

BIOMEDICAL ENGINEERING

Carnegie Mellon University

# **CARNEGIE MELLON** FORUM ON **BIOMEDICAL** ENGINEERING

September 21, 2018

Department of Biomedical Engineering College of Engineering Carnegie Mellon University Scott Hall 5000 Forbes Ave Pittsburgh, PA 15213 www.bme.cmu.edu





# Explore Frontiers in Biomedical Engineering!

The Carnegie Mellon Forum on Biomedical Engineering provides a platform for discussions and identification of grand challenges and frontiers in biomedical engineering research, education, and translation.

The forum consists of keynote and plenary talks, plenary panel discussions, and poster presentations in the frontiers of biomedical engineering. A poster award competition is open to students, postdocs or residents who present their research in any area interfacing engineering with medicine and health.







# Program

8:30 - 9:00	Networking an
9:00 – 9:05	Welcome Rema Burcu Akinci, Ph.I Associate Dean for Carnegie Mellon U
9:05 – 9:35	Keynote Lectu Rely on Emerge Living Systems
	Roger D. Kamm, P Cecil and Ida Greer Mechanical Engine Massachusetts Inst Past Chair, Interna Member, National Moderator: Bin He Engineering, CMU
9:35 - 10:05	Keynote Lectu Fastest Camer Compressed U
	Lihong V. Wang, P Bren Professor of I California Institute Member, National Moderator: Marler Helen Dunham Cov
10:05 - 10:35	Keynote Lectu Precision Medi
	<b>Tejal Desai, Ph.D.</b> Ernest L Prien Ende Department of Bio University of Califo Member, National <b>Moderator:</b> Conra Department of Bio
10:35 - 10:55	Coffee Break
10:55 - 11:25	Keynote Lectu Challenges and
	Howie Choset, Ph Professor of Robot Electrical and Com Carnegie Mellon Un Editor, Science Rob

### d Poster Viewing

### arks

D. Research, College of Engineering Iniversity

### re: Microphysiological Models that ence in Multi-Cellular Engineered

### Ph.D.

en Distinguished Professor of Biological and eering

titute of Technology

tional Academy of Medical and Biological Engineering

Academy of Medicine

e, Professor and Head, Department of Biomedical

#### re: World's Deepest-Penetration and ras: Photoacoustic Tomography and Itrafast Photography

#### Ph.D.

Medical Engineering and Electrical Engineering of Technology Academy of Engineering ne Behrmann, NAS, George A. and wan Professor of Cognitive Neuroscience, CMU

### re: Tackling Grand Challenges in icine Through Biomedical Engineering

lowed Professor and Chair pengineering & Therapeutic Sciences ornia, San Francisco Academy of Medicine ad Zapanta, Teaching Professor and Associate Head, medical Engineering, CMU

### re: d Trends in Medical Robotics

#### ۱.D.

tics, Biomedical Engineering,

- nputer Engineering
- niversity
- botics

Hebert, Professor and Director, Robotics Institute, CMU

### Program continued

11:25 - 11:55	Keynote Lecture: Driving and Reshaping Biotechnology				
	Justin C. Sanchez, Ph.D.				
	Director, Biological Technology Office				
	<b>Moderator:</b> Christopher Bettinger, Associate Professor of Biomedical				
	Engineering and Material Sciences and Engineering, CMU				
12:00 - 13:00	Networking Lunch				
13:00 - 13:20	Plenary Talk: Challenges in Translating BME Technologies				
	Christine E. Schmidt, Ph.D.				
	Pruitt Family Professor and Chair of J. Crayton Pruitt Family				
	University of Florida				
	President, American Institute of Medical and Biological Engineering				
	Moderator: Adam W. Feinberg, Associate Professor of Biomedical				
	Engineering and Material Sciences and Engineering, CMU				
13:20 - 13:40	Plenary Talk: Artificial Intelligence: Implications for Advanced Imaging and Precision Medicine				
	Dorin Comaniciu. Ph.D.				
	Vice President, Siemens Healthineers Technology Center				
	Siemens Corporation				
	Moderator: Byron Yu, Associate Professor of Biomedical Engineering and				
	Electrical & Computer Engineering, CMU				
13:40 - 14:00	Plenary Talk: Challenges in BME Education				
	Sanjeev G. Shroff, Ph.D.				
	Distinguished Professor and Gerald E. McGinnis Chair of				
	University of Pittsburgh				
	<b>Moderator:</b> Keith Cook, Professor and Associate Head,				
	Department of Biomedical Engineering, CMU				
14:00 - 14:20	Plenary Talk: CMU Approach to Addressing BME Challenges				
	Bin He, Ph.D.				
	Professor and Head, Department of Biomedical Engineering				
	Carnegie Mellon University Chair International Academy of Medical and Biological Engineering				
	Editor-in-Chief, IEEE Transactions on Biomedical Engineering				
	Moderator: Ren Xi, Assistant Professor of Biomedical Engineering, CMU				
14:20 - 15:00	Plenary Panel Discussion				
	Panelists: Comaniciu, Schmidt, Shroff Moderator: Bin He				
15:00 - 17:00	Poster Session				
17:00 - 17:10	Announcement of Poster Awards				

# Invited Speakers



#### Dr. Roger D. Kamm

Cecil and Ida Green Distinguished Professor of Biological and Mechanical Engineering, Massachusetts Institute of Technology Member, National Academy of Medicine

Professor Roger Kamm is Cecil and Ida Green Distinguished Professor of Biological and Mechanical Engineering at MIT. Professor Kamm is an international leader in bringing the fields of mechanics together with biology and chemistry. His work has explored the ways in which single molecules transmit force through macromolecular networks and modeled their mechanical properties. He has also developed new cell culture methods that facilitate formation of multi-cellular engineered living systems in a realistic microenvironment. Recognition for his contributions is reflected in Kamm's election as Fellow to AIMBE, ASME, BMES, AAAS and the IAMBE. He is also the 2010 recipient of the ASME Lissner Medal for lifetime achievements, the inaugural recipient (2018) of the ASME Nerem Medal for education and mentorship, and was elected to the National Academy of Medicine.



Bren Professor of Medical Engineering and Electrical Engineering, California Institute of Technology Member, National Academy of Engineering

Lihong Wang is Bren Professor of Medical Engineering and Electrical Engineering at California Institute of Technology. His book entitled "Biomedical Optics: Principles and Imaging," one of the first textbooks in the field, won the 2010 Joseph W. Goodman Book Writing Award. He also edited the first book on photoacoustic tomography. He has published 495 peer-reviewed articles in journals including Nature and Science and delivered 490 keynote, plenary, or invited talks. His Google Scholar h-index and citations have reached 120 and 59,000, respectively. His laboratory was the first to report functional photoacoustic tomography, 3D photoacoustic microscopy, photoacoustic endoscopy, photoacoustic reporter gene imaging, the photoacoustic Doppler effect, the universal photoacoustic reconstruction algorithm, microwave-induced thermoacoustic tomography, ultrasound-modulated optical tomography, time-reversed ultrasonically encoded (TRUE) optical focusing, nonlinear photoacoustic wavefront shaping (PAWS), compressed ultrafast photography (10 trillion frames/s, world's fastest camera), Mueller-matrix optical coherence tomography, and optical coherence computed tomography.

#### Dr. Lihong V. Wang



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## **Invited Speakers**



#### Dr. Tejal Desai

Ernest L Prien Endowed Professor and Chair, Department of Bioengineering & Therapeutic Sciences, University of California, San Francisco Member, National Academy of Medicine

Teial Desai is the Ernest L Prien Endowed Professor and Chair of the Department of Bioengineering & Therapeutic Sciences, Schools of Pharmacy and Medicine at University of California, San Francisco (UCSF), director of the NIH training grant for the Joint Graduate Program in Bioengineering at the University of California, Berkeley (UCB) and UCSF, and founding director of the UCSF/UC Berkeley Masters Program in Translational Medicine.

Desai's research spans multiple disciplines including materials engineering, cell biology, tissue engineering, and pharmacological delivery systems to address issues concerning disease and clinical translation. She has published over 200 peerreviewed articles. Her research is at the cutting-edge in precision medicine, enabled by advancements in micro and nanotechnology, engineering, and cell biology directed to clinical challenges in disease treatment. She seeks to design new platforms to overcome existing challenges in therapeutic delivery.

She is Chair of the American Institute for Medical and Biological Engineering College of Fellows. In 2015, she was elected to the National Academy of Medicine.



#### Dr. Howie Choset

Professor, Robotics Institute, Biomedical Engineering, and Electrical & Computer Engineering, Carnegie Mellon University Editor, Science Robotics

Howie Choset is Professor of Robotics, Biomedical Engineering, Electrical and Computer Engineering at Carnegie Mellon University where he serves as the co-director of the Biorobotics Lab and as director of the Robotics Major. Choset's research group reduces complicated high-dimensional problems found in robotics to low-dimensional simpler ones for design, analysis, and planning. Motivated by applications in confined spaces. Dr. Choset's work has been supported by a number of government and industry grants, and his work has been published in Science, Proceedings of the National Academies of Science among other journals. Dr. Choset co-led the formation of the Advanced Robotics for Manufacturing Institute, which is a \$250M national institute advancing both technology development and education for robotics in manufacturing.







Dr. Justin C. Sanchez

Director, Biological Technology Office, Defense Advanced Research Projects Agency

Dr. Justin Sanchez was named Director of BTO in May 2016, after serving as Acting Deputy Director since December 2015. He joined DARPA as a Program Manager in 2013 to explore neurotechnology, brain science and systems neurobiology. Before coming to DARPA, Dr. Sanchez was an Associate Professor of Biomedical Engineering and Neuroscience at the University of Miami, and a faculty member of the Miami Project to Cure Paralysis. He directed the Neuroprosthetics Research Group, where he oversaw development of neural-interface medical treatments and neurotechnology for treating paralysis and stroke, and for deep brain stimulation for movement disorders, Tourette's syndrome and Obsessive-Compulsive Disorder.

### Dr. Christine E. Schmidt

Pruitt Family Professor and Chair of J. Crayton Pruitt Family Department of Biomedical Engineering University of Florida President, American Institute of Medical and Biological Engineering

Christine E. Schmidt is the J. Crayton Pruitt Family Endowed Chair and Department Chair of the J. Crayton Pruitt Family Department of Biomedical Engineering at the University of Florida. She was one of the founding faculty members of the Department of Biomedical Engineering at UT Austin, and was at UT Austin until December 2012, when she moved to become the Chair of Biomedical Engineering at the University of Florida. Dr. Schmidt's research is focused on developing new biomaterials and biomaterial composites (e.g., natural material scaffolds, processed tissues, electronic polymer composites) that can be used to physically guide and stimulate regenerating nerves and the healing of other tissues. Dr. Schmidt is active in commercialization efforts. Her research on development of decellularized nerve tissue has been licensed and utilized in AxoGen Inc.'s Avance® nerve graft, which has impacted many thousands of patients who suffer from peripheral nerve injuries. Her research is also the foundation for the start-up company, Alafair Biosciences, in Austin Texas that focuses on internal wound care management. Dr. Schmidt is a Fellow of AIMBE, AAAS, BMES, and FBSE. She currently serves as the President for AIMBE.

#### Dr. Dorin Comaniciu

Vice President, Siemens Healthineers Technology Center, Siemens Corporation

Dorin Comaniciu is Vice President at Siemens Healthineers, having global responsibility for Digital Technologies and Innovation. His teams specialize in using large collections of data to build artificial intelligence applications for healthcare. His scientific contributions to medical imaging and machine intelligence translated into multiple clinical products focused on improving the quality of care, specifically in the fields of diagnostic imaging, image-guided therapy, and personalized medicine. A Top Innovator of Siemens, Dr. Comaniciu is a Fellow of IEEE, ACM, Medical Image Computing and Computer Assisted Intervention Society, and American Institute for Medical and Biological Engineering. He is recipient of multiple honors, including an honorary doctorate and the IEEE Longuet-Higgins Prize for fundamental contributions to computer vision. Comaniciu holds 260 patents and co-authored 300 peer-reviewed publications, which received 40,000 citations in the areas of machine intelligence, medical imaging and computer vision.

# **Invited Speakers**



#### Dr. Sanjeev G. Shroff

Distinguished Professor and Gerald E. McGinnis Chair of Department of Bioengineering, and Professor of Medicine, University of Pittsburgh

Dr. Sanjeev Shroff is the Distinguished Professor and Gerald E. McGinnis Chair in Bioengineering and Professor of Medicine at the University of Pittsburgh. Dr. Shroff's research is in the cardiovascular arena, with two main focus areas: (1) Contractile and regulatory proteins and post-translational regulation of cardiac contraction. (2) Role of vascular stiffness in cardiovascular function and potential therapeutic applications of vascular stiffness-modifying drugs and/or hormones (e.g., relaxin). His research efforts have been supported by numerous grants from NIH (continuous funding since 1986), AHA, NSF, and industry sources. He was the recipient of the Established Investigator Award from the AHA and was elected as a Fellow of the American Physiological Society, Fellow of the American Institute for Medical and Biological Engineering, and the Fellow of Biomedical Engineering Society. Dr. Shroff has been serving as the Principal Investigator on a NIH-NHLBI pre-doctoral T32 training grant (Cardiovascular Bioengineering Training Program) since 2005 and the Coulter Translational Research Partnership II grant since 2013.



#### Dr. Bin He

Professor and Head, Department of Biomedical Engineering, Carnegie Mellon University Chair, International Academy of Medical and **Biological Engineering** Editor-in-Chief, IEEE Transactions on Biomedical Engineering

Bin He is Professor and Head of Department of Biomedical Engineering, and Professor of Electrical and Computer Engineering and the Center for Neural Basis in Cognition at Carnegie Mellon University, Pittsburgh. Dr. He has made significant research and education contributions to the field of neuroengineering and biomedical imaging, including functional biomedical imaging, multimodal neuroimaging and noninvasive brain-computer interface. His pioneering research has helped transforming electroencephalography from a 1-dimensional detection technique to 3-dimensional neuroimaging modality. His lab demonstrated for the first time for humans to fly a drone and control a robotic arm just by thinking about it using EEG. He has contributed significantly to neuroengineering education including editing the first textbook in Neural Engineering, and led multiple NIH and NSF training grants in neuroengineering. Dr. He has received a number of awards including the IEEE Biomedical Engineering Award, the Academic Career Achievement Award and Distinguished Service Award from the IEEE Engineering in Medicine and Biology Society, the Established Investigator Award from the American Heart Association, and NSF CAREER Award. Dr. He has served as the Editor-in-Chief of IEEE Transactions on Biomedical Engineering from 2013-2018, and as the Chair of the International Academy of Medical and Biological Engineering from 2018.

# Poster Session and Competition

#### 101

**CFD-Based Optimization of Data-Driven Mesh** Deformation Based on Time-Dependent Medical Images; Yuxuan Yu, Yongjie Jessica Zhang; CMU

#### 102

**Material Transport Simulation in Complex** Geometry of Neurons Using Isogeometric Analysis; Angran Li, Xiaoqi Chai, Ge Yang, Yongjie Jessica Zhang; CMU

#### 103

In Vivo Evaluation of Reverse Perfluorocarbon **Emulsions for Pulmonary Drug Delivery of Tobramycin** in Respiratory Infections; Diane L. Nelson, Neil Carleton, Chi Chi Do-Nguyen, Mario L. Fabiilli, Keith E. Cook; CMU, University of Michigan

#### 104

EEG Systems for Accommodating Thick and Curly Hair Arnelle Etienne, Ashwati Krishnan, Shawn K Kelly, Pulkit Grover; СМИ

#### 105

Controlling the crystalline structure of silk biomaterials with non-invasive ultrasound techniques; Megan DeBari, Rosalyn Abbott; CMU

#### 106

Improving urinary catheter safety and tissue engineered urethral scaffolds through an enhanced understanding of human urethral tissue biomechanics; Eoghan M. Cunnane, Niall F. Davis, Alan J. Ryan, Jochen Hess, Michael T. Walsh, Fergal J. O'Brien, David A. Vorp; University of Limerick, Royal College of Surgeons (Dublin), University of Pittsburgh, Tallaght Hospital (Dublin), University of Essen (Germany)

#### 107

Customizable, 3D-printed, (several) thousand-channel probes for neural recording and photostimulation; Saleh MS, Nicholas MA, Hodge AT, Panat R, Yttri EA; CMU

#### 108

**Can Machine Ratings of Hyoid Bone Displacement During Swallowing Predict Penetration and Aspiration?;** Cara Donohue, Zhenwei Zhang, Mandy Mahoney, Subushan Perera, Ervin Sejdić, James L. Coyle; University of Pittsburgh

#### 109

Joint Image Segmentation and Registration Based on a Dynamic Level Set Approach Using Hierarchical B-splines; Aishwarya Pawar, Yongjie Jessica Zhang, Cosmin Anitescu, Timon Rabczuk; CMU, Bauhaus-Universitat Weimar, Germany



#### 110

Do Machine Ratings of Hyoid Bone Displacement During Videofluoroscopy Match Clinician Ratings Using the MBSImP?; Cara Donohue, Amanda Mahoney, Zhenwei Zhang, Atsuko Kurosu, Ervin Sejdica , James Coyle; University of Pittsburgh

#### 111

Low-Cost, High Temporal Resolution Diffuse Correlation Spectroscopy; J. Yang, A. Ruesch; MA. Smith and JM. Kainerstorfer; CMU

#### 112

Engineering human adipose microenvironments to study metabolic dysfunction in obesity; Mallory D. Griffin, Rosalyn D. Abbott; CMU

#### 113

Isolating Specific vs. Non-Specific Binding Responses in Conductive Polymer based Biosensors; Phil Smith, Indorica Sutradhar, Maxwell Telmer, B. Reeja Jayan; CMU

#### 114

Nanoparticle Doped PEDOT Enables High Drug Loading and **Release of Previously Non-Compatible Compounds;** Kevin Woeppel, X. Tracy Cui; University of Pittsburgh

#### 115

Ultra-Compliant Adhesive Hydrogels for Improving the Performance of Flexible Neural Interfaces; Chenchen Mou, Christopher J. Bettinger; CMU

#### 116

Frequency dependent hemodynamic response to intracranial pressure changes; Alexander Ruesch, Samantha Schmitt, Jason Yang, Matthew A. Smith, Jana M. Kainerstorfer; CMU, University of Pittsburgh

#### 117

Introducing cell signaling into 3D printable ECM hydrogels; via multifunctional particles; Songyang Li, Sai Gopal Yerneni, Phil Campbell; CMU

#### 118

Dynamic diffuse optical imaging for breast cancer therapy prediction; Constance M. Robbins, Jason Yang, James F. Antaki, Jana M. Kainerstorfer; CMU, Cornell University

A Model of Neurovascular Coupling and its Application to Cortical Spreading Depolarization; Jiaming Cao, Pulkit Grover, Jana M Kainerstorfer; CMU

#### 121

Hydrodynamic Multi-Particle Trapping; Jarrett Boyd, Melikhan Tanyeri; Duquesne University

#### 122

**Cytokine-Releasing Microspheres for Use in Porous** Scaffolds; Katherine Lorentz, Darren Haskett, Justin Weinbaum Morgan Fedorchak, Antonio D'Amore, William R. Wagner, Steven Little, David Vorp; University of Pittsburgh

#### 123

Mice learn to modulate intra- and inter-limb paw kinematics with training on a novel locomotor behavioral paradigm; Katrina P Nguyen, Abhinav Sharma, Jinke Liu, Nikhil Maheshwari, Mauricio R Gil-Silva, Steven M Chase, Aryn H Gittis; CMU

#### 124

Graphene-based Biocompatible and Transparent Microelectrode Arrays for Simultaneous Electrical and Optical Measurements of Electrogenic Cells; Sahil Rastogi, Jacqueline Bliley, Daniel Shiwarski, Guruprasad Raghavan, Adam Feinberg, Tzahi Cohen-Karni; CMU

#### 125

Improved Adult and Pediatric Aortic Elastogenesis Driven by Adipose-Derived Mesenchymal Stem Cell Secreted Factors; Aneesh Ramaswamy, Rachel Sides, Kaori Sugiyama, Hiromi Yanagisawa, Victor Morell, David Vorp, Justin Weinbaum; University of Pittsburgh

#### 126

Silica Nanoparticles Enable Oral Delivery of Insulin; N. G. Lamson, A. Berger, K. A. Whitehead; CMU

#### 127

3D Printed high density neural micro-electrode array; Mohammad S. Saleh, Mark A. Nicholas, Rit Bezbaruah, Alexander T. Hodge, Eric Yittri, Rahul Panat; CMU

#### 128

Noninvasive Brain-Computer Interface using Sensorimotor Rhythms: Daniel Suma, Jianjun Meng, James Stieger, Bin He; CMU, University of Minnesota Twin Cities

#### 129

**Three-Dimensional Sensor Arrays for Exploring Electrophysiology of Electrogenic Microtissues;** Anna Kalmykov, Changjin Huang, Arif Abdullah, Elnatan Mataev, K. Jimmy Hsia and Tzahi Cohen-Karni; CMU, University of Illinois

#### 130

Altered large-scale brain network of oscillatory activities in long-term mindfulness meditators;

H Jiang1, X Guo, X Wang, Z Wang, T Xue, H Li, T Xu, S Ye, S Tong, D Cui, B He; CMU

#### 131

Engineering functional muscle tissue using 3D printed

collagen scaffolds; Andrew Lee, Thomas Hinton, Andrew Hudson, Jaci Bliley, Adam W. Feinberg; CMU

#### 132

**Computational Assessment of Cardiac Hemodynamics and Biomechanics for a Torsional Ventricular Assist Device** (tVAD); Elaine Soohoo, Lewis K Waldman, Dennis R Trumble; CMU, Insillcomed, Inc

#### 133

Stretch-induced conformational change of fibronectin influences growth factor binding domain availability; Emily N Sevcik, Adam W Feinberg; CMU

#### 135

Hybrid-nanomaterials for remote non-genetic photo-stimulation of cells and tissue; Nicholas Johnson, Sahil Rastogi, Jacqueline Bliley, Daniel Shiwarski, Adam Feinberg, Tzahi Cohen-Karni; CMU

Combined Use of a Selective Factor XII Inhibitor with a Polycarboxybetaine Surface Coating Generates Potent Artificial Lung Anticoagulation Without Bleeding; Noritsugu Naito, Rei Ukita, Neil Carleton, Kalliope Bouloubassis, Keith Cook: CMU

#### 137

Noninvasive ultrasound neuromodulation induces long term depression in rat hippocampus; Xiaodan Niu, Kai Yu, Bin He; CMU

### 138

Acoustic Radiation Force Impulse (ARFI) imaging to assess effects of tendon loading; Gerald A Ferrer, Wagas Khali, Volker Musahl, Kang Kim, Richard E. Debski; University of Pittsburgh

Soft Robotic Bi-Ventricular Sleeve for Long-term Cardiac Support; Jooli Han, Dennis R. Trumble; CMU

#### 140

**Metabolic Labeling and Chemoselective Functionalization** of Native Biomaterials; Piyumi Wijesekara, Daniele Evangelista-Leite, Konrad T. Rajab, Philipp T. Moser, Kentaro Kitano, Konstantinos P. Economopoulos, Daniel E. Gorman, Harald C. Ott, Xi Ren; CMU

### 141

**Computational Analysis of Thermomechanical Stress Developed During Polarized-Light Scanning Cryomacroscopy** Experiments, with Applications to Cryopreservation; Prem K. Solanki, Yoed Rabin; CMU

#### 142

Switched Hybrid Neuroprosthesis with Muscle Fatigue Estimation from Ultrasound Imaging; Zhiyu Sheng, Nitin Sharma, Kang Kim; University of Pittsburgh

#### 143

Reducing Thermomechanical Stress During Ice-Free Rewarming from Cryopreservation Storage Using Radiofrequency Rewarming; Prem K. Solanki, Yoed Rabin; CMU

#### 144

**Analyzing Right Ventricular Response to** Sacubitril/Valsartan Treatment in Pulmonary Hypertension; Danial Sharifi Kia, Claire Tushak, Evan Benza, Kang KIm, Marc A. Simon; CMU, University of Pittsburgh

#### 145

Self-Assembled Biomimetic Energy Dissipating Vascular Tissue Adhesives; Xiamin Tang, Christopher J Bettinger; CMU

#### 146

**Extracellular Matrix Organization and Biomechanics** of the Lamina Cribrosa in Populations at High Risk for Glaucoma; Jr-Jiun Jean Liou, Ehab Tamimi, Reza Behkam, Hirut Kollech, Amy Hill, Catalina Ardila, Jonathan Vande Geest; University of Pittsburgh

#### 147

Motion Tracking of Acoustic-Actuate Microswimmer by Ultrasound Imaging and SDC Estimation; Zunding Xiao, Fang-Wei Liu, Qiyang Chen , Kang Kim, Sung Kwon Cho, Nitin Sharma; University of Pittsburgh

#### 148

Measurement of Residual Limb Skin Strain Within a Socket Type Prosthesis in Transfemoral Amputees During Walking; Tom Gale, Shumeng Yang, Richard McGough; Mark Goodman; William Anderst; University of Pittsburgh

#### 149

Role of wearables in unlocking qualitative and quantitative attributes of physical activity in wheelchair users; Akhila Veerubhotla, Dan Ding; University of Pittsburgh, Department of Veteran Affairs, Pittsburgh

#### 150

Continuous muscle strength monitor for ankle dorsi-flexi using combined ultrasound imaging and electromyography; Qiang Zhang, Zhiyu Sheng, Danial Sharifi Kia, Kang Kim, Nitin Sharma; University of Pittsburgh

#### 151

**Multidimensional Phase Coupled Speckle Tracking** Algorithm using Kriging Interpolation; Brandon Rebholz, Mohamed Almekkawy; Penn State University

#### 152

Automatic Segmentation of Swallowing Accelerometry and Sounds using Deep Neural Networks; Yassin Khalifa, James L. Coyle, Ervin Sejdić; University of Pittsburgh

#### 154

In situ Ultrasonically Tunable Virtual Relay Lens for Non-invasive Micro-endoscopy; Matteo Giuseppe Scopelliti, Daniele Busacchio, Maysam Chamanzar; CMU

#### 155

In-situ Reconfigurable Ultrasonically Sculpted Optical Beam Paths for Non-invasive 3D Imaging; Yasin Karimi, Matteo G. Scopelliti, Maysam Chamanzar; CMU

**Cell Migration Coordination by Site-Dependent** Cell-Cell Contact; David Li, Yu-li Wang; CMU

#### 157

Multiscale Cardiac FEA for Biomechanical Cardiac Compression Analysis; Edgar Aranda-Michel, Lewis K. Waldman, Dennis R. Trumble; CMU

#### 158

Lamina Cribrosa Strain Response in Glaucomatous and Non-glaucomatous Samples using Multiphoton Imaging and Digital Volume Correlation; Hirut Kollech, Reza Behkam, Jonathan Vande Geest; University of Pittsburgh

#### 159

Multi-Focus Beamforming for Thermal Strain Imaging Using a Single Ultrasound Curved Linear Array Transducer; Waqas Khalid, Kang Kim; University of Pittsburgh

#### 160

Modeling Load-Dependent Cardiomyopathies Using **Engineered Human Cardiac Tissues;** *Jacqueline Bliley* Mathilde Vermeer, Rebecca Duffy, Ivan Batalov, Dan Shiwarski, Josh Tashma, Andrew Lee, Yan Sun, Anna Kalmykov, Rachelle Palchesko, Peter van der Meer, Adam W. Feinberg; CMU, University of Groningen

#### 161

Neck sensor-supported hyoid bone tracking during swallowing; Shitong Mao, Zhenwei Zhang, Yassin Khalifa, Amanda Suzanne Mahoney, Carrie Ann Kuhn Donohue, Aliaa Sabry Elbahnasy, James L Coyle, Ervin Sejdic; University of Plttsburgh

#### 162

Melatonin improves quality and longevity of chronic neural recording; Asiyeh Golabchi, Bingchen Wu, Takashi D. Y. Kozai, Xinyan Tracy Cui; University of Pittsburgh

#### 163

Shape Reconstruction for Endoscopy with Robust Perspective Shape from Shading; V. B. Surya Prasath, Lucile Marchal; Cincinnati Children's Hospital

#### 164

Assessing a Nerve Specific ECM-Based Hydrogel in a Rat Sciatic Transection Model; Tyler Meder, Travis Prest, Valeria Yupanqui, Nice Sophia, Bryan Brow; University of Pittsburgh, University of Antipolisu

#### 165

Mosaicking and Blending in Large-scale Neuroimaging for Robust Dendrite Detection; Harshith Bondada, V. B. Surya Prasath, Bruce Aronow; Cincinnati Children's Hospital Medical Center

#### 166

Human Epithelial Type-2 Cell Segmentation with Deep Convolutional Neural Networks; Srinivasa Siddhartha, Selagamsetty, Vellai Badradoss Surya Prasath; CCHMC

#### 167

**Modeling Microscale Clot Formation in Artificial Lungs;** Angela Lai, Natsuha Omori, Julia Napolitano, James F. Antaki, Keith E. Cook; CMU, Cornell University

#### 168

Spatiotemporal transition patterns of spontaneous brain activity in rats; Yikang Liu, Nanyin Zhang; Penn State University

#### 169

Freeform Reversible Embedded 3D Printing of Epoxy Composites; Neeha Dev Arun, Adam Feinberg; CMU

#### 170

Mapping 3D Mechanical Strains during TissueFormation with a Novel Fibronectin-based NanomechanicalBiosensor; Daniel J. Shiwarski; Joshua Tashman, Alkiviadis Tsamis,Quentin Jallerat, Malachi Blundon, John M. Szymanski, BrookeMcCartney, Adam W. Feinberg; CMU

#### 171

**FingerSight: A device for the Blind;** *Shantanu Satpute, Janet Canady, Roberta Klatzky, George Stetten; University of Pittsburgh* 

#### 173

**Microvessel Structure Visualization in Three-Dimension;** Jiachen Ning; Chao Liu, Anthony Wertz, Artur Dubrawski; Auton Lab

#### 174

Computer-aided simulation of mechanical properties of DNA based cantilevers; *Ying Liu, Rebecca Taylor; CMU* 

#### 176

**Exposure of muscle stem cells to a stiff microenvironment drives an "aged" mitochondrial phenotype;** *Mamiya H, Sahu A, Cheikhi A, Shinde S, Luketich S, Nasello G, Van Houten B, D'Amore A, Barchowsky A, Ambrosio F; University of Pittsburgh, University of Zaragoza, Zaragoza, Spain* 

### 177

Intramolecular Interactions of Conjugated Polymers Mimic Molecular Chaperones to Stabilize Protein-Polymer Conjugates; Stefanie L. Baker, Aravinda Munasinghe, Hironobu Murata, Ping Lin, Krzysztof Matyjaszewski, Coray M.

Hironobu Murata, Ping Lin, Krzysztof Matyjaszewski, Coray M. Colina, Alan J. Russell; CMU

#### 178

Dissociating volitional and non-volitional drivers of activity in M1; Carmen F Fisac, Steven M Chase; CMU

#### 179

**Raspberry-derived treatment of inflammatory bowel disease;** *Kyle E. Cochran, Nicholas G. Lamson, Kathryn A. Whitehead; CMU* 

#### 180

#### Engineering Extracellular Vesicle Membranes with Tunable Multipurpose Cholesterol-DNA Tethers;

Saigopalakrishna S. Yerneni, Sushil Lathwal, Esma S. Yolcu, Krzysztof Matyjaszewski, Lee E. Weiss, Haval Shirwan, Subha R. Das, Phil G. Campbell; CMU, University of Louisville

#### 181

An Exploration of Epicardial Adhesion Strategies for Alternative Cardiac Assist Devices; Molly Kaissar, Elaine Soohoo, Dennis R. Trumble; CMU

#### 182

High-density Steeltrodes: A New Platform for Recording from Non-human Primate Brain; Zabir Ahmed, Jay Reddy, Tobias Teichert, Maysamreza Chamanzar; CMU, University of Pittsburgh

#### 183

Gait and Posture Assessment in Chiari Malformation Patients; Brittany Sommers, Visar Berki, Brian Davis; University of Akron

#### 184

Parylene Optical Waveguides: A New Platform for Implantable Photonics; Jay Reddy, Maya Lassiter,

Ramgopal Venkateswaran, Luke Stewart, Alison Barth, Maysamreza Chamanzar; CMU

#### **186**

**Preclinical assessment of a compliance matched biopolymer vascular graft;** Ali Behrangzade, Catalina Ardila, Ehab Tamimi, Kenneth Furdella, Jr-Jiun Jean Liou, Jonathan Vande Geest; University of Pittsburgh

#### 188

**Optical Coherence Tomography (OCT) Image Denoising by Generative Adversarial Network (GAN);** Jiahong Ouyang, Tejas Mathai, John Galeotti; CMU

#### 189

Measuring Resting State Functional Connectivity in Awake Mouse's Brain Using fMRI; Hayreddin Said Unsal; Penn State University

#### 190

Studying the Mechanism of Cell Reorientation under Cyclic Stretching with a Polyacrylamide-Based Stretcher for Concomitant Imaging; Jui-Chien Lien, Yu-Li Wang; CMU

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**Can Ultra-resolution EEG do better than ECoG?;** Praveen Venkatesh, Ritesh Kumar, Amanda Robinson, Ashwati Krishnan, Rui Sun, Matthew J. Boring, Gayathri Mohankumar, Arun Antony, R. Mark Richardson, Shawn Kelly, Michael Tarr, Marlene

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