SECOND CARNEGIE MELLON FORUM ON BIOMEDICAL ENGINEERING

September 19-20, 2019

Carnegie Mellon University

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 fellows who present their research in any area interfacing engineering with medicine and health.











Program

THURSDAY, SEPTEMBER 19

	IAMBE Symposium on Grand Challenges in Biomedical Engineering Location: Connan Room, 1st Floor of the Cohon University Center SESSION 1: Neuroengineering, Imaging and Informatics Moderator: John Gore, NAE, IAMBE University Professor and Director, Vanderbilt University Institute of Imaging Science, Vanderbilt University		
14:30 - 14:55	The Role of Neuroprostheses in the Restoration of Function in Spinal Cord Injury		
	Hunter Peckham, NAE, IAMBE Donnell Institute Professor of Biomedical Engineering and Orthopaedics Distinguished University Professor, Case Western Reserve University		
14:55 – 15:20	Overcoming the Barriers that Obscure the Interlinking of Heterogeneous Big Medical Data through Data Sharing and Harmonization		
	Dimitrios Fotiadis, IAMBE Professor of Biomedical Engineering, University of Ioannina, Greece Editor-in-Chief, IEEE Journal of Biomedical and Health Informatics		
15:20 - 15:45	RF Engineering for Parallel MRI		
	Steve Wright, IAMBE Royce E. Wisenbaker II Professor of Electrical and Computer Engineering Texas A & M University		
15:45 - 16:15	Coffee Break		
	SESSION 2: Cell/Tissue Engineering and Biomaterials Moderator: Christine E. Schmidt, IAMBE Pruitt Family Professor and Department Chair of Biomedical Engineering, University of Florida, President, American Institute of Medical and Biological Engineering		
16:15 - 16:40	Implant Biomaterials in the Age of Tissue Engineering and Regenerative Medicine		
	Rena Bizios, NAM, IAMBE Lutcher Brown Chair Professor of Biomedical Engineering University of Texas at San Antonio		
16:40 – 17:05	Drivers Wanted: Cellular Delivery of Anti-Cancer Therapeutics in the Circulation		
	Michael King, IAMBE J. Lawrence Wilson Professor and Department Chair Department of Biomedical Engineering, Vanderbilt University Editor-in-Chief, Cellular and Molecular Bioengineering		
17:05 – 17:30	Pathogen Mimicking Nanovaccine Platform Technology: A New Paradigm		
	Balaji Narasimhan, IAMBE Anson Marston Distinguished Professor of Chemical and Biological Engineering Vlasta Klima Balloun Faculty Chair, Iowa State University		

FRIDAY, SEPTEMBER 20

	Carnegie Mellon Forum on Biomedical Engineering Location: Rangos Ballroom, 2nd Floor of the Cohon University Center Networking		
08:00 - 08:30			
08:30 - 08:40	Welcome Remarks		
	J. Michael McQuade, PhD Vice President for Research Carnegie Mellon University		
08:40 - 09:10	Keynote Lecture: Engineering the Future of Health		
	Bruce J. Tromberg, PhD Director, National Institute of Biomedical Imaging and Bioengineering National Institutes of Health	Moderator: Bin He, IAMBE Trustee Professor of Biomedical Engineering and Department Head Carnegie Mellon University	
09:10 – 09:40	Keynote Lecture: Microfluidics and Nanotechnology for Biology and Medicine		
	Rashid Bashir, IAMBE Dean of Engineering Grainger Distinguished Chair in Engineering and Professor of Bioengineering University of Illinois at Urbana-Champaign	Moderator: Adam W. Feinberg, PhD Arthur Hamerschlag Career Development Professor of Biomedical Engineering and of Materials Science and Engineering Carnegie Mellon University	
09:40 – 10:10	Keynote Lecture: Intelligent and Recognitive Biomaterials for Protein Delivery and Advanced Sensing		
	Nicholas Peppas, NAE, NAM, IAMBE Cockrell Family Regents Chaired Professor of Biomedical & Chemical Engineering Director, Institute of Biomaterials, Drug Delivery and Regenerative Medicine University of Texas at Austin	Moderator: Anne Skaja Robinson, PhD Trustee Professor of Chemical Engineering and Department Head Carnegie Mellon University	
10:10 - 10:30	Coffee Break		
10:30 – 11:00	Keynote Lecture: Science for Robotics and Robotics for Science - Challenges and Opportunities		
	Guang-Zhong Yang, FRE, IAMBE Professor and Director, Hamlyn Centre for Robotic Surgery, Imperial College London Founding Editor, Science Robotics	Moderator: Howie Choset, PhD Kavcic-Moura Professor of Computer Science, Robotics and Biomedical Engineering, Carnegie Mellon University	
11:00 – 11:30	Keynote Lecture: Wired: Structural constraints on the efficacy of endogenous and exogenous control signals in the human brain		
	Danielle S. Bassett, PhD Professor of Bioengineering University of Pennsylvania	Moderator: Barbara Shinn-Cunningham, PhD Professor and Director of Neuroscience Institute, Carnegie Mellon University	

11:30 - 11:40	Update at CMU Biomedical Engineering Department		
	Bin He, IAMBE Trustee Professor and Department Head of Biomedical Engineering Carnegie Mellon University	Moderator: Conrad Zapanta, PhD Associate Department Head and Teaching Professor of Biomedical Engineering Carnegie Mellon University	
11:40 – 12:00	New Fellow Induction Ceremony International Academy of Medical and Biological Engineering		
12:00 - 13:00	Networking Lunch		
13:00 - 13:25	Plenary Talk: Systems Biology Approaches to Improving Preclinical-to-Clinical Translation in Therapeutics Discovery and Development		
	Douglas Lauffenburger, NAE, IAMBE Ford Professor of Biological Engineering, Chemical Engineering, and Biology MIT	Moderator: Yu-li Wang, PhD Mehrabian Professor of Biomedical Engineering Member, Academic Sinica Carnegie Mellon University	
13:25 - 13:50	Plenary Talk: Al in Breast Cancer Imaging		
	Maryellen L. Giger, NAE, IAMBE A.N. Pritzker Professor of Radiology Vice-Chair of Radiolog University of Chicago	Modetator: Jana Kainerstorfer, PhD Assistant Professor of Biomedical Engineering Carnegie Mellon University	
13:50 - 14:15	Plenary Talk: The Role of Bioengineering in the Treatment of Essential Tremor		
	Gary Glover, NAE, IAMBE Professor of Radiology, Neurosciences & Biophysics, and of Electrical Engineering & Psychology Stanford University	Moderator: Maysam Chamanzar, PhD Assistant Professor of Electrical and Computer Engineering, and Biomedical Engineering, Carnegie Mellon University	
14:15 – 14:40	Plenary Talk: Relaxin: Cardiovascular Actions and Therapeutic Potential		
	Sanjeev Govinddas Shroff Distinguished Professor and Gerald E. McGinnis Chair in Bioengineering Professor of Medicine University of Pittsburgh	Moderator: Keith Cook, PhD Associate Department Head and Professor of Biomedical Engineering Carnegie Mellon University	
14:40 – 15:00	Plenary Panel Discussion		
	Moderator: Bin He, IAMBE Panelists: Giger, Glover, Lauffenburger, Shroff		
15:00 - 17:20	Poster Session		
17:20 - 17:30	Announcement of Poster Awards		

Invited Speakers



Rashid Bashir, IAMBE

Dean of Engineering Grainger Distinguished Chair in Engineering and Professor of Bioengineering University of Illinois at Urbana-Champaig

Rashid Bashir is Dean of Engineering, the Grainger Distinguished Chair in Engineering and Professor of Bioengineering at the University of Illinois at Urbana-Champaign. He received the NSF Faculty Early Career Award and the 2012 IEEE EMBS Technical Achievement Award. He is a fellow of IEEE, AIMBE, AAAS, BMES, IAMBE, RSC, APS, and NAI. He has been involved in 3 startups that have licensed his technologies. He was part of the founding team and co-chair of the curriculum committee for the Carle Illinois College of Medicine, the world's first engineering based College of Medicine at the University of Illinois at Urbana-Champaign. His research group is interested in developing new technologies for precision and personalized medicine, and 3D bio-fabrication of cellular systems. He is Associate Director and UIUC site lead on an NSF Science and Technology Center on Emergent Behavior of Integrated Cellular Systems (with MIT, Georgia Tech, and other partners).



Danielle S. Bassett

Eduardo D. Glandt Faculty Fellow MacArthur Fellow Professor, Department of Bioengineering University of Pennsylvania

Danielle S. Bassett is Professor of Bioengineering at the University of Pennsylvania. She is most well known for her work blending neural and systems engineering to identify fundamental mechanisms of cognition and disease in human brain networks. She has received multiple prestigious awards, including American Psychological Association's 'Rising Star', Alfred P Sloan Research Fellow, MacArthur Fellow Genius Grant, Early Academic Achievement Award from the IEEE Engineering in Medicine and Biology Society, Harvard Higher Education Leader, Office of Naval Research Young Investigator, National Science Foundation CAREER, Popular Science Brilliant 10, Lagrange Prize in Complex Systems Science, Erdos-Renyi Prize in Network Science. Her work has been supported by the National Science Foundation, the National Institutes of Health, the Army Research Office, the Army Research Laboratory, the Office of Naval Research, the Department of Defense, the Alfred P Sloan Foundation, the John D and Catherine T MacArthur Foundation, the Paul Allen Foundation, the ISI Foundation, and the University of Pennsylvania.



Rena Bizios, NAM, IAMBE

Lutcher Brown Chair Professor of Biomedical Engineering University of Texas at San Antonio

Rena Bizios, is the Lutcher Brown Chair Professor of Biomedical Engineering at the University of Texas at San Antonio (UTSA). Her research interests include cellular and tissue engineering, cell interactions with materials, tissue regeneration, biomaterials (including nanostructured ones) and biocompatibility. Professor Bizios' education-related contributions and research accomplishments have been recognized a number of awards including: Clemson Award for Outstanding Contributions to the Literature, Society for Biomaterials (1998); Distinguished Scientist Award, Houston Society for Engineering in Medicine and Biology (2009); Women's Initiatives Mentorship Excellence Award, American Institute of Chemical Engineers (2010); Founders Award, Society for Biomaterials (2014); Theo C. Pilkington Outstanding Educator Award, Biomedical Engineering Division, American Society for Engineering Education (2014); Amber Award, UTSA Ambassadors (2014); Excellence in STEM Education Award, American Institute for Medical and Biological Engineering (2018); and the Excellence in Biomaterials Science Award, Surfaces in Biomaterials Foundation (2019). Professor Bizios is Charter Member of the UTSA Academy of Distinguished Researchers, Fellow of six professional scientific/engineering, and Member of the National Academy of Medicine.



Dimitrios Fotiadis, IAMBE

Professor of Biomedical Engineering University of Ioannina, Greece Editor-in-Chief, IEEE Journal of Biomedical and Health Informatics

Dimitrios I. Fotiadis is currently a Professor of Biomedical Engineering in the Department of Materials Science and Engineering, University of Ioannina, Ioannina, Greece, where he is also the Director of the Unit of Medical Technology and Intelligent Information Systems. He has coordinated and participated in more than 200 R&D funded projects, is the author or co-author of more than 250 papers in scientific journals, 450 papers in peer-reviewed conference proceedings, and more than 50 chapters in books. He is also the editor or co-editor of 28 books. He is a Fellow of IAMBE, IEEE, and EAMBES. He serves as the Editor in Chief of IEEE Journal of Biomedical and Health Informatics. His research interests include multiscale modeling of human tissues and organs, intelligent wearable/implantable devices for automated diagnosis, processing of big medical data, sensor informatics, image informatics, and bioinformatics. He is the recipient of many scientific awards including the one by the Academy of Athens.

Invited Speakers continued



Gary Glover, NAE, IAMBE

Professor of Radiology, Neurosciences & Biophysics, and of Electrical Engineering & Psychology Stanford University

Gary H. Glover received his Ph.D. in Electrical Engineering from the University of Minnesota in 1969. He joined GE's Corporate Research & Development (CR&D) Labs in Schenectady, New York and studied solid state devices, computed ultrasound tomography and X-ray computed tomography until 1976, when he moved to GE's Medical Systems in Milwaukee to help transition fan-beam CT technology from CR&D. In 1980, he began the development of MRI as one of a team of five, and was thus instrumental in defining both the CT and MR products for GE. He joined Stanford's Radiology Department as Professor in 1990 and founded the Radiological Sciences Laboratory, dedicated to advancing biomedical imaging. His field of research is in MRI physics in general, and specifically in the development and application of functional MRI (fMRI) methods since 1993. His students' recent contributions include optimized techniques for acquisition and analysis of fMRI data, characterization of the dynamics of brain networks, development of real-time fMRI biofeedback methods, and multimodal neuroimaging using fMRI combined with EEG, fNIRS, fPET and functional MR Elastography, as well as with neuromodulatory transcranial electrical and magnetic stimulation.



Maryellen L. Giger, NAE, IAMBE

A.N. Pritzker Professor of Radiology Vice-Chair of Radiology University of Chicago

Maryellen L. Giger, Ph.D. is the A.N. Pritzker Professor of Radiology and Vice-Chair of Radiology (Basic Science Research) at the University of Chicago. For over 30 years, she has conducted research on computer-aided diagnosis, including computer vision, machine learning, and deep learning, in the areas of breast cancer, lung cancer, prostate cancer, lupus, and bone diseases. She is a former president of the American Association of Physicists in Medicine and of SPIE (the International Society of Optics and Photonics). She is the inaugural Editor-in-Chief of the SPIE *Journal of Medical Imaging*.

She is a member of the National Academy of Engineering (NAE) and was awarded the William D. Coolidge Gold Medal from the American Association of Physicists in Medicine. She is a Fellow of AAPM, AIMBE, SPIE, SBMR, and IEEE, a recipient of the EMBS Academic Career Achievement Award, and is a current Hagler Institute Fellow at Texas A&M University.



Bin He, IAMBE

Trustee Professor and Department Head of Biomedical Engineering Carnegie Mellon University Chair, International Academy of Medical and Biological Engineering

Bin He is Trustee Professor and Department Head of Biomedical Engineering at Carnegie Mellon University. Dr. He has made significant research and education contributions to the field of neuroengineering and biomedical imaging. Dr. He has received a number of awards including the IEEE Biomedical Engineering Award, the William J. Morlock Award, the IEEE EMBS Academic Career Achievement Award and IEEE EMBS Distinguished Service Award, the AHA Established Investigator Award, among others. He is an elected Fellow of International Academy of Medical and Biological Engineering, IEEE, American Institute of Medical and Biological Engineering (AIMBE), and Biomedical Engineering Society. Dr. He served as a past President of the IEEE Engineering in Medicine and Biology Society, and as Chair of Publications Committee of AIMBE. Dr. He served as the Editor-in-Chief of IEEE Transactions on Biomedical Engineering from 2013-2018, and serves as the Chair of the International Academy of Medical and Biological Engineering.



Michael King, IAMBE

(7)

J. Lawrence Wilson Professor and Department Chair Department of Biomedical Engineering Vanderbilt University Editor-in-Chief, Cellular and Molecular Bioengineering

Michael R. King is the J. Lawrence Wilson Professor and Department Chair of Biomedical Engineering at Vanderbilt University. Previously he was the Daljit S. and Elaine Sarkaria Professor at Cornell University. He completed a Ph.D. in chemical engineering at the University of Notre Dame and postdoctoral training in bioengineering at the University of Pennsylvania. He has written textbooks on the subjects of statistical methods and microchannel flows, and has received several awards including the NSF CAREER Award, Outstanding Research Awards from the American Society of Mechanical Engineers and the American Society of Clinical Chemistry, and was a James D. Watson Investigator of New York State. King is a Fellow of the American Institute for Medical and Biological Engineering and the Biomedical Engineering Society, and serves as Vice President of the International Society of Bionic Engineering. He is the Editor-in-Chief of Cellular and Molecular Bioengineering, an official journal of the Biomedical Engineering Society, and serves as the Chair-Elect of the Biomedical Engineering Council of Chairs.

Invited Speakers continued



Douglas Lauffenburger, NAE, IAMBE

Ford Professor of Biological Engineering, Chemical Engineering, and Biology MIT

Douglas Lauffenburger is Ford Professor of Bioengineering and founding Head of the Department of Biological Engineering at MIT. Dr. Lauffenburger's B.S. and Ph.D. degrees are in chemical engineering from the University of Illinois (1975) and the University of Minnesota (1979). A central focus of his research program is cell-cell communication and cell signaling important in pathophysiology, with application to drug discovery and development, aimed at development of predictive computational models derived from quantitative experimental studies. Lauffenburger co-authored the monograph *Receptors: Models for Binding, Trafficking & Signaling (Oxford Press,* 1993) and co-edited the book *Systems Biomedicine: Concepts and Perspectives* (Elsevier Press, 2010). More than 100 doctoral students and postdoctoral associates have undertaken research education under his supervision.

Prof Lauffenburger has served as a scientific advisor to numerous biotech/pharma companies and biomedical science-related foundations. He is a member of the National Academy of Engineering and the American Academy of Arts & Sciences, and has served as President of the Biomedical Engineering Society, Chair of the College of Fellows of American Institute for Medical & Biological Engineering, and on the Advisory Council for NIGMS, and as a co-author of the 2009 NRC report on *A New Biology for the 21st Century*.



Balaji Narasimhan, IAMBE

Anson Marston Distinguished Professor of Chemical and Biological Engineering Vlasta Klima Balloun Faculty Chair Iowa State University

Balaji Narasimhanis Anson Marston Distinguished Professor and Vlasta Klima Balloun Faculty Chair in the Chemical and Biological Engineering Department at Iowa State University (ISU). He served as Associate Dean of Research in the ISU College of Engineering from 2007 to 2013 and oversaw record growths in the college's research portfolio and doctoral degree production. Currently, he directs the Nanovaccine Institute.

Narasimhan's research is focused on the molecular design of nanoscale polymer systems and biomaterials to precisely control molecular architecture and functionality in these systems. He has won various awards including the Society of Biomaterials Clemson Award for Contributions to the Literature, among others. He is an elected Fellow of the American Institute of Medical and Biological Engineering, the American Association for the Advancement of Science, and the International Academy of Medical and Biological Engineering. He is an Associate Editor of Science Advances and a Section Editor of Biological Engineering for Current Opinion in Chemical Engineering.



Hunter Peckham, NAE, IAMBE

Donnell Institute Professor of Biomedical Engineering and Orthopaedics Distinguished University Professor Case Western Reserve University

Hunter Peckham is the Donnell Institute Professor of Biomedical Engineering and Orthopaedics, Distinguished University Professor, Founder, Institute for Functional Restoration at Case Western Reserve University. He serves as Co-Director of the MetroHealth Rehabilitation Institute at MetroHealth Medical Center. The major area of Dr. Peckham's research is in rehabilitation engineering and neuroprostheses. Dr. Peckham's research effort focuses on functional restoration of the paralyzed upper extremity in individuals with spinal cord injury. Dr. Peckham is a fellow of the American Institute of Medical and Biological Engineering; a fellow and honorary member of the American Spinal Injury Association; member of the National Academy of Engineering; and a member of the National Academy of Inventors. Dr. Peckham received the Paul B. Magnuson Award, the highest honor for VA Rehabilitation Investigators. He received his Ph.D. degree in Biomedical Engineering from Case Western Reserve University.



Nicholas A. Peppas, NAE, NAM, IAMBE

(9)

Cockrell Family Regents Chaired Professor of Biomedical Engineering and of Chemical Engineering Director, Institute of Biomaterials, Drug Delivery and Regenerative Medicine University of Texas at Austin

Nicholas A. Peppas is the Cockrell Family Regents Chaired Professor in the Departments of Biomedical and Chemical Engineering, Surgery, and Pediatrics in the Dell Medical School, and Pharmacy, and Director of the Institute of Biomaterials, Drug Delivery and Regenerative Medicine of the University of Texas at Austin. His work in biomaterials, drug delivery, regenerative medicine and bionanotechnology follows a multidisciplinary approach by blending modern molecular and cellular biology with engineering principles to design the next-generation of medical systems and devices for patient treatment. In 2012 he received the Founders Award of the NAE, while in 2018 he received the Adam Yarmolinsky Award of the NAM, the highest recognitions of the Academies, for his contributions to the field. Peppas is a member of NAE, NAM, American Academy of Arts and Sciences, National Academy of Inventors, Chinese Academy of Engineering, the National Academy of France, the Royal Academy of Spain, the Academy of Athens (Greece), International Academy of Biomedical Engineering and the Academy of Texas. He was the Chair of BME at UT from 2009 to 2015.

Invited Speakers continued



Sanjeev Govinddas Shroff

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

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.



Bruce J. Tromberg

Director, National Institute of Biomedical Imaging and Bioengineering National Institutes of Health

Bruce Tromberg is the Director of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) and lead investigator of the section on Biomedical Optics in the National Institute of Child Health and Human Development (NICHD) at the National Institutes of Health (NIH). Prior to joining NIH in 2019, Dr. Tromberg was a professor of Biomedical Engineering and Surgery at the University of California at Irvine (UCI) for 28 years. He served as director of UCI's Beckman Laser Institute and Medical Clinic (BLIMC) from 2003 to 2018, and was the principal investigator (PI) of the Laser Microbeam and Medical Program (LAMMP), an NIH P41 National Biomedical Technology Resource Center, from 1997-2018. Dr. Tromberg specializes in the development of optics and photonics technologies for biomedical imaging and therapy. He has co-authored more than 450 publications and holds 18 patents in new technology development as well as bench-to-bedside clinical translation, validation and commercialization of devices. He has received several awards including the R&D 100 award, the Michael S. Feld Biophotonics Award from The Optical Society (OSA), the Directors Award from the International Society of Optical Engineering (SPIE), and is a Fellow of the OSA, SPIE, and the American Institute for Medical and Biological Engineers (AIMBE).



Steve Wright, IAMBE

Royce E. Wisenbaker II Professor of Electrical and Computer Engineering Texas A & M University

Steven M. Wright is the Royce E. Wisenbaker II Professor of Electrical and Computer Engineering at Texas A&M University. The focus of his research group has been in the application of electromagnetics and new technology to the development of low-cost and high-speed magnetic resonance imaging and spectroscopy. Recently most of the group's work has been in the application of array technology to multinuclear MR spectroscopy at 7 Tesla. Dr. Wright is a Fellow of the IEEE, the International Society of Magnetic Resonance in Medicine and the American Institute for Medical and Biological Engineering. He has served on the Board of Trustees for the International Society of Magnetic Resonance in Medicine and as Vice President for Member and Student Activities for the IEEE Engineering in Medicine and Biology Society. He served as Chair of the 2011 IEEE International Symposium on Biomedical Imaging (ISBI 2011).



Guang-Zhong Yang, FRE, IAMBE

Professor and Director, Hamlyn Centre for Robotic Surgery Imperial College London Founding Editor, Science Robotics Chair, the UK-RAS Network

Guang-Zhong Yang is director and co-founder of the Hamlyn Centre for Robotic Surgery. Professor Yang is also the Chairman of the UK-RAS Network (http://ukras. org). The mission of the UK-RAS Network is to provide academic leadership in RAS, expand collaboration with industry and integrate and coordinate activities of the EPSRC funded RAS capital facilities, Centres for Doctoral Training (CDTs) and partner universities across the UK.

Professor Yang's main research interests are in medical imaging, sensing and robotics. He is a Fellow of the Royal Academy of Engineering, fellow of IEEE, IET, AIMBE, IAMBE, MICCAI, CGI and a recipient of the Royal Society Research Merit Award and listed in The Times Eureka 'Top 100' in British Science. Professor Yang is the founding editor of Science Robotics (http://robotics.sciencemag.org/) – a journal of the Science family dedicated to the latest advances in robotics and how it enables or underpins new scientific discoveries. He was awarded a CBE in the Queen's 2017 New Year Honour for his contribution to biomedical engineering.

Poster Session and Competition

101

Engineering Hybrid Exosome Delivery Systems

Saigopalakrishna S. Yerneni, Sushil Lathwal, Pradeep Shrestha, Julia Cuthbert, Haval Shirwan, Lee E. Weiss, Esma S. Yolcu, Subha R. Das, Krzysztof Matyjaszewski and Phil G. Campbell; CMU

102

Organ-on-a-chip System for the Modeling of Synovial Joint Pathologies

Zhong Li, Zixuan Lin, Monica Romero Lopez, Benjamen O'Donnell, Xinyu Li, Ian J. Moran, Peter G. Alexander, Stuart B. Goodman, Bruce A. Bunnell, Hang Lin, Rocky S. Tuan; University of Pittsburgh, Stanford University, Tulane University, Central South University (China)

103

Adversarial domain adaptation for cross data source macromolecule in situ structural classification in cellular electron cryo-tomograms Xiangrui Zeng, CMU

104

A Novel Ticagrelor Coated Stent to Eliminate the Need for Dual Anti Platelet Therapy Post PCI

Jared D. Romeo, John J. Pacella, Ellen S. Gawalt; University of Pittsburgh, CMU, Duquesne University

105

Three-Dimensional Biosensor Arrays for Exploring Electrophysiology of Electrogenic Microtissues

Anna Kalmykov, Changjin Huang, Jacqueline Bliley, Daniel Shiwarski, Joshua Tashman, Arif Abdullah, Sahil K Rastogi, Shivani Shukla, Elnatan Mataev, Adam W Feinberg. K Jimmy Hsia, Tzahi Cohen-Karni; CMU, Nanyang Technological University (Singapore), University of Illinois at Urbana-Champaign

106

Photostimulation of neurons using fuzzy graphene

Sahil K Rastogi, Matteo Scopelliti, Jane Hartung, Vishnu Nair, Raghav Garg, Bernardo Pinto, Francisco Bezanilla, Bozhi Tian, Michael Gold, Maysam Chamanzar, Tzahi Cohen-Karni; CMU, University of Pittsburgh, University of Chicago

107

Matrix-bound Nanovesicles as a Source of Lysyl Oxidase for Strengthening Tissues

Yoojin Lee, Jordan Birkhimer, George Hussey, Stephen F. Badylak; University of Pittsburgh

108

CMU Array: A 3D Nano-Printed, Customizable Ultra-High-Density Microelectrode Platform

M. Sadeq Saleh, Sandra Ritchie, Mark Nicholas, Rriddhiman Bezbaruah, Jay Reddy, Maysam Chamanzar, Eric Yttri, Rahul Panat; CMU

109

Evaluating Nanoparticle Penetration in Tumor Spheroids

Reetwan Bandyopadhyay, Jessica Widman, Laura Suggs; University of Pittsburgh, University of Texas at Austin

110

B-spline based neuron segmentation using level set method *Aishwarya Pawar, Yongjie Jessica Zhang; CMU*

111

Material Transport Simulation in Complex Geometry of Neurons Using Isogeometric Analysis Angran Li; CMU

112

Manipulating Gene Expression of Human Lamina Cribrosa Cells and Astrocytes

Jr-Jiun Liou, Shenghuo Tian, Michael Yee, Paul Kinchington, and Jonathan P. Vande Geest; University of Pittsburgh

113

Anatomically realistic lumen motion representation in patient-specific space-time isogeometric flow analysis of coronary arteries with time-dependent medical-image data Yuxuan Yu, Yongjie Jessica Zhang, Kenji Takizawa, Tayfun E. Tezduyar, Takafumi Sasaki; CMU, Rice University, Waseda University (Japan)

114

Extracellular Matrix Deformations of the Porcine Recurrent Laryngeal Nerve in Response to Compression

Gloriani Sanchez Marrero, Reza Behkam, Julie M Barkmeier-Kraemer, Jonathan P Vande Geest; University of Pittsburgh, University of Utah,

115

Hierarchical Machine Learning for Design of High-fidelity Bio-printed Constructs

Jennifer Bone, Adam Feinberg, Phil LeDuc, Newell Washburn, CMU

116

Chromatin Mechanical Response To A Variety Of Clinically Relevant Stimuli

Daniel B. Whitefield, Li Lan, Shelly Peyton, Kris Noel Dahl; CMU, University of Pittsburgh, University of Massachusetts at Amherst

117

Ultrasound-targeted microbubble cavitation with sodium nitrite synergistically enhances nitric oxide production and microvascular perfusion

Gary Yu, Filip Istvanic, Xucai Chen, Mehdi Nouraie, John Pacella; University of Pittsburgh

118

Covalent Functionalization of Graphene Oxide with Polyesters as a Mechanically Enhanced Scaffold for Bone Regeneration

Stephen J. Schmidt, Brian D. Holt, Anne M. Arnold, Stefanie A. Sydlik; CMU

119

Assembling an Experimental Set-up for a Tactile Feedback Enabled, Tele-operated Robotic Hand

Esther Bedoyan, Dr. Dustin Tyler, Leah Roldan; Case Western Reserve University, Louis Stokes Veterans Affairs Medical Center, VA Advanced Platform Technology Center, Cleveland Functional Electrical Stimulation Center

384PillarPlate for Testing Antimicrobial Preservative Effectiveness in High Throughput

Gyuyoung Park, Prabha Acharya, Dr. Pranav Joshi, Dr. Moo-Yeal Lee; Cleveland State University

121

Soft Robotic Bi-Ventricular Sleeve for Long-term Cardiac Support

Jooli Han, Dennis Trumble; CMU

122

An integrated plate system for human organoid culture and disease modeling

Sangjoon Lee, Soo-Yeon Kang, Sunil Shrestha, Pranav Joshi, Gyu-Young Park, Sumaiya Ahmed, Moo-Yeal Lee; Cleveland State University

123

Isoelectric Focusing Parameters Affect the Mechanical and Geometric Properties of Electrochemically Aligned Collagen Threads

Wenhuan Sun, Victoria Webster-Wood; CMU

124

Engineering the Mesodermal Niche for Endoderm-derived Organ Parenchyma

Wai Hoe Ng, Minrui Chen, Elizabeth Johnston, Jun Jie Tan, Xi Ren; CMU, Universiti Sains Malaysia (Malaysia)

125

Micro- and Nano- Technolgies for the Enrichment, Isolation, and Detection of Extracellular Vesicles Mackenzie Maurer, Wen-Long Zhang, Si-Yang Zheng; CMU,

Pennsylvania State University, Binghamton University

126

Tailorable Antibacterial Heparin-Chitosan Nanospheres for Efficient Antibiotic Delivery

Shahrzad Abri, Ashwin Amar Ghatpande, Hazel A. Barton, Nic D. Leipzig; University of Akron

127

Evaluating the Progression of Mesenchymal Stem Cell Osteogenic Biomarker Expression in Response to Biomaterial Properties

Kirstene Gultian, Antonio Quinones, Sandra Miskiel, Tae Won B. Kim, Sebastián L. Vega; Rowan University

128

Assessment of a Peripheral Nerve Extracellular Matrix Derived Hydrogel for Improving Functional Recovery Following Nerve Reconstruction

Tyler Meder, Travis Prest, Lucile Marchal, Valeria Yupanqui, Clint Skillen, Bryan Brown; University of Pittsburgh, University Nice Sophia Antipolis (France)

129

Eye movement-related metrics index slow fluctuations of neural activity in visual and prefrontal cortex Richard Johnston, Matthew A. Smith; CMU

130

Therapeutic Ultrasound Triggered Silk Scaffold Degradation for Tissue Regenerative Applications

Megan DeBari, Xiaodan Niu, Sean Periera, Mallory Griffin, Bin He, Rosalyn Abbott; CMU

131

Tumor-Derived Exosomes Contain SQSTM-1 And Promote a Tolerogenic Dendritic Cell Response *Bharthi R, Gorgulho CM, Ludwig, N, Whiteside, TL, Lotze MT; University of Pittsburgh*

132

A neural network for online spike classification that improves decoding accuracy

Deepa Issar, Ryan C. Williamson, Sanjeev B. Khanna, Matthew A. Smith; University of Pittsburgh, CMU

133

Mass Transfer Kinetics of Water-in-Perfluorocarbon Emulsions Diane Nelson, Keith Cook, Robert Tilton; CMU

134

Simulation and analysis of passive epithelial morphodynamics during tissue convergent extension Sommer Anjum, Lance Davidson; University of Pittsburgh

135

Subcutaneous priming of neural stem cell-seeded scaffolds improves function following spinal cord injury Trevor R Ham, Dingk D, Pukale, Mohammad Hamrangsekachaee

Trevor R Ham, Dipak D Pukale, Mohammad Hamrangsekachaee, Nic D Leipzig; University of Akron

136

Tunable Multifunctional Bioinks for 3D Printing Applications in Bone Regeneration *Songyang Li; CMU*

137

Multiple oscillatory push-pull antagonisms constrain seizure propagation

Haiteng Jiang, Zhengxiang Cai, Greg Worrell, Bin He; CMU, Mayo Clinic

138

Double Helix Coil for Wireless Powering and data transmission of Biomedical Implants

Tianfeng Wang, Qi Xu, Shitong Mao, Wenyan Jia, Zhi-Hong Mao, Mingui Sun, Houjun Tang; University of Pittsburgh

139

In vivo ultrasound super-resolution imaging for renal microvasculature assessment in mouse acute kidney injury model

Qiyang Chen, Jaesok Yu, Brittney Rush, Roderick J. Tan, Kang Kim; University of Pittsburgh

140

Neck sensor-supported estimation of laryngeal closure duration during swallowing

Shitong Mao, Aliaa Sabry, Yassin Khalifa, James L Coyle, Ervin Sejdic; University of Pittsburgh

Tracing Back Large-scale Epilepsy Networks from Noninvasive EEG Measurements – A Spatio-temporal Perspective

Abbas Sohrabpour, Zhengxiang Cai, Shuai Ye, Gregory Worrell, Bin He; CMU, Mayo Clinic

142

In vivo spatiotemporal patterns of oligodendrocyte and myelin damage at the neural electrode interface

Keying Chen, Steven Wellman, Franca Cambi, James Eles, Takashi Kozai; University of Pittsburgh

143

DNA Nanostructures for Mechanosensation

Susana M. Beltrán, Weitao Wang, Philip R. LeDuc, and Rebecca E. Taylor; CMU

144

Deep Food Volume Estimation from Single RGB Image

Zhengeng Yang, Shunxin Cao, Hongshan Yu, Wenyan Jia, Zhi-Hong Mao, Mingui Sun; University of Pittsburgh

145

Affective brain patterns as multivariate neural correlates of cardiovascular disease risk

Peter J. Gianaros, Thomas E. Kraynak, Dora C-H Kuan, James J. Gross, Kateri McRae, Ahmad R. Hariri, Stephen B. Manuck, Javier Rasero, Timothy D. Verstynen; University of Pittsburgh, CMU, Stanford University, University of Denver, Duke University

146

Specific inhibition of viral microRNAs by carbon-dots mediated delivery of locked nucleic acids for viral cancer therapy

Enguo Ju; Univeristy of Pittsburgh

147

Continuous Two-Dimensional Noninvasive EEG BCI Robotic Arm Control

Daniel Suma, Jianjun Meng, Bradley Edelman, Bin He; CMU, Stanford University

148

Upper Esophageal Sphincter Opening Segmentation with Convolutional Recurrent Neural Networks in High Resolution Cervical Auscultation

Yassin Khalifa, Cara Donohue, James L. Coyle, Ervin Sejdic; University of Pittsburgh

149

Altered Structural Covariance Networks of Cortical Gray Matter and Surface Area in First-Episode Antipsychotic-Naïve Psychotic Disorder

Nicholas Theis, Derek Tang, Satish Iyengar, Matcheri Keshavan, Konasale Prasad; UPMC, University of Pittsburgh, Harvard Medical School

150

Construction of thymus organoid by congregating thymic epithelial cells (TECs) locally in vivo using a Fc-binding amphiphilic polypeptide pG_EAK based hydrogel displaying anti-TEC antibodies

Wen Liu, Stephanie Wong-Noonan, Ngoc Pham, Isha Pradhan, Amy Spigelmyer, Riley Funk, Justin Nedzesky, Henry Cohen, Ellen S. Gawalt, Yong Fan, Wilson S. Meng; Allegheny-Singer Research Institute, Duquesne University, CMU, University of Pittsburgh

151

CMU Array: A Customizable Ultra-High-Density Optic-Fiber Paired Neural Interface by 3D Nanoparticle Printing

Sandra Ritchie, M. Sadeq Saleh, Mark Nicholas, Mateusz Podzorski, Rit Bezbaruah, Jay Reddy, Maysam Chamanzar, Eric Yttri, Rahul Panat; CMU

152

Myocardial Thickening During Cardiac Compression Edgar Aranda-Michel, Lewis K. Waldman, Dennis R. Trumble; CMU

153

Anisotropic Cues Promote Symmetry Breaking of Adherent Cells

David Li, Yu-li Wang; CMU

154

Sustained Analgesic and Anti-inflammatory Efficacy of a Single Dose COX-2 Inhibiting Nanomedicine in a Mouse CFA-induced Inflammatory Model

Lu Liu, Michele Herneisey, Eric Lambert, Shannon Loftus, Takaaki komatsu, Vijay S. Gorantla, Jelena M. Janjic; Duquesne University, Daiichi University of Pharmacy (Japan), Wake Forest Institute for Regenerative Medicine

155

Investigating the Impact of a Bioengineered Thymus on T-Lymphopoiesis in a Humanized Mouse Model

Ann E. Zeleniak, Connor Wiegand, Catherine L. McCormick, Wen Liu, Henry M. Cohen, Haonan Guan, Massimo Trucco, Ipsita Banerjee, Yong Fan; Allegheny Singer Research Institute, CMU, University of Pittsburgh

156

Non-invasive Measurement of Intracranial Pressure with Diffuse Optical Tissue Spectroscopy

Alexander Ruesch, Jason Yang, Samantha Schmitt, Deepshikha Acharya, Matthew A. Smith, Jana M. Kainerstorfer; CMU

157

Enhanced Spatio-temporal Reconstruction of Neural Activities Using Simultaneous Electroencephalography and Near-infrared Spectroscopy

Jiaming Cao, Theodore J. Huppert, Pulkit Grover, Jana M. Kainerstorfer; CMU, University of Pittsburgh

158

Advanced micro-nano devices for the enrichment of plant pathogenic viruses

Wen-Long Zhang, Mackenzie Maurer, Hong-Zhang He, Si-Yang Zheng; CMU

Changes in Neurovascular Coupling and Neural Adaptation with Cerebrovascular Autoregulatory Impairment Deepshikha Acharya, Alexander Ruesch, Samantha Schmitt,

Jason Yang, Matthew A. Smith, Jana M. Kainerstorfer; CMU

159

HIV-1 interacts with cytoplasmic CPSF6 during trafficking on microtubules

Zhou Zhong, Sooin Jang, Jiying Ning, Alan Engelman, Peijun Zhang, Simon C. Watkins, Zandrea Ambrose; University of Pittsburgh, Dana-Farber Cancer Institute

161

Dual Particle Trapping Using a Microfluidic Trap

Jarrett Boyd; Duquesne University

162

A hybrid exoskeleton for lower-limb function restoration with feedback muscle fatigue information from ultrasound strain imaging

Zhiyu Sheng, Nitin Sharma, Kang Kim; University of Pittsburgh

163

Adventitial Extracellular Matrix From Aneurysmal Aorta **Exhibits Less Pericyte Contractility**

Kaitlyn Wintruba, Marie Billaud, Amadeus Stern, Bryant Fisher, Jennifer C. Hill, Tara D. Richards, Thomas G. Gleason, Julie A. Phillippi; University of Pittsburgh

164

Significantly Reduced Cancer Metastasis by Regulating ECM Parameters: A Cellular Potts Model Approach

Antara Pal, Pegi Haliti, Wu Qi, Prabir Patra, Bhushan Dharmadikhari; Acton Boxborough Regional High School, University of Bridgeport

165

Leveraging machine learning for IC50 prediction using molecular sequence data Rishikesh Magar; CMU

166

Biomaterial Composite to Recreate the Osteochondral Interface

Matthew Dicerbo, Mohammed Mehdi Benmassaoud, Sandra Miskiel, Tae Won B. Kim, Sebastián L. Vega; Rowan University

167

Photoresponsive Fluorescence from Azobenzene Confined in Protein Engineered Coiled-coil Mesofibers

Kamia Punia, Liming Yin, Katharina Hüll, P. Douglas Renfrew, M. Lane Gilchrist, Richard Bonneau, Dirk Trauner, Jin K. Montclare; New York University, The City College of the City University of New York, State University of New York

168

Automated Bolus Detection in Videofluoroscopic Images with Mask-RCNN

Handenur Caliskan, Amanda Mahoney, Ervin Sejdic; University of Pittsburgh

169

The Con-Tactor: A Novel Tactile Stimulator that Makes and Breaks Contact with the Skin

Maxwell Lohss, Roberta Klatzky, George Stetten; University of Pittsburgh, CMU

170

Development of PET-EPR co-imaging system for murine breast cancer

Ryan O'Connell, Oxana Tseytlin, Alexander V. Stolin, Raymond R. Raylman, Mark Tseytlin

171

Imaging HIV-1 Transmission and Dissemination in **Humanized Mice**

Chandra Nath Roy, Christopher Kline, Zandrea Ambrose; University of Pittsburgh

172

Influence of movement workspace on M1 neural representation of arm movements

L. Bahureksa, W. M. Joiner, S. M. Chase; CMU, University of California Davis

173

Computational modeling of the biomechanical failure of the cerebral arterial wall

Ronald N. Fortunato, Anne M. Robertson, Chao Sang, Spandan Maiti; University of Pittsburgh

174

Subcutaneous priming of neural stem cell-seeded scaffolds improves function following spinal cord injury

Dipak D Pukale, Trevor R Ham, Mohammad Hamrangsekachaee, Nic D Leipzig; University of Akron

175

Controlling the Compliance of Polycaprolactone: Gelatin Tissue Engineered Vascular Grafts in a Rat Model Kenneth J. Furdella, Shinichi Higuchi, Kang Kim, William R. Wagner, Jonathan P. Vande Geest; University of Pittsburgh

176

Microbubbles carrying STAT3 Decoy Oligonucleotide with Pulsed Ultrasound for Enhanced Therapeutic Effect in **Head and Neck Tumors**

Thiruganesh Ramasamy, Xucai Chen, Bin Qin, Jennifer Grandis, Flordeliza S. Villanueva; University of Pittsburgh

177

Liquid Condensation Drives Telomere Clustering Huaiying Zhang; CMU

178

Faster Search Algorithm for Speckle Tracking in Ultrasound Images

Skanda Bharadwaj, Mohamed Almekkawy; Penn State University

179

Engineering Vascularized Lung Organoids to Investigate Vascular-Parenchymal Crosstalk in Regeneration and Pathogenesis

Piyumi Wijesekara, Xi Ren; CMU

Biomimetic Cu-Zn Protoporphyrin Metal Organic Framework for Enhanced Chemodynamic Therapy by Amplifying Tumor Oxidative Stress

Yan Zhang, Faming Wang, Lai Shi, Mackenzie L Maurer, Yiqiu, Xia, Wenlong Zhang, Hongzhang He, Siyang Zheng; CMU

181

StabilEyes - New Assistive Technology for Nystagmus to Produce a Stabile Real-Time Video Image

Julia Foust, Linghai Wang, Holly Stants, William Smith, Roberta Klatzky, George Stetten; University of Pittsburgh, CMU

182

FRESH 3D Printing a Full-Scale Adult Human Heart Tissue Phantom for Surgical Planning

Eman Mirdamadi, Joshua Tashman, Daniel Shiwarski, Rachelle Palchesko, Adam Feinberg; CMU

183

Enhanced Invasiveness of tumor cells after mechanical sorting with a high throughput microfluidic device

Yiqiu Xia, Hongzhang He, Wengqing Li, Yizhu Chen, Si-Yang Zheng; CMU

184

A lab-on-a-chip for inducing osteocyte mechanotransduction via oscillating fluid shear stress

Sharon L. Truesdell, Abba C. Zubair, Marnie M. Saunders; University of Akron, Mayo Clinic

185

Simultaneous dimensionality reduction and deconvolution of calcium imaging activity

Tze Hui Koh, William E. Bishop, Takashi Kawashima, Misha B. Ahrens, Steven M. Chase, Byron M. Yu; CMU, Howard Hughes Medical Institute

186

Characterization of response to tissue compression in healthy breast with hand-held optical imaging device

Constance M. Robbins, James F. Antaki, Jana M. Kainerstorfer; CMU, Cornell University

187

Implantable Optoelectronic Neural Probes Using Advanced Polymer/Stainless Steel Nanofabrication

Jay W. Reddy, Zabir Ahmed, Tobias Teichert, Maysam Chamanzar; CMU, University of Pittsburgh

188

Initial Steps to Generating Organized Tissue Engineered Constructs

Joseph Maggiore, Lance Davidson; University of Pittsburgh

189

Engineering Multi-Layered Cornea Stroma Constructs Using Aligned ECM Protein Scaffolds

Santiago D. Carrasquilla, Rachelle Palchesko, James Funderburgh, Adam Feinberg; CMU, University of Pittsburgh

190

Ultrasonically Sculpted Virtual Optical Relay Lens for Imaging and Photomanipulation in Tissue Matteo Giuseppe Scopelliti, Yasin Karimi,

Maysamreza Chamanzar; CMU

191

Ionization at pH 5 as a novel screening method for mRNA delivering lipid nanoparticles

Daria Strelkova, Khalid A. Hajj, Ryan M. Weiss, Kathryn A. Whitehead; CMU

192

Terahertz pulsed imaging for burn depth determination in an in vivo porcine scald model

Omar B. Osman, Zachery B. Harris, Juin W. Zhou, M. Hassan Arbab; State University of New York at Stony Brook

193

Dynamic Mechanical Loading Improves Function of Engineered Heart Muscle

Jacqueline M. Bliley, Mathilde Vermeer, Rebecca Duffy, Ivan Batalov, Anna Kalmykov, Josh Tashman, Dan Shiwarski, Rachelle Palchesko, Duco Kramer, Nils Bomer, Maria C. Bolling, Alexander S. Teplenin, Linda Volkers, Daniel A. Pijnappels, Peter van der Meer, Adam W. Feinberg; CMU, University of Groningen (The Netherlands), Leiden University (The Netherlands)

194

Electrical stimulation pulse width and frequency may modulate spatiotemporal spread and timing of layer II/III excitatory neuronal calcium activity in-vivo Kevin Stieger, Sarah Verduci, Takashi D.Y. Kozai;

University of Pittsburgh

195

Automated feeding of bone cells cultured within a lab-on-a-chip system

Chris C Van Vranken, Sharon L Truesdell, Marnie M Saunders; University of Akron

196

Development Of An Ambulatory Destination Therapy Low Coagulation ECMO System

Kalliope Roberts, Keith Cook; CMU

197

Extracellular matrix fabrication methods for a biomimetic, respiratory support organ

E. Comber, R. Palchesko, X. Ren, A. Feinberg, K. Cook; CMU

198

Exposure of muscle stem cells to a stiff microenvironment drives an "aged" mitochondrial phenotype

Hikaru Mamiya, Amrita Sahu, Amin Cheikhi, Abish Pius, Sunita Shinde, Sruthi Sivakumar, Samuel Luketich, Gabriele Nasello, Philip LeDuc, Antonio D'Amore, Anne Robertson, David Vorp, Thomas Rando, Aaron Barchowsky, Fabrisia Ambrosio; University of Pittsburgh, CMU, Stanford University, University of Zaragoza (Spain)

Using single-cell network analysis approach to develop an integrative biological age metric

Sruthi Sivakumar, Stephen Price, Giulia Menichetti, Amrita Sahu, Zach Clemens, Abish Pius, Amin Cheikhi, Fabrisia Ambrosio; University of Pittsburgh, CMU, Northeastern University

200

Selective Activation of Ferret Abdominal Vagal Pathways using a Nerve Cuff Electrode with Multiple Circumferential Contacts

Jonathan A. Shulgach, Derek Miller, Ameya C. Nanivadekar, Stephanie Fulton, Michael Sciullo, John Ogren, LianeWong, Bryan. McLaughlin, Lee E. Fisher, Bill. J. Yates, Charles C. Horn; CMU, University of Pittsburgh

201

Nanowire-templated three-dimensional fuzzy graphene (NT-3DFG)-based ultra-microelectrodes for electrophysiological investigation at sub-msec temporal and sub-cellular spatial resolutions

Sahil K Rastogi, Jacqueline Bliley, Laura Matino, Francesca Santoro, Adam Feinberg, Tzahi Cohen-Karni; CMU, Italian Institute of Technology (Italy)

202

Optimization on bio-heat problem with the partial differential equation by using the Conjugate gradient method

Xilun Liu; Pennsylvania State University

203

Novel electrodes for reliable EEG recordings on coarse and curly hair

Arnelle Etienne, Harper Weigle, Tarana Laroia, Amber Afelin, Ashwati Krishnan, Shawn Kelly, Pulkit Grover; CMU, Wesleyan University

204

Develop a surgical screening tool for supravalvular aortic stenosis

Rana Zakerzadeh; Duquesne University

205

Evaluation of a portable intracortical brain-computer interface according to user-centered design principles *Nikhil Verma, Jeffrey Weiss, Jennifer Collinger; University of Pittsburgh*

206

Flexible Adhesive Hydrogel-Integrated Electrode For Selective Stimulation In Rat Vagus Nerve

Chenchen Mou, Mats Forssell, Michael Sciullo, Fan Sun, Tyler W Simpson, Gutian Xiao, Lee E Fisher, Charles C. Horn, Gary K. Fedder, Christopher Bettinger; CMU, University of Pittsburgh

207

Numerical simulation of oxygen transport in an abdominal aortic aneurysm

Tanja Cupac, Nina Dorfner, Rana Zakerzadeh; Duquesne University

208

Subsample Speckle Tracking; Targeted B-Mode Interpolation (TBI)

Brandon Rebholz, Mohamed Almekkawy; Penn State University

209

In vivo and in silico tools to evaluate efficacy loss of lipidoid nanoparticles Namit Chauhdary, Kathryn Whitehead; CMU

210

How Adherent Cells Reorient in Response to Cyclic Stretching Jui-Chien Lien, Yu-Li Wang; CMU

211

Influence of Vaginal Shape on Surgical Success of Uterine Prolapse Repairs

Shaniel T. Bowen, Pamela A. Moalli, Steven D. Abramowitch; University of Pittsburgh

212

Studying the Mechanotransduction of BMPs and ALK1 within an All-in-One Multi-Shear Stress Microfluidic Device

Ya-Wen Cheng, Utku Sonmez, William Okech, Beth L. Roman, Lance A. Davidson; University of Pittsburgh

213

Ultrasonic Acoustic Waveguide Behavior of the Auditory and Vestibular Systems

Anna Hiers, Christopher Dumm, Brandon Saltsman, Scott Mang, Jeffrey Vipperman, George Klinzing, Carey Balaban; University of Pittsburgh

Carnegie Mellon University

Neuroscience Institute

A LEADER OF TRANSFORMATIVE ADVANCES IN NEURAL SCIENCES

Human brains are enormously complex, with 100 billion neurons connected by 100 trillion synapses. Understanding how the brain works is one of the biggest puzzles left for science to solve. Insight into the brain also has tremendous societal value—basic understanding of neurological structures, functions, and changes forms the basis for treatments for disorders that afflict around 450 million people worldwide. The invention and application of the next generation of neural technologies and tools, including implantable devices and brain-computer interfaces, will enable the development of new treatments for neurological disorders.

Answering critical questions in neuroscience depends on cross-disciplinary work at the intersection of biology, cognitive psychology, computer science, statistics, and engineering. Harnessing CMU's core strengths in all of these areas, researchers in the new Carnegie Mellon Neuroscience Institute (CMNI) are working to reveal and improve brain function in both the healthy and diseased brains; to invent next-generation neural technologies and tools and to develop ways to deploy them; and to train future leaders in neuroscience with the cross-disciplinary skills and knowledge to solve tomorrow's problems.

Research Focus



Cognitive Neuroscience researchers at CMU have been at the forefront of research aimed at understanding the psychological and neural mechanisms that support human perception, learning, memory, language, problem-solving, and social behaviors.



Computational Neuroscience brings computational tools to the study of the nervous system using, for example, statistical and machine learning methods to create powerful models of neurons and to enable analysis of complex network activity.



Neuro Technology and Engineering research focuses on designing and implementing next-generation neural interfaces to better understand brain function and dysfunction and to address clinical needs by enabling new interventions and therapies.



Systems Neuroscience research is centered on understanding how the diversity of discrete neural cell types, like those in the cerebral cortex and basal ganglia, interact to give rise to perception and behavior.

Training Programs

At CMNI, we have created cross-disciplinary educational experiences for both graduate and undergraduate students to develop leaders with the skills, knowledge, and ethical grounding to use neural sciences to solve tomorrow's problems.

- The PhD Program in Neural Computation provides advanced training in quantitative approaches to the study
 of the brain. The program leverages the world class strengths of CMU and Pitt in computer science, machine
 learning, statistics, and dynamic systems to teach students to solve critical problems in neuroscience. A sister
 PhD Program in Systems Neuroscience is being developed to serve PhD students strongly interested in
 neurobiology.
- The PhD Program in Cognitive Neuroscience integrates behavioral, neuroscientific and computational methods in the study of mind, brain and behavior. The training faculty of this program includes many of the world's leading researchers in Psychology and builds on the computational and analytic strengths of CMU.
- Both summer and year-round Undergraduate Programs provide opportunities for undergraduate trainees. Summer programs are open to students from any college or university. CMU's Minor in Neuroscience is available through both Biological Sciences and Psychology. Students in either minor can customize their education by choosing their distribution electives. The inter-college Minor in Neural Computation, coordinated by the CMNI, is jointly sponsored by the School of Computer Science, the Mellon College of Science, and the Dietrich College of Humanities and Social Sciences.

GOLD SPONSOR



Bayer: Shaping Radiology through Innovation Leadership

As a true life science company, Bayer understands where treatment starts: With an early and precise diagnosis. Radiologists have a unique ability to provide clear direction during moments of uncertainty in a patient's clinical journey. That's why, for more than 100 years, Bayer Radiology has created high-quality imaging products, tools and services to strengthen confidence on the path to better health.

Bayer is a global enterprise with core competencies in basic sciences and high tech engineering. Bayer offers the full range of products and services to support Radiologists achieving high quality contrast enhanced imaging in CT,MR, PET, Interventinal and Angiography. Our comprehensive and continually evolving portfolio includes medical devices, contrast media, integrated dose-management software (radiation dose and contrast dose), and equipment service across a broad range of modalities. Its products in medical device field are designed to benefit people and improve their quality of life. Bayer is committed to the principles of sustainable development and to its social and ethical responsibilities as a corporate citizen.

GOLD SPONSOR

invitrogen

Look beyond the status flow

Speed isn't just about going fast, it's about enabling discovery

The Invitrogen[™] Attune[™] NxT Flow Cytometer combines precision with performance in a true-benchtop flow cytometer that's configurable with up to 4 lasers and 16 parameters of detection. Do more. Find more. Explore more.

- Empower your research—superior level of data fidelity at speeds up to 10 times faster
- Enable new applications and sample types investigate difficult sample types like tumors with clogresistant fluidics
- Enjoy walk-away automation—convert between tubes and plates in seconds



Flow cytometry special offer*—for a limited time, receive discount pricing, plus:

- Free autosampler
- 1 year of additional service (beyond warranty)
- 1 year of running fluids

For more information on this offer, please contact your sales representative or go to thermofisher.com/attune/special-offer

Find out more at thermofisher.com/attune/special-offer

Thermo Fisher S C I E N T I F I C

For Research Use Only. Not for use in diagnostic procedures. © 2016 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific and its subsidiaries unless otherwise specified. COL02571 0916

* This promotion is open to customers in the US (excluding Puerto Rico) and Canada who purchase a 2–4 laser Attune NxT Flow Cytometer, Attune NxT Autosampler, and one year of fluids in a single purchase order. Discuss with your sales representative for further details. You must have a valid quote to take advantage of this offer. Offer valid on orders received no later than December 31, 2016, or until promotional supplies are depleted, whichever comes first. The estimated retail value of the Attune NxT Autosampler is \$30,000 USD. The one year of additional service will start at the time of expiration of the product warranty. Service plan terms and conditions apply. Customer can use this promotion only once. Cannot be combined with other discounts or promotions. Offer void where prohibiled, ticesed, or restricted by federal, state, provincial, or local laws or regulational policy. Other restrictions may apply.

SILVER SPONSOR



BME FORUM ORGANIZING COMMITTEE

Bin He, Chair Keri Baker Zhengxiang Cai Maysam Chamanzar Lance Davidson Evie Jean Jana Kainerstorfer Karina Shevchenko Conrad Zapanta

Organized by:

Endorsed by:





Carnegie Mellon University



International Academy of Medical and Biological Engineering Affiliated with International Federation for Medical and Biological Engineering

21

Department of Biomedical Engineering

Carnegie Mellon University Scott Hall 5000 Forbes Ave Pittsburgh, PA 15213 www.bme.cmu.edu