

# 43<sup>rd</sup> NORTHEAST BIOENGINEERING CONFERENCE

March 31 - April 2

Department of  
Biomedical Engineering



**NJIT**  
New Jersey Institute  
of Technology





# 43rd Northeast Bioengineering Conference

New Jersey Institute of Technology  
Newark, NJ

March 31 - April 2, 2017

## ABOUT NJIT

One of the nation's leading public technological universities, New Jersey Institute of Technology (NJIT) is a top-tier research university that prepares students to become leaders in the technology-dependent economy of the 21st century. NJIT's multidisciplinary curriculum and computing-intensive approach to education provide technological proficiency, business acumen and leadership skills.

With an enrollment of 11,400 graduate and undergraduate students, NJIT offers small-campus intimacy with the resources of a major public research university. NJIT is a global leader in such fields as solar research, nanotechnology, resilient design, tissue engineering, and cybersecurity, in addition to others. NJIT is among the top U.S. polytechnic public universities in research expenditures, exceeding \$130 million, and is among the top 1 percent of public colleges and universities in return on educational investment, according to PayScale.com. NJIT has a \$1.74 billion annual economic impact on the State of New Jersey.

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### SPONSORS & EXHIBITORS



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# PROGRAM SCHEDULE

## SCOPE OF THE CONFERENCE PROGRAM

### INVITED AND SUBMITTED PRESENTATIONS

Each day begins with an invited **Keynote Address** by a national leader in biomedical engineering. Introductory biographies of these speakers appear on page 5 in this booklet.

Most work submitted by conference participants will be presented as “*electronic*” posters. Some participants requested *oral presentations*, and 40 percent of those requests were programmed into cohesive groups of talks.

On research focused days of the conference (Saturday and Sunday), faculty from the northeast region will present invited talks. One group of talks will be presented as **Faculty Seminars**, where four invited speakers in a focused area of biomedical engineering will each introduce you to their

work. In addition, each session of oral talks by participants will be introduced by an invited **Chairman’s Talk** by the faculty chair of that platform session. Introductory biographies of invited faculty are on pages 6-8.

### FINDING WORK THAT INTERESTS YOU

Titles of invited talks are indicated in the program schedule that follows in this booklet. Submitted presentations are listed in three *xeroxed addenda* included with this booklet: **Design Posters, Research Posters, Oral Research Talks**. Each list is grouped by program theme and subgrouped alphabetically by first author. The time and poster location is indicated. In addition, the NEBEC website (nebec.org) links to *a searchable database of submitted presentations*.

## FRIDAY AFTERNOON PROGRAM

<b>1 p.m. - 1:30 p.m.</b>	<b>INDUSTRY KEYNOTE SPEAKER: Hans Hartmann</b> (COO, Oculus) - <b>ATRIUM</b>		
<b>1:45 p.m. - 3 p.m.</b>	<b>BREAKOUT SESSIONS: Career Development in Biomedical Engineering</b>		
	<b>BME Careers in Industry</b> Atrium  <b>Panel</b> Emilio Sanchez (Stryker) Hans Hartmann (Oculus) Carla Cerqueira (Edwards) Amy Cilento (Optum) Matt Alcalde (BioNJ)	<b>Clinical Careers</b> Kupfrian Seminar A  <b>Panel</b> Karisa Solt-Schreck (JHU) Pooja Sheth (Einstein Med) Anna Barrett (Kessler) Saul Weiner (NJ Dental Sch)	<b>Entrepreneurship</b> Kupfrian Seminar B  <b>Panel</b> Mike Wiley (Venture Capital) Barry Kappel (Sapience Therapy) John Crombie (UpStart Products)
<b>3 p.m. - 5:30 p.m.</b>	<b>UNDERGRADUATE DESIGN POSTERS - Ballroom</b>		
<b>5:30 p.m. - 6 p.m.</b>	<b>UNDERGRADUATE DESIGN AWARDS CEREMONY - Atrium</b>		
<b>6 p.m. - 7:30 p.m.</b>	<b>NETWORKING BUFFET WITH INDUSTRY, ACADEMIC AND CAREER LEADERS - Gallery</b>		
<b>7:30 p.m. - 10 p.m.</b>	<b>NETWORKING VIA POOL TOURNAMENT, PING-PONG AND BOWLING - Game Room</b>		

## SATURDAY PROGRAM

<b>8 a.m. - 9 a.m.</b>	<b>BREAKFAST BUFFET - Gallery</b>		
<b>9 a.m. - 9:30 a.m.</b>	<b>CONFERENCE KEYNOTE SPEAKER: Gilda Barabino</b> (President, AIMBE) - <b>Atrium</b>		
<b>9:30 a.m. - 11:30 a.m.</b>	<b>RESEARCH POSTER PRESENTATIONS: Session I - Ballroom</b>		
<b>11:45 a.m. - 1:15 p.m.</b>	<b>FACULTY SEMINAR: Biomedical Imaging - Atrium</b>		
	<p><b>Elisa Konofagou</b> <i>Imaging Mechanical and Electro-mechanical Properties of the Myocardium In Vivo</i></p> <p><b>Arvind Pathak</b> <i>“A Pixel Is Worth a Thousand Words” - The Role of Imaging in Cancer</i></p> <p><b>Andrew Tsourkas</b> <i>Engineering Targeted Nanoparticles and Antibodies for Molecular Imaging</i></p> <p><b>Yale Goldman</b> <i>Super-resolution Optical Tracking and Structural Dynamics Molecule by Molecule</i></p>		
	<b>Oral Research Talks</b> Rehabilitation Engineering - Kupfrian Seminar A - Damiano Zanotto <i>Wearable Technology for Gait Training and Gait Assessments</i>	<b>Oral Research Talks</b> Tissue Engineering - Kupfrian Seminar B - Vivek Kumar Moderator	<b>Oral Research Talks</b> Bioengineering of Development - Kupfrian Lecture Room - Xiaobo Li Moderator
<b>1:15 p.m. - 2 p.m.</b>	<b>NETWORKING LUNCHEON - Gallery</b>		
<b>2 p.m. - 4 p.m.</b>	<b>POSTER PRESENTATIONS: Session II - Ballroom</b>		
<b>4:15 p.m. - 5:45 p.m.</b>	<b>FACULTY SEMINAR: Biomechanics &amp; Tissue Engineering - Atrium</b>		
	<p><b>Trey Crisco</b> <i>From Wrist Biomechanics, to Head Impacts, to Toy Therapies</i></p> <p><b>Warren Grayson</b> <i>Platform Technologies for Engineering Composite Tissues</i></p> <p><b>Sanjeev Shroff</b> <i>Dynamic Myocardial Contractile Parameters from Ventricular Pressure-Volume Measurements</i></p> <p><b>Kevin Costa</b> <i>Engineering 3-D Human Cardiac Tissues and Organoids</i></p>		
	<b>Oral Research Talks</b> Biomaterials - Kupfrian Seminar A - Sangamesh Kumbhar <i>Micro-nanostructures for Tissue Engineering</i>	<b>Oral Research Talks</b> Biomedical Imaging - Kupfrian Seminar B - Bharat Biswal Moderator	<b>Oral Research Talks</b> TBI & Neural Engineering - Kupfrian Lecture Room - Peter Galie <i>Mechanical Stress Regulates Blood-brain Barrier Integrity</i>
<b>6 p.m. - 7:30 p.m.</b>	<b>NETWORKING BUFFET WITH RESEARCH LEADERS - Gallery</b>		
<b>7:30 p.m. - 10 p.m.</b>	<b>NETWORKING AT THE HIGHLANDER PUB (CASH ONLY) - Pub</b>		

## SUNDAY MORNING PROGRAM

<b>8 a.m. - 9 a.m.</b>	<b>BREAKFAST BUFFET - Gallery</b>	
<b>9 a.m. - 9:30 a.m.</b>	<b>RESEARCH KEYNOTE SPEAKER: Michele Grimm</b> (National Science Foundation) - <b>Atrium</b>	
<b>9:30 a.m. - 11:30 a.m.</b>	<b>RESEARCH POSTER PRESENTATIONS: Session III - Ballroom</b>	
<b>11:45 a.m. - 1:15 p.m.</b>	<b>FACULTY SEMINAR: Brain Injury - Atrium</b>	
	<p><b>Reuben Kraft</b> <i>Multiscale Modeling of the Axonal Tract Level in the Brain</i></p> <p><b>Kurosh Darvish</b> <i>Nonlinear Effects in Brain Tissue Are Important in Predicting Traumatic Injury</i></p> <p><b>Barclay Morrison</b> <i>Primary Blast Injury Decreases Neuronal Plasticity</i></p> <p><b>David Shreiber</b> <i>In Situ Estimation of Axon-level Strain Following Tissue-level Stretch</i></p>	
	<p><b>Oral Research Talks</b> <b>Tissue Engineering &amp; Modeling</b> - Kupfrian Seminar A <b>Catherine von Reyn</b> <i>Neuroengineering Strategies to Dissect and Modify Sensorimotor Circuits</i></p>	<p><b>Oral Research Talks</b> <b>Orthopaedic Biomechanics</b> - Kupfrian Seminar B <b>Deva Chan</b> <i>Biomechanics of Joint Degeneration and Repair</i></p>
<b>1:30 p.m. - 1:45 p.m.</b>	<b>CLOSING CEREMONY - Atrium</b> Awards Announcements: Research Poster Awards and Oral Talk Awards	

## EVENT LOCATIONS

The location of each event in the program is specified at the end of each line in the program schedule. All events occur either in the Campus Center or Kupfrian Hall, which is located next door to the Center. Details of each location are:

**ATRIUM** - First Floor of the Campus Center

**BALLROOM** - Second Floor of the Campus Center; enter through the Gallery

**GALLERY** - Second Floor of the Campus Center, outside the Ballroom

**KUPFRIAN ROOMS** - Lower level of Kupfrian Hall

**GAME ROOM** - Basement of Campus Center

**PUB** - Third Floor of Campus Center



### CONFERENCE KEYNOTE

#### Gilda Barabino

Dr. Barabino is dean and Berg professor at The Grove School of Engineering at The City College of New York (CCNY). She is also president of AIMBE, the most prestigious organization of professional fellows in biomedical engineering. She is also the immediate past-president of the Biomedical Engineering Society. She earned her Ph.D. from Rice University and served as a professor of BME at Georgia Tech. She is a noted investigator in the areas of sickle cell disease and cellular and tissue engineering.



### INDUSTRY KEYNOTE

#### Hans Hartmann

Hans Hartmann is now the chief operating officer (COO) of Oculus, the leading maker of immersive virtual reality headgear. Until recently, he was the COO of Fitbit. Previously, he held a wide variety of industrial management experiences with companies that provided automotive GPS, optical networks, data storage and internet fax. He also spent 15 years at Hewlett-Packard managing quality, operations and marketing. He holds a B.S. in electrical engineering from NJIT and an M.S. in manufacturing systems engineering from Stanford.



### RESEARCH KEYNOTE

#### Michele Grimm

Dr. Grimm is the program director of the Engineering of Biomedical Systems and Disability & Rehabilitation Engineering Programs at the National Science Foundation. Her home institution is Wayne State University, where she is a faculty member in BME. She earned her Ph.D. from the University of Pennsylvania. Her research over 25 years has engaged tissue biomechanics – from brain to bone – through which she has become a Fellow of ASME. She is an internationally recognized expert in the mechanisms of brachial plexus injury during birth.

# SENIOR FACULTY TALKS



**Elisa E. Konofagou** is the Robert and Margaret Hariri Professor of Biomedical Engineering and Radiology at Columbia University, where she directs the Ultrasound Elasticity Imaging Lab. She earned her Ph.D. in biomedical engineering from the University of Houston and did postdoctoral work at Brigham and Women's Hospital. She is a Fellow of AIMBE. Dr. Konofagou's main interests are the development of novel elasticity imaging techniques for applications to cardiac, arterial, breast and ligament tissue as well as the blood-brain barrier.



**Arvind P. Pathak** is Associate Professor of Radiology, Oncology & Biomedical Engineering at Johns Hopkins. He earned his Ph.D. at the Medical College of Wisconsin/Marquette joint BME program followed by a postdoc at Hopkins. Dr. Pathak's lab employs biomedical imaging, computational models and visualization tools to answer critical questions in cancer biology. His team investigates the micro-environment of tumors with the goal of developing clinical biomarkers and a deeper understanding of disease progression and metastasis.



**Kevin D. Costa** is Associate Professor of Medicine and Director of Cardiovascular Cell and Tissue Engineering at Mt. Sinai School of Medicine. He earned his Ph.D. in bioengineering at the University of California, San Diego, with postdoctoral fellowships at Johns Hopkins and Washington University. His lab focuses on multi-scale mechano-biology of cardiovascular remodeling, injury, repair and regeneration, using techniques that include atomic force microscopy, nano-medicine and 3-D tissue and organoid engineering.



**Andrew Tsourkas** is Professor of Bioengineering at the University of Pennsylvania, where he directs the Center for Targeted Therapeutics and Translational Nanomedicine. He earned his Ph.D. in biomedical engineering from Georgia Tech and did postdoctoral training in molecular imaging at Harvard. He is a Fellow of AIMBE. His research aims to develop new nano-formulations that can carry high payloads for therapy or imaging and develop highly efficient attachments of targeting ligands to nanoparticles.



**Yale E. Goldman** is Physiology Professor and former director of the Muscle Institute at the University of Pennsylvania. He obtained his MD and Ph.D. degrees at Penn and was a postdoctoral fellow at University College London. He is a Fellow and past president of the Biophysical Society. His laboratory studies molecular motors and protein synthesis using novel optical methods that include nanometer tracking of position and orientation of single fluorescent probes and ultra-fast feedback infrared optical traps.



**Sanjeev Shroff** is Distinguished Professor and Gerald McGinnis Chair in Bioengineering at the University of Pittsburgh. Dr. Shroff earned his Ph.D. in bioengineering from the University of Pennsylvania and is a Fellow of AIMBE. He is widely recognized for his cardiovascular research on (1) left ventricular mechano-energetic function and underlying cellular processes; (2) vascular stiffness as modified by drugs or hormones; and (3) regional contractile dyssynchrony in global ventricular mechanics and energetics.



**J. J. Trey Crisco** is Henry F. Lippitt Professor of Orthopedics and Professor of Engineering. He earned his Ph.D. in applied mechanics from Yale. He is Editor-in-Chief of the Journal of Applied Bio-mechanics and past president of the American Society of Biomechanics. He investigates musculoskeletal biomechanics, where he focuses on upper extremity mechanics and osteoarthritis, using advanced imaging analysis and neuromuscular therapy through toy and game play for children. He also focuses on sports performance and injury prevention.



**David Shreiber** is Professor of Biomedical Engineering at Rutgers. He earned his bioengineering Ph.D. at the University of Pennsylvania followed by a postdoc at the University of Minnesota. Research foci include the multi-scale analysis of CNS injury mechanics; biomaterial, tissue and cellular engineering approaches for repair and restoration of neural functions, and designing new technology for brain-machine interfaces. Recently, his lab has focused on axonal injury from stretch, and the use of chemical and mechanical gradients to guide axon growth.



**Reuben Kraft** is Assistant Professor of Mechanical and Biomedical Engineering at Penn State University. He obtained his Ph.D. from Johns Hopkins followed by a postdoc with the Army Research Lab. He leads a Computational Biomechanics Group that focuses on multiscale computational mechanics and methods, which are used to solve problems at the interface of biology and multiscale mechanics. He also studies blast physics and human performance in extreme environments.



**Warren L. Grayson** is Associate Professor of Biomedical Engineering at Johns Hopkins. He earned a biomedical engineering Ph.D. from Florida State University followed by a postdoc at Columbia. His lab addresses challenges associated with engineering functional craniofacial and orthopedic constructs for use in therapeutic applications. He develops innovative methods using stem cells to create patient-specific grafts, and designs advanced bio-reactors to maintain cell viability while precisely controlling the cellular microenvironment.



**Barclay Morrison III** is Professor of Biomedical Engineering at Columbia, where he leads the Neuro-trauma and Repair Lab. He earned his bioengineering Ph.D. from Penn, with a clinical neuroscience postdoc in the UK. He is associate editor of the Journal of Biomechanical Engineering and the Journal of Neurotrauma. He focuses on the biomechanics of traumatic brain injury, and the biochemical, genomic and molecular pathways responsible for post-traumatic cell death. He actively engages in educating the new crop of biomedical engineers.



**Kurosh Darvish** is an Associate Professor of Mechanical Engineering at Temple University. He earned his Ph.D. in mechanical and aerospace engineering and biomechanics from the University of Virginia. His research interests include soft tissue biomechanics, traumatic brain injury, traumatic aortic rupture, orthopedic devices and human body dynamics. Two of his most cited papers involve nonlinear mechanical effects in brain tissue due to viscoelasticity and large deformations.

# SESSION CHAIRS



**Deva Chan** is Assistant Professor of Biomedical Engineering at Rensselaer Polytechnic Institute. She earned her Ph.D. from Purdue University, followed by a postdoctoral fellowship at Rush University Medical Center in Chicago. Her research aims to quantify the mechanical and biochemical mechanisms of joint degeneration and repair, and to integrate noninvasive medical imaging and computational modeling techniques to assess it.



**Peter Galie** is Assistant Professor of Biomedical Engineering at Rowan University. He earned his Ph.D. from the University of Michigan. His laboratory's research focuses on how disease changes fluid flow in the brain, and how altered fluid flows affect the behavior of cells in the central nervous system. He uses microfluidic techniques to create models to control the fluid environment of cultured cells.



**Catherine von Reyn** is Assistant Professor of Biomedical Engineering at Drexel University. She earned her Ph.D. at the University of Pennsylvania; thereafter, she was a postdoctoral associate at the Janelia Research Campus of the Howard Hughes Medical Institute. She uses genetic engineering, whole-cell patch clamp in behaving animals, modeling and detailed behavioral analysis to study sensorimotor circuits. She aims to engineer de novo synaptic connections for neurodegenerative diseases.



**Sangamesh Kumbar** is Associate Professor of Orthopaedic Surgery and a member of the core biomedical engineering faculty at the University of Connecticut. He earned his Ph.D. at Karnatak University, India. His research aims to develop mechanically competent, porous, 3-D tissue scaffolds functionalized with nanofiber structures of natural origin for bone repair and regeneration. In addition, he aims to develop novel injectable particulate delivery systems for chemotherapeutic agents.



**Damiano Zanotto** is Assistant Professor of Mechanical Engineering at Stevens Institute. He earned his Ph.D. in industrial engineering (emphasis on mechatronics) at the University of Padua, Italy. He was a postdoc at the University of Delaware, then became an associate research scientist in the Robotics and Rehabilitation Lab at Columbia University. He studies exoskeletons for rehabilitation and wearable sensors for motion analysis.



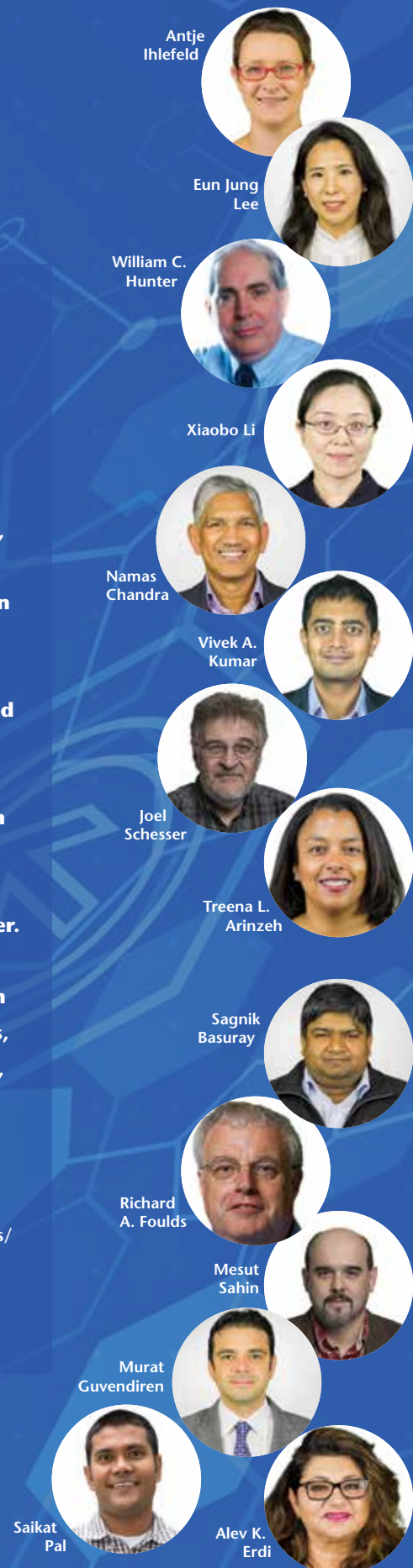
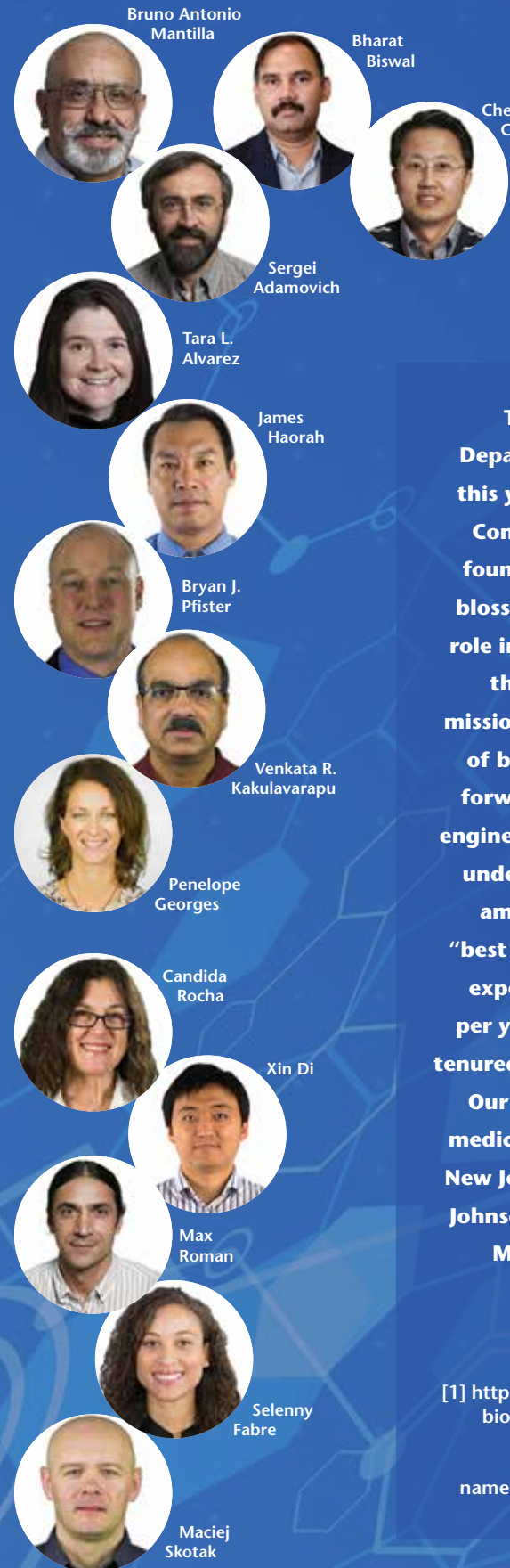
**Xiaobo Li** is Associate Professor of Biomedical Engineering and Electrical Engineering at NJIT. She earned her Ph.D. at the University of Birmingham, England, and has been a faculty member at Albert Einstein College of Medicine. She develops analytical and statistical techniques to quantitatively evaluate the structural and functional organization in the human brain using structural MRI/fMRI/DTI data.



**Vivek Kumar** is Assistant Professor of Biomedical Engineering and Chemical Engineering at NJIT. He earned his Ph.D. at Georgia Tech, and then had postdoctoral stints at Rice University and Harvard Medical School. His research lies at the intersection of biomaterials, drug discovery and clinical translation, which he has applied to angiogenesis, inflammation, soft-tissue engineering and drug development.



**Bharat Biswal** is Distinguished Professor of Biomedical Engineering at NJIT. He earned his Ph.D. in the biophysics imaging program at the Medical College of Wisconsin. He is internationally renowned for developing MRI techniques to study connectivity between different regions of the brain. In fact, the National Institute of Mental Health cited his research as one of the top two advancements in 2010.



**The Biomedical Engineering Department at NJIT is proud to host this year's Northeast Bioengineering Conference. Just 15 years after its founding, the BME Department has blossomed into a dynamo. Fitting its role in a research-intensive university, the department excels in both missions: educate the next generation of biomedical engineers, and drive forward the frontiers of biomedical engineering knowledge. Our accredited undergraduate BME program ranks among the top 10 nationally for "best value" [1]. Our audited research expenditures exceed \$3.25 million per year [2], averaging \$250,000 per tenured or tenure-track faculty member. Our graduates populate numerous medical device companies in northern New Jersey: e.g., Stryker Orthopaedics, Johnson & Johnson, Becton Dickinson, Maquet, Integra Life Sciences, Edwards Lifesciences. Welcome to BME@NJIT !**

[1] <http://www.bestvalueschools.com/rankings/biomedical-engineering-degrees-2016/>  
 [2] [profiles.asee.org/profiles/6951/screen/29?school\\_name=New+Jersey+Institute+of+Technology](http://profiles.asee.org/profiles/6951/screen/29?school_name=New+Jersey+Institute+of+Technology)

# **Future Northeast Bioengineering Conferences**

**2018**

**Drexel University**

Chair: Kenneth Barbee

**2019**

**Rutgers University**

Chair: Joseph Freeman

**2020**

**Penn State University**

Chair: Keefe Manning

**PLAN TO ATTEND!!**

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New Jersey Institute  
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