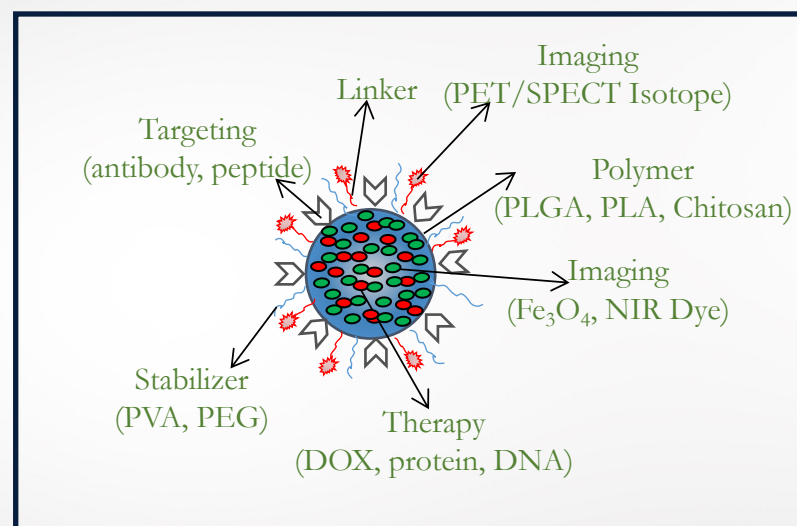
Imaging lipofuscin with VIS-OCT



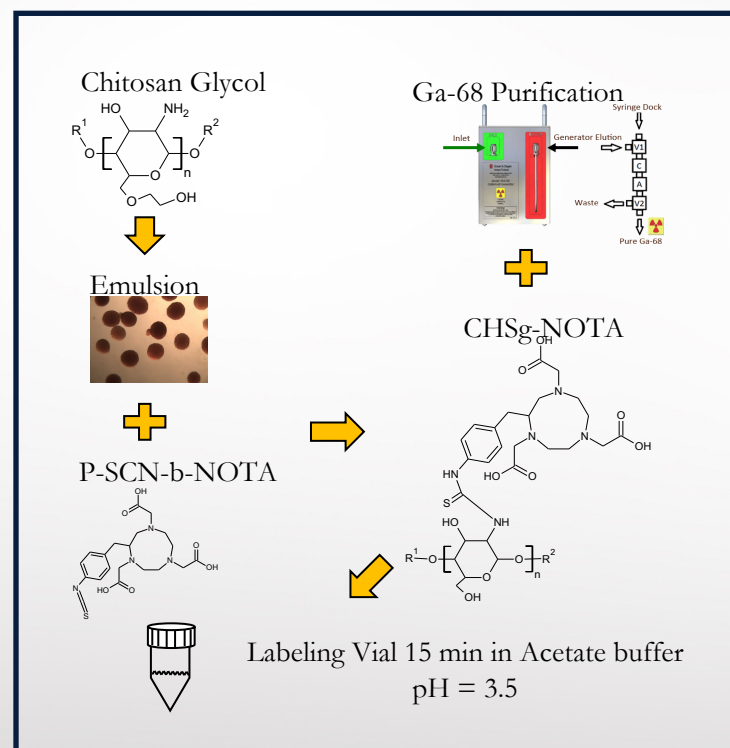
Image Guided Therapy Lab

Anthony J McGoron, Ph.D.

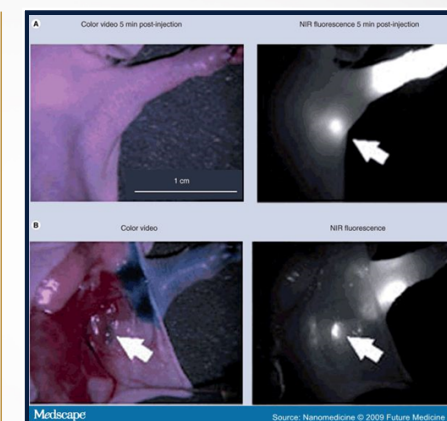
Dr. McGoron develops targeted image-guided drug-delivery for combatting cancer.



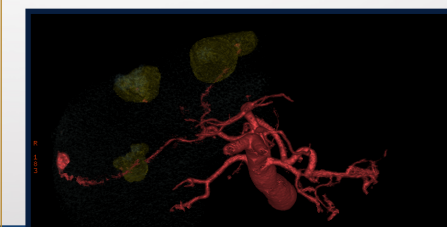
Ideal Drug Delivery Vehicle



Conjugation Chemistry of Ga-68 to Chitosan Microspheres



Sentinel lymph node imaging using NIR probes



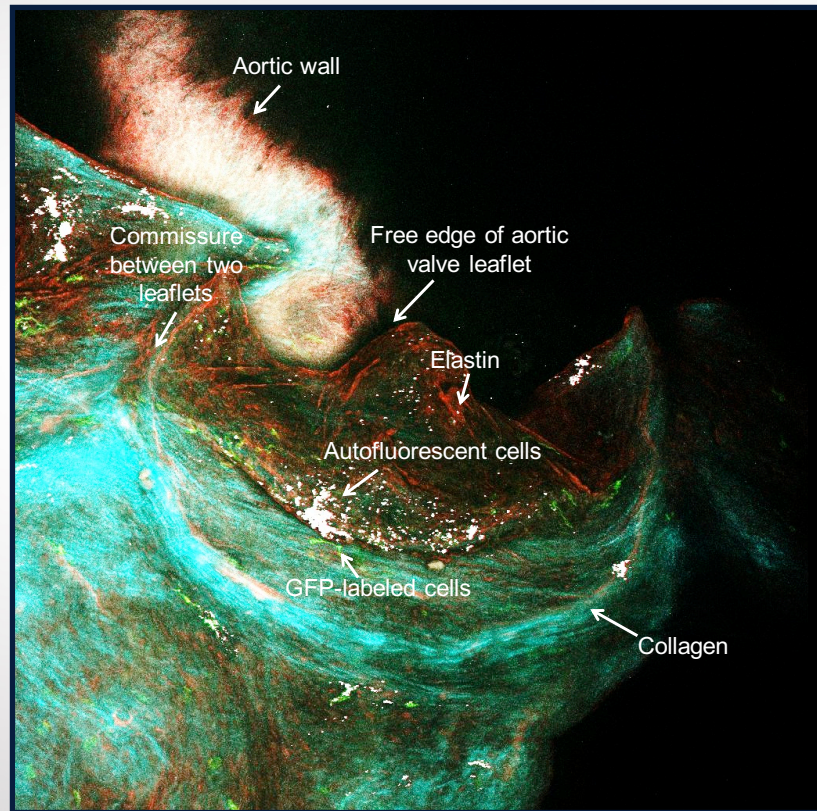
3D-Model of liver tumors and supplying vasculature



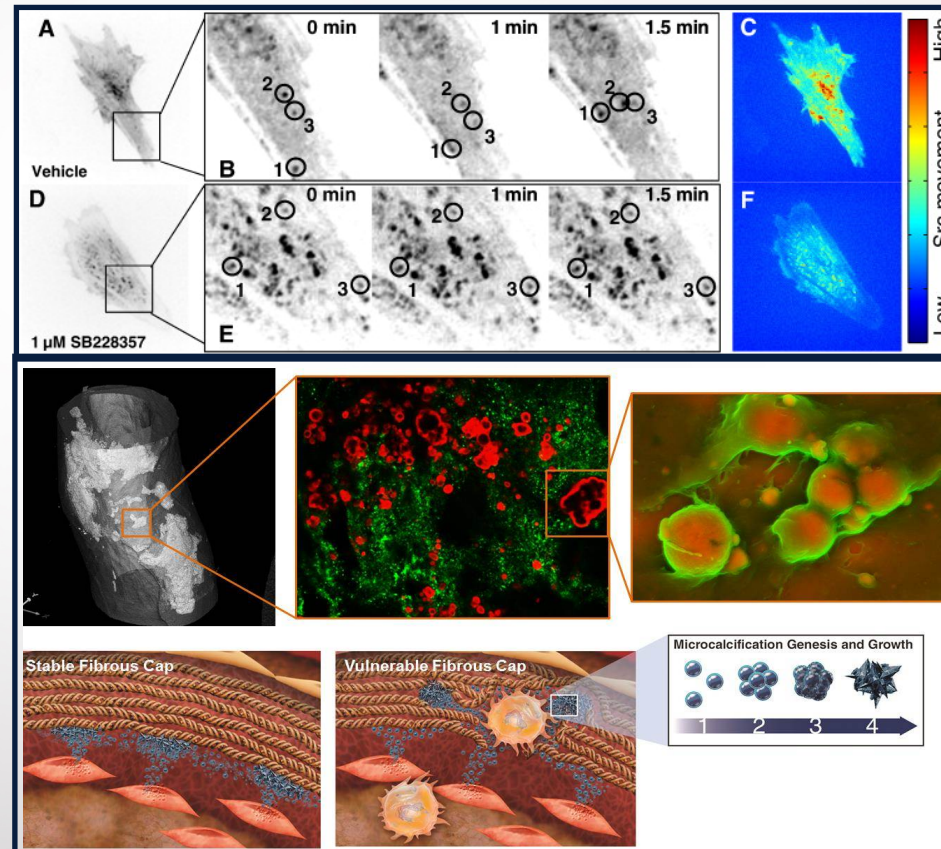
Cardiovascular Matrix Remodeling Laboratory

Joshua D. Hutcheson, Ph.D.

Dr. Hutcheson studies cardiovascular disease mechanisms.



Optical imaging and cell tracing techniques show cellular and extracellular matrix composition in cardiovascular tissues



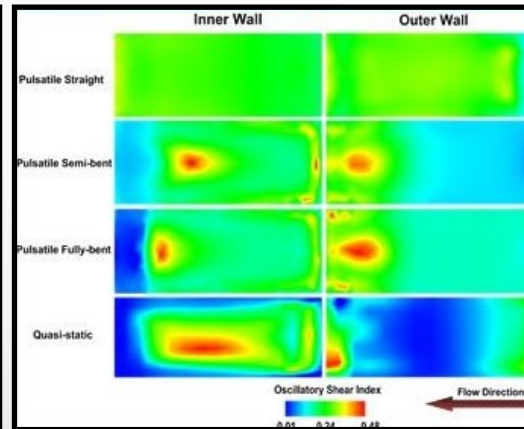
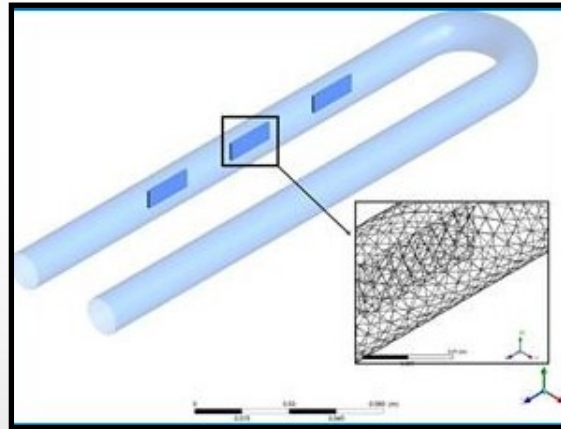
Extracellular matrix remodeling results from intracellular and cell-cell interactions



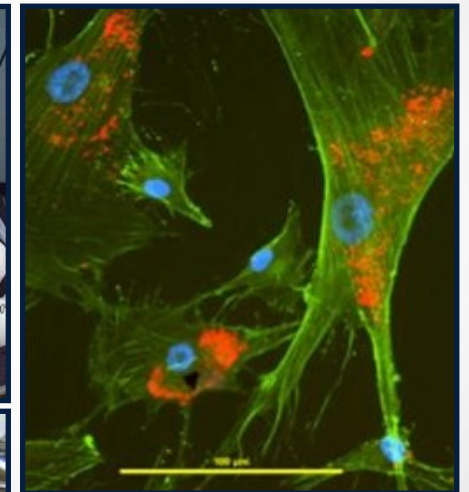
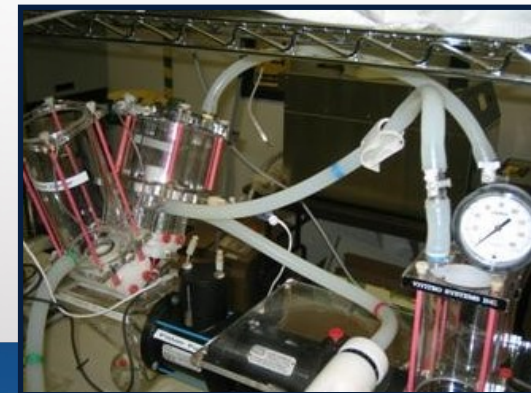
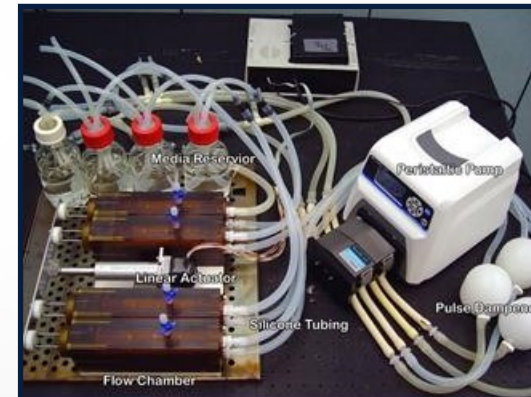
Tissue Engineered Mechanics, imaging and Materials Lab

Sharan Ramaswamy, Ph.D. FAHA

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



Cardiovascular mechanics, including computational models



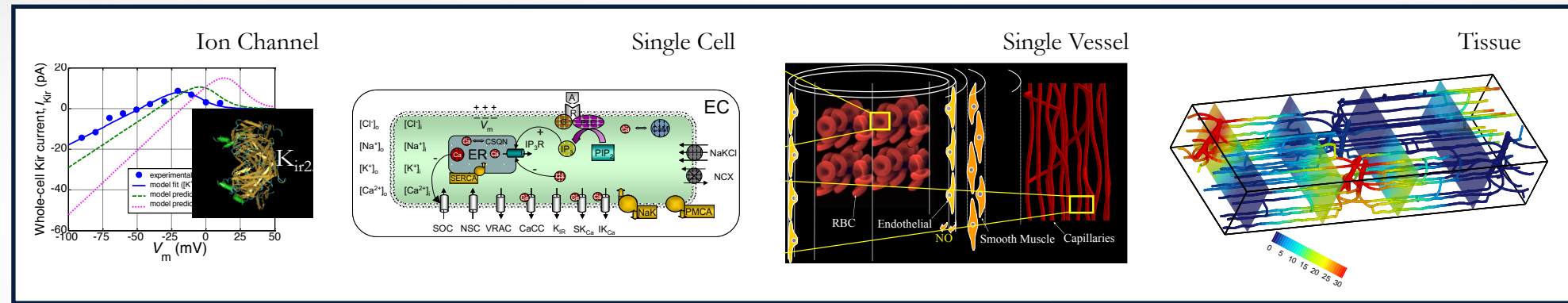
Heart valve tissue engineering and mechanobiology



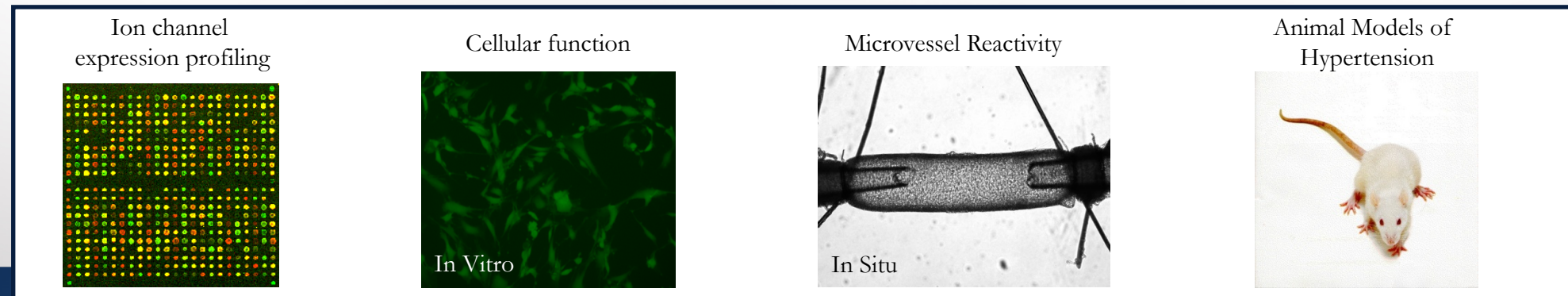
Laboratory of Vascular Physiology and Biotransport

Nikolaos M. Tsoukias, Ph.D.

Dr. Tsoukias studies neuromuscular coupling.



Modeling



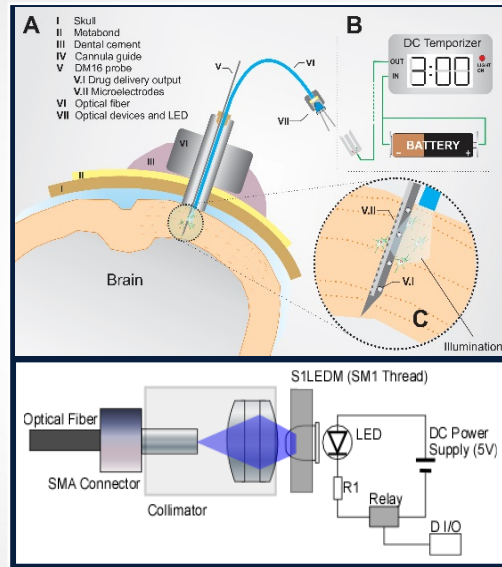
Experiments



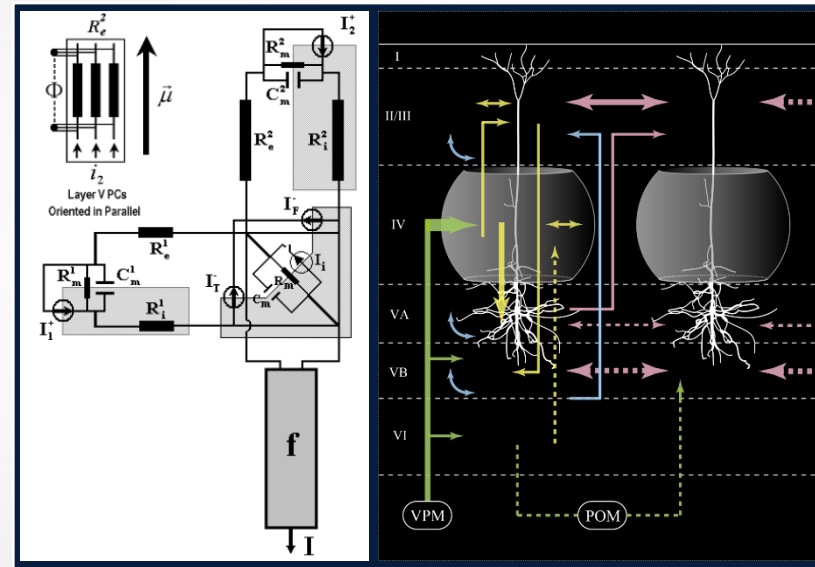
Neuronal Mass Dynamic Lab

Jorge Riera, Ph.D.

Dr. Riera is making strides in treating multiple brain disorders.

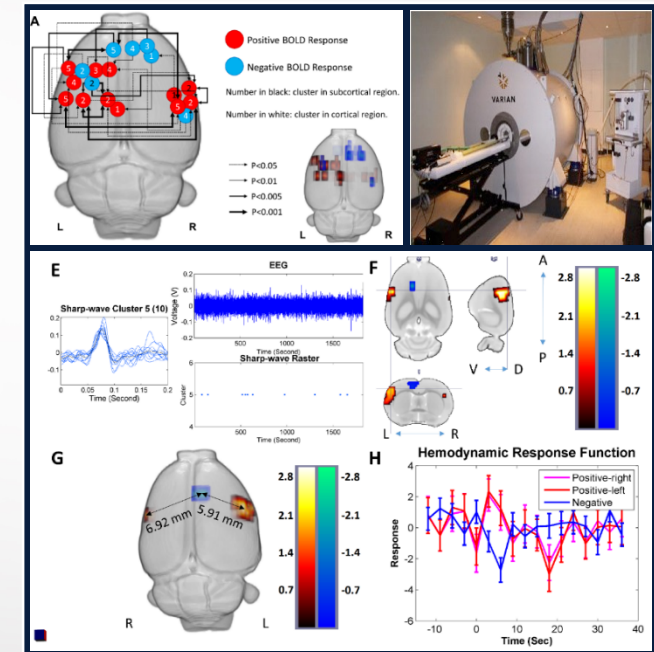
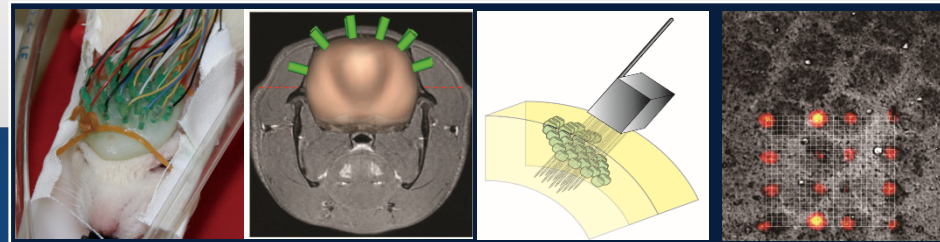


Optogenetics



Microcirculation

Multi-electrode arrays for
large-scale recording and
3D recording



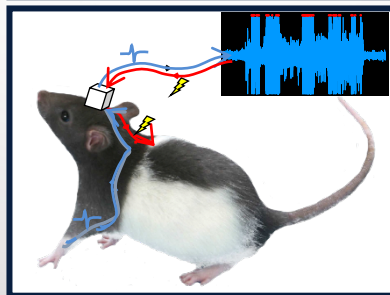
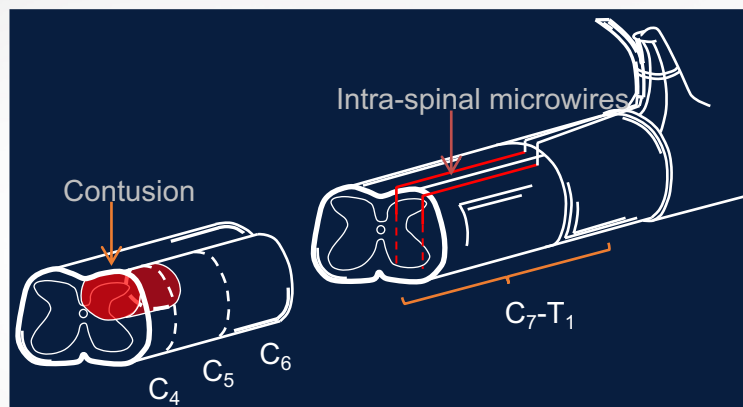
Multi-modal imaging for neurovascular
coupling study



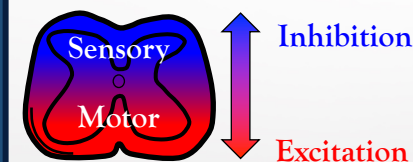
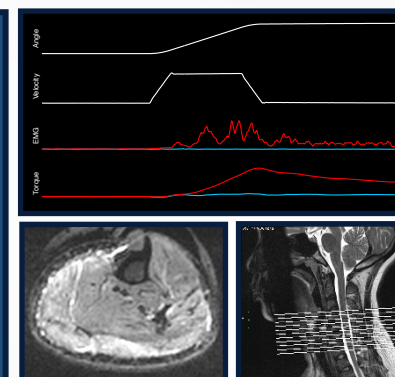
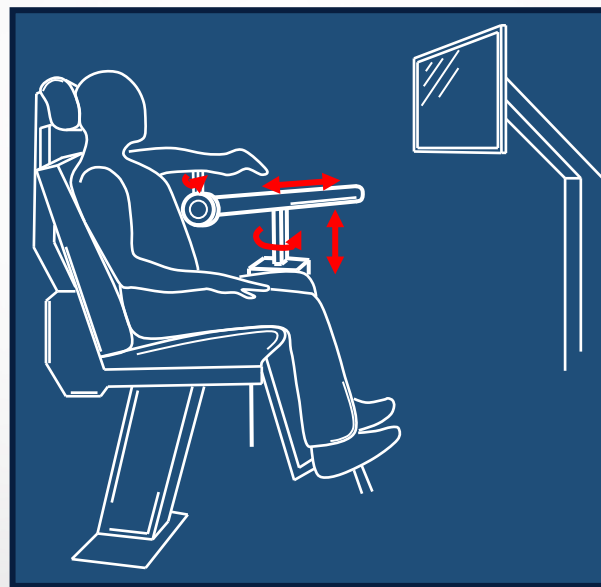
Neurological Injury & Sensorimotor Integration Laboratory

Jacob McPherson, Ph.D.

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



Preclinical research:
neuro-computer
interface, motor
rehabilitation and
neuropathic pain



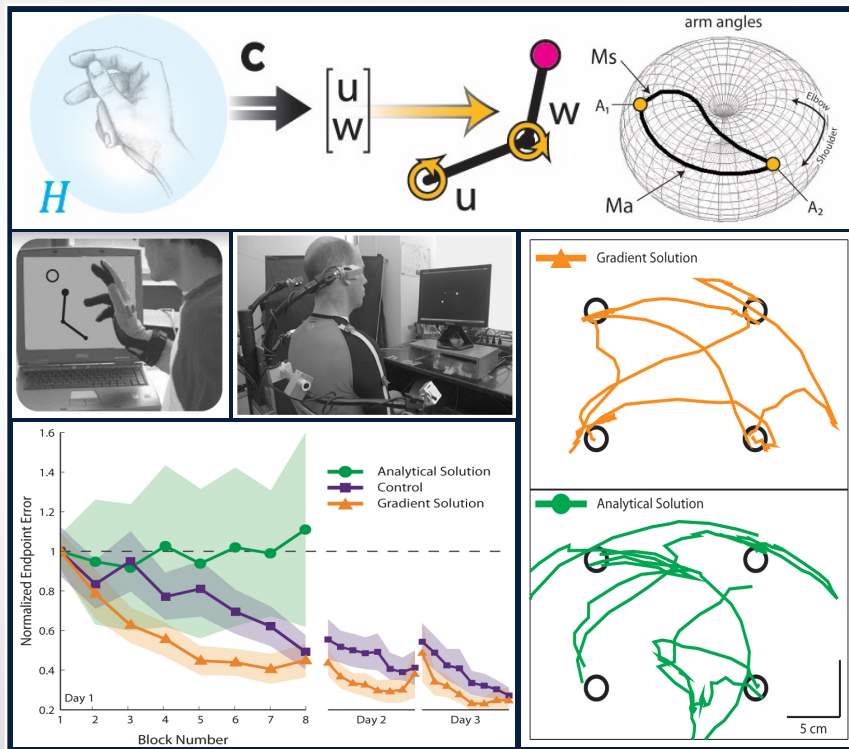
Clinical research: Stroke, spinal cord injury, neuro/electro-physiology, neuropharmacology, robotics and MRI.



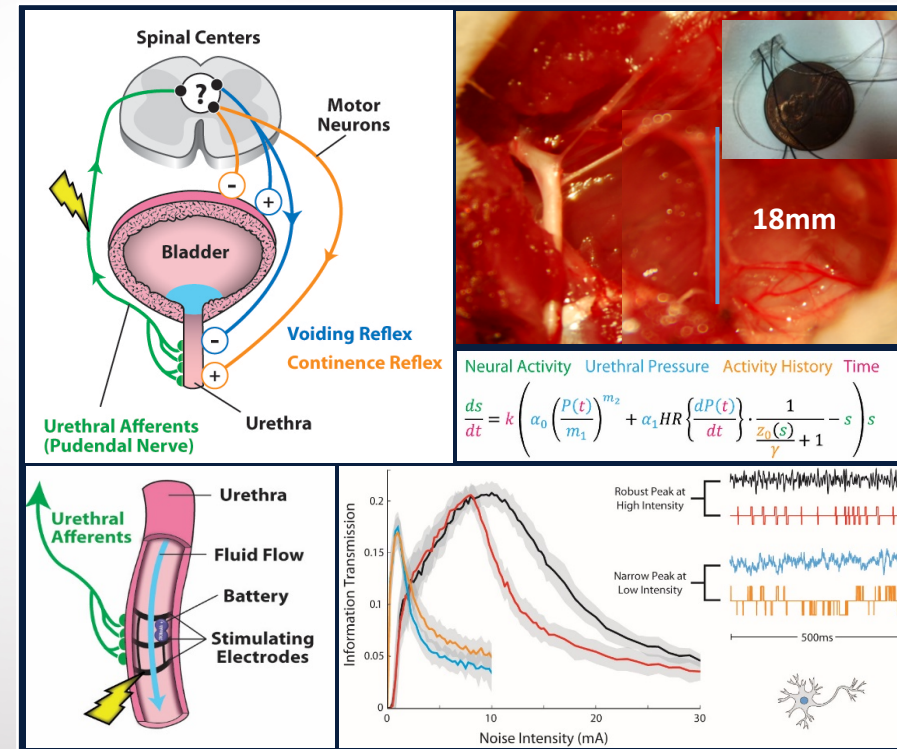
Applied Neural Interfaces Laboratory

Zachary Danziger, Ph.D.

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



Novel testbeds and decoding algorithms for brain-computer interfaces and body-machine interfaces



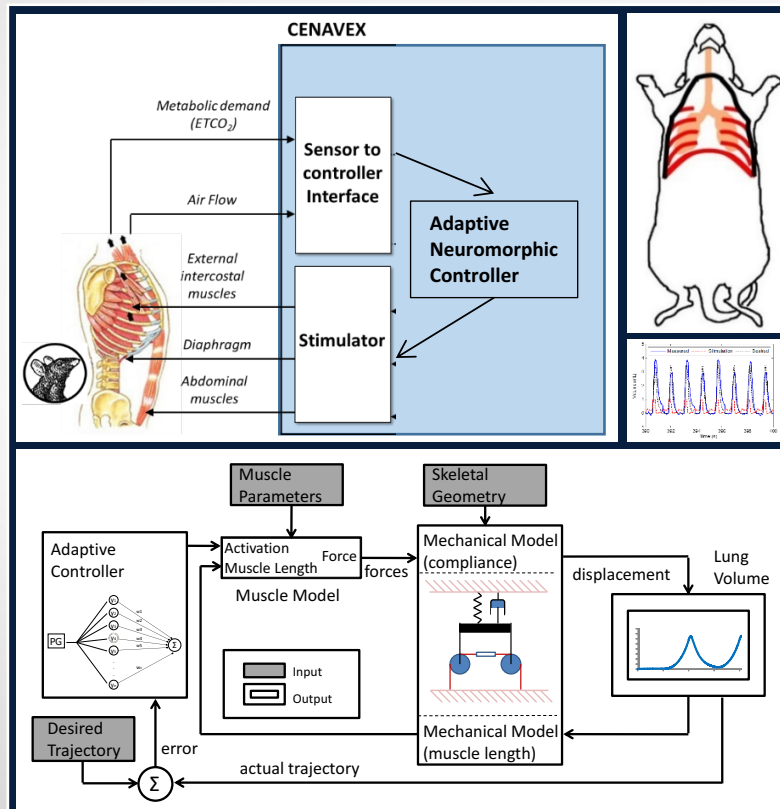
Peripheral nerve stimulation and mathematical modeling of the urinary tract to treat urinary retention and incontinence



Adaptive Neural Systems Laboratory

Ranu Jung, Ph.D.

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



Restore ventilatory function after paralysis - computational modeling; bioelectronics effecting neuroplasticity

Peripheral nerve interface to restore sense of touch and proprioception - ANS-neural-enabled prosthetic hand system (FDA Class III medical device); Sensorimotor perception studies.



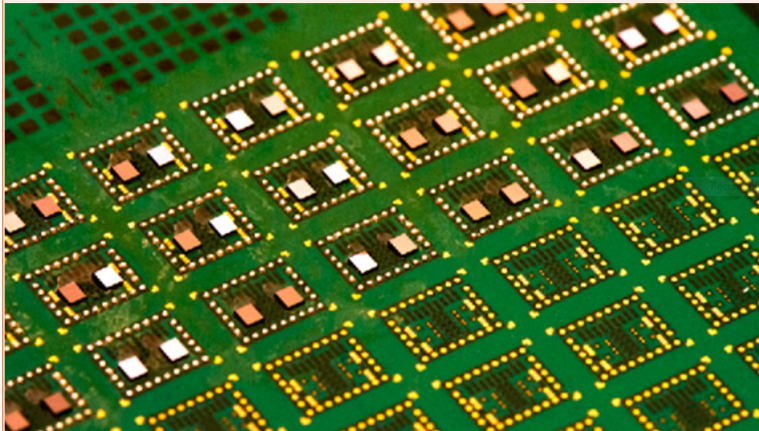
Bioelectronics Packaging Laboratory

Raj Markondeya, Ph.D.

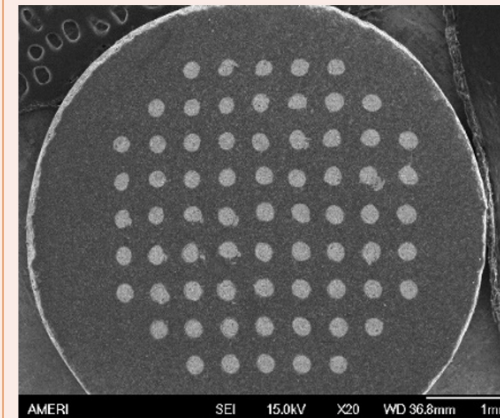
Dr. Raj develops packaging of bioelectronics implants for health monitoring and curing neurological disorders.

BIOELECTRONIC PACKAGING RESEARCH

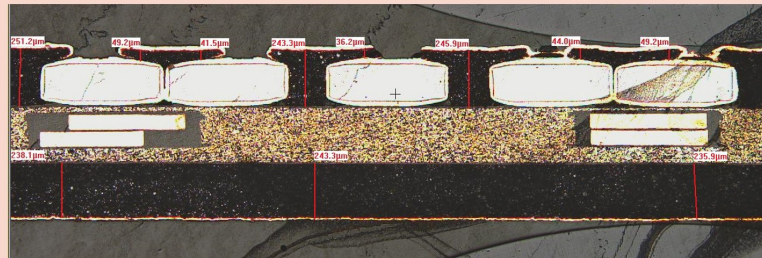
3D Packaging with High-Component Density



Fine-Pitch Hermetic Feedthroughs for Retinal Implants

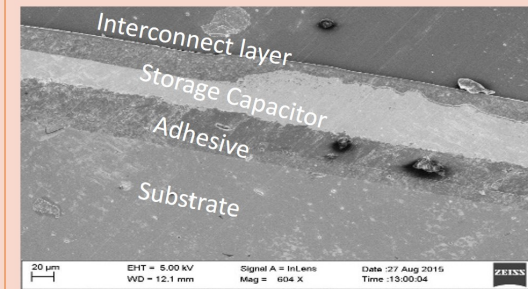


Embedded Active and Passive Components



FIU-GT Collaboration

Thinfil Flex Power Supply and Storage



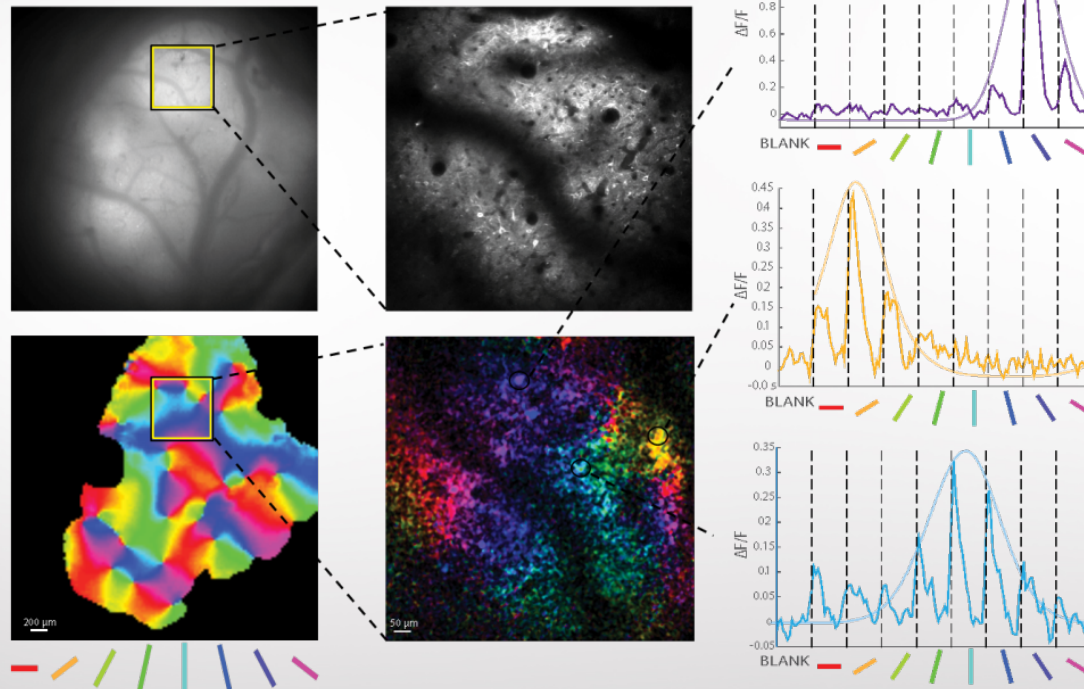


Visual Cortical Circuits Laboratory

James Schummers, Ph.D.

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

Widefield and two-photon microscopy of neuronal activity patterns visual cortex



Interactions between neurons and astrocytes in the brain

