UNIVERSITY *of* DELAWARE

BIOMEDICAL ENGINEERING

FALL | 2015

A YEAR OF MAJOR MILESTONES

UNIVERSITY OF DELAWARE | College of Engineering

DEPARTMENT OF BIOMEDICAL ENGINEERING

CHAIR'S PERSPECTIVE

DEAR FRIENDS AND COLLEAGUES,

The University of Delaware's Biomedical Engineering (BME) has had a landmark year. We have achieved department status, received ABET accreditation and launched a new undergraduate curriculum.

As we continue to thrive, we enthusiastically welcome to our department two new faculty: Sarah Rooney and Fabrizio Sergi. Sarah Rooney will focus on incorporating evidence-based teaching practices into the BME undergraduate curriculum. Fabrizio Sergi researches biorobotics, a multidisciplinary field that combines robotics, biomechanics, neuroscience and rehabilitation. Next January we will add two more to our faculty: Curtis Johnson and Megan Killian. We look forward to great things from our new members and from our current faculty.

Our undergraduate program remains fully enrolled with over 200 students. Our second class of 47 students graduated this past May, and, as with last year, once again won the Dean's Cup challenge which goes to the department whose graduating seniors show the highest participation in donating back to UD. This year, our undergraduate students had a phenomenal year, winning recognition and funding for their innovations that were developed through their senior design course and through other venues.

Our graduate program is still growing and flourishing. Our graduate students continue to be recognized, winning research awards and prestigious fellowships, including the Laird Fellowship. We welcomed 8 new graduate students this fall, bringing our total number to 28.

We look forward to another exciting year of growth and success for the BME department.

Warm regards,

Dawn Elliott
Professor and Chair,
Biomedical Engineering

Faculty and students at the 2015 Biomedical Engineering Graduation Celebration in Patrick T. Harker Interdisciplinary Science and Engineering Laboratory Atrium.

FALL 2015

Biomedical Engineering

Biomedical Engineering is published by the Office of Communications in the College of Engineering for the alumni, friends and peers of the College of Engineering.

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BIOMEDICAL ENGINEERING

FALL 2015

FEATURES

SECTIONS

ON THE COVER

Erica Comber and Eva Gatune (pictured left to right) in the Biomedical Engineering Department's Delaware Technology Park Lab.


2015!

A YEAR OF MAJOR MILESTONES

The biomedical engineering (BME) program at the University of Delaware recently reached two important milestones: accreditation by ABET (Accreditation Board for Engineering and Technology) and approval for departmental status by the UD Faculty Senate.

The BME program, developed by a steering committee led by Tom Buchanan and composed of faculty from all engineering departments, was launched in 2010 with mechanical engineering's Jill Higginson as the first director. In 2011, Dawn Elliott became the director and first primary faculty member. Now department chair, Elliott has continued to develop affiliated faculty appointments across the university, implement the new undergraduate program, and launch the graduate program.

"The undergraduate program has been extremely popular since the very beginning," Elliott says. "Our incoming undergraduate classes are capped at 55 students, and unfortunately we're having to turn away outstanding applicants every year."

As of January 2016, BME will have eleven primary faculty, five of whom are women. The undergraduate population in the department is also well balanced, with more than 40 percent female students. "I think that the overarching purpose of biomedical applications makes the field attractive to women," Elliott says. Elliott credits other departments in the College of Engineering with providing the support needed to offer courses until BME built up its own faculty. These early collaborations left a legacy of cooperation and openness that continues to facilitate co-advisement of students and collaborative research.

"We're really proud of the education program we've developed," Elliott says. "Our partnership with mechanical engineering and their interdisciplinary senior design course has also led to a great pathway to innovation for our students, with our clinical immersion course leading to senior design projects and then to entrepreneurship. In addition, many of our undergraduates are conducting research with faculty across campus."

Research in the department currently focuses on four interdisciplinary areas: musculoskeletal and neural engineering, cancer diagnosis and therapy, disease modeling, and tissue and regenerative engineering.

"Our biomedical engineering researchers have key collaborations with not only other faculty within the college, but also many in the applied sciences," says Babatunde Ogunnaike, dean of the College of Engineering. "With affiliated faculty in BME now totaling close to 80, we truly have a village educating our students and developing new knowledge in one of the most rapidly growing areas of engineering."

Elliott looks forward to having the physical infrastructure that will enable expansion of these efforts as UD competes with the top biomedical engineering departments in the nation.

"We started with a blank piece of paper five years ago, and now we have a top-notch education program, fruitful collaborations, high-impact research, and a blueprint for student entrepreneurship," she says.■

BME is ABET accredited and granted departmental status

INNOVATIONS ABOUND

BME undergraduate students have developed innovative designs for clinical applications and for educational tools.

UNCAP'N-IT
A cap remover

UNCAP'N-IT is a semi automated device that removes the caps from 15ml and 50ml conical tubes. It was developed by an interdisciplinary senior design team that included BME undergrads Annie Sanger and Si Vu. This team was selected by the senior design faculty advisors to receive the Get'er Done Award for their outstanding performance throughout the semester, their real and implementable design, and their professionalism.

Sponsored by VWR International

mTRIGGER
PT assist

mTrigger is a biofeedback system for use in physical therapy developed by a student team that included BME undergrad Gabriel Szczepanek. The team presented their innovation at Delaware Biotechnology Institute's Spin in Showcase. This device plugs into an iPhone's headphone port and then attaches to sensor pads on a patient's skin. As the patient goes through various exercises, the app records muscle motion, tracking the patient's progress and putting that data into a game environment that gives each patient a bit of competitive incentive to keep working at it.

Sponsored by Office of Economic Innovation & Partnerships

SIMUCATH
A urinary catheter simulation

SimuCath is a novel wearable technology that allows health care professionals to safely train to perform urinary catheterizations on live actors. It was developed by an interdisciplinary senior design team that included BME seniors Bimal Amin and Wes McDowell. SimUCath was selected to participate in the 2015 Clinton Global Initiative University in March. It was also awarded first prize at the 2015 Design of Medical Devices Conference at the University of Minnesota in April. Previously, it took second place at First Step and was selected by i-Corps, both UD programs that foster innovative student STEM technologies.

Sponsored by UD Healthcare Theatre Program

SIMUTRACH
A tracheostomy simulation

SimuTrach is an overlay worn by actors playing the role of patients that provides realistic training for the care of tracheostomy patients. It was developed by an interdisciplinary senior design team in 2013-14 and included BME undergrads Brad Biggs, Devon Bond and Nick Campagnola. SimuTrach was awarded first-place technology innovation winner at the 2015 International Meeting on Simulation in Healthcare.

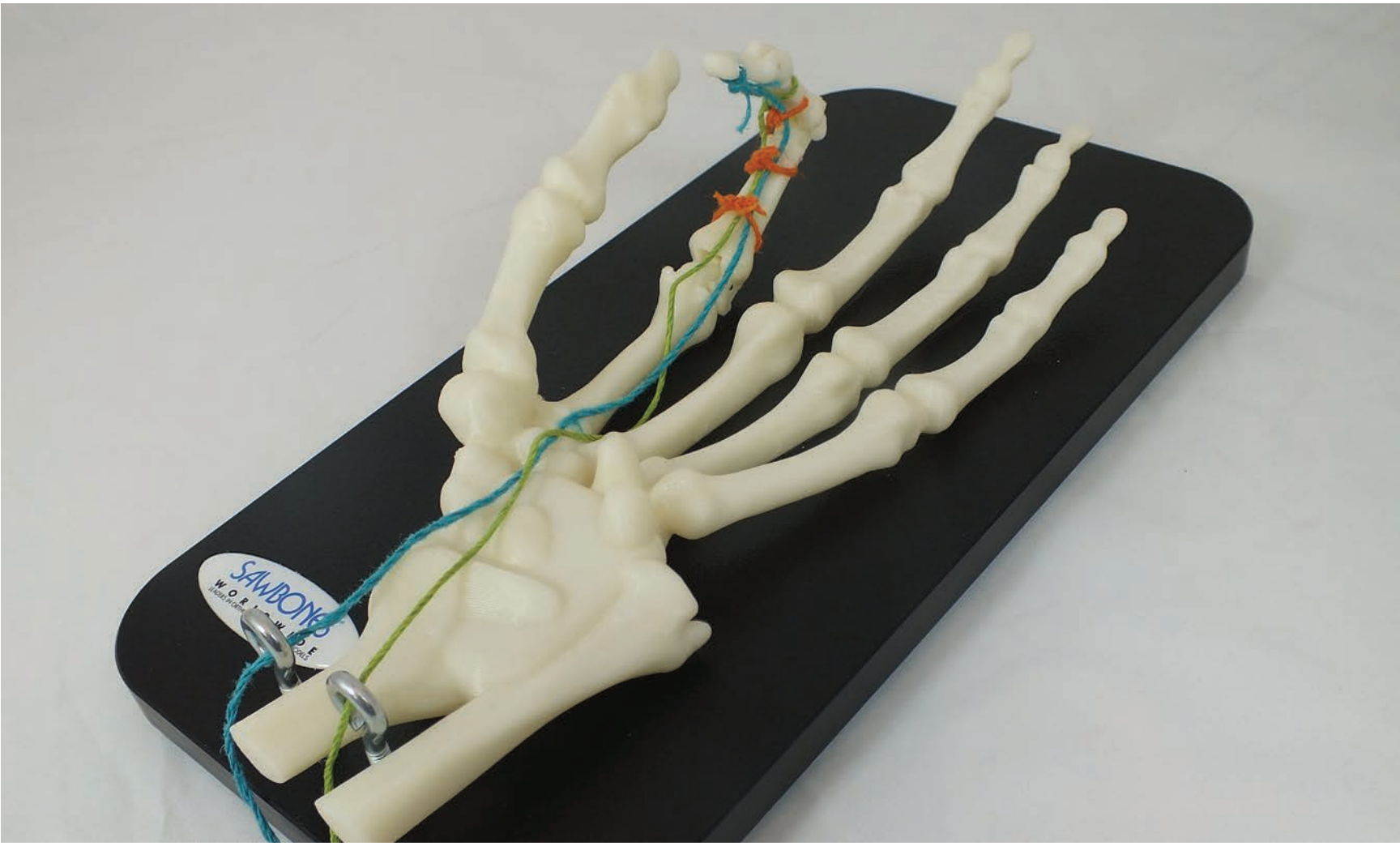
SimuTrach is currently on its third prototype, and the team is now working on branding, pricing, identifying partners, and creating a marketing plan.

Sponsored by UD Healthcare Theatre Program

SMARTBOOT
An instrumented walking boot

The Smartboot (pictured below) is an instrumented clinical walking boot for partial weight bearing training. It provides visual feedback to inform patients if they are underloading or overloading their limb after an injury, and enables long term monitoring to evaluate patient compliance during daily life. It was developed by an interdisciplinary senior design team that included BME undergrads Timothy West and David Schnall. Smartboot was awarded third place in the Undergraduate Design Project Competition in Rehabilitation and Assistive Devices at the 2015 Summer Biomechanics, Bioengineering and Biotransport Conference.

Sponsored by Jill Higginson, associate professor in mechanical engineering, and Brian Knarr, associate scientist in Delaware Rehabilitation Institute.



ORTHOPAEDICS IN ACTION A unique STEM curriculum kit

The team launched their OIA kits at the 2015 American Association of Orthopaedic Surgeons annual meeting and the 2015 Ruth Jackson Orthopaedic Society meeting. The goal is to have OIA kits in 100 classrooms by the end of 2015. The team also received early feedback from The Perry Initiative's national partner, Project Lead The Way Inc., and funding support from two major medical device firms, Zimmer Inc. and Stryker Corp., to help with development and launch costs.

Orthopaedics in Action, (OIA) is a unique curriculum kit for middle and high school students that teaches science, mathematics and engineering concepts through medical experiments. The curriculum was designed by a team including BME undergrads Manuela Restrepo, Emily Pavilonis, Ryan Locke and Jeannie Kontos, building off a kit originally developed as part of the Perry Initiative, a non-profit organization that inspires young women to be leaders in orthopedic surgery and engineering. Based on the design team's prototypes, Jenni Buckley, assistant professor of mechanical engineering and co-founder of The Perry Initiative, contacted the makers of Sawbones anatomical models (www.sawbones.com) to manufacture the classroom materials for the OIA kits. With feedback from high schools in Delaware and Maryland, the kits were refined. The final curriculum has 5 different kits offering interactive hands-on lessons and anatomical models for students to immerse themselves in orthopedics and engineering concepts. OIA was selected to receive funding from First Step.

SENIOR DESIGN TEAMS

Additional senior design teams with BME members that won recognition.

PLAYSKIN AIR
Pediatric Exoskeleton Garment
UD Pediatric Mobility Group
Dr. Michele Lobo

SIMUTHOR
Thoracic Simulation System
UD Healthcare Theatre Program
Amy Cowperthwait

MRI DYNAMOMETER
Muscle Force Measurement Device
UD College of Health Sciences,
Dr. Chris Modlesky

DRIVESIM
Driving Simulator Device
First State Orthopaedics,
Dr. Michael Axe

SIMUSHOCK
Defibrillation Simulation Device
UD Healthcare Theatre Program
Amy Cowperthwait

UNDERGRADUATE NEWS

ATTENDING COULTER COLLEGE

Junior BME students selected for a national training program

During summer 2014, a team of 6 BME juniors -- Kyra Isaacs, Sabrina Casas, Kaitlyn Rakowski, Emily Pavilonis, Mara Gluck, and Gabriel Szczepanek (pictured from left to right) -- led by Dr. Anita Singh and by a clinical collaborator, Michael McCulloch, from Nemours were selected to attend BMES Coulter College. This is a training program supported by the Wallace H. Coulter Foundation that focuses on the translation of biomedical innovations. Topics include patent law, regulatory strategy, reimbursement codes, working with technology transfer offices, follow-on funding sources, and more. Student design teams are guided by faculty and clinical experts through a highly dynamic process that is designed to help them better understand how innovations can meet clinical needs, and that provides tools and approaches that are required to accelerate the translation of biomedical innovations to the market place to improve patient care.

BMES UNDERGRADUATE RESEARCH DAY AT HOPKINS

Students from UD's Biomedical Engineering Society (BMES) and their faculty adviser Emily Day visited Johns Hopkins University (JHU) in March to participate in the third annual BMES Undergraduate Research Day with students from JHU and the University of Maryland's Fischell Department of Bioengineering. UD BME junior Bretta Fylestra won the Best Poster Award for her research with Steven Stanhope, professor in kinesiology and applied physiology, that involves developing a quantitative mathematical model for footplate rollover shapes used in ankle-foot orthosis (AFO) and creating customized 3D-printed AFOs to test the mathematical orthosis.

VISITING AIR LIQUIDE WITH DELAWARE SENATOR COONS

In October 2014, BME students Amanda Morrison, Saisri Gajjala, Gabriel Szczepanek and Kyra Isaacs (pictured from left to right with Senator Coons in the middle) were among a group of engineering students invited to Air Liquide in Newark, DE for National Manufacturing Day with Senator Coons. They learned about the company and its life sciences department. Air Liquide plans to expand its medical and healthcare R&D in the next few years and is interested in biomedical engineers.

WINNING RECOGNITION

BME undergrad Amira Idris placed first in triple jump at the Eastern College Athletic Conference Championships (ECAC) in March, becoming the first Blue Hen woman to capture an ECAC indoor title in a field event as she broke UD's record. For spectacular performances in triple jump and long jump during the following meets in Richmond and Raleigh, she was honored as the CAA Women's Field Athlete of the Week for two weeks in a row.

Idris also won third place at the First Step competition for her invention Vibrosocket, a comfortable and affordable device that fits around or over the residual limb of lower limb amputees and increases tissue activity thus promoting healthy function.

UNDERGRAD STUDENT HONORS

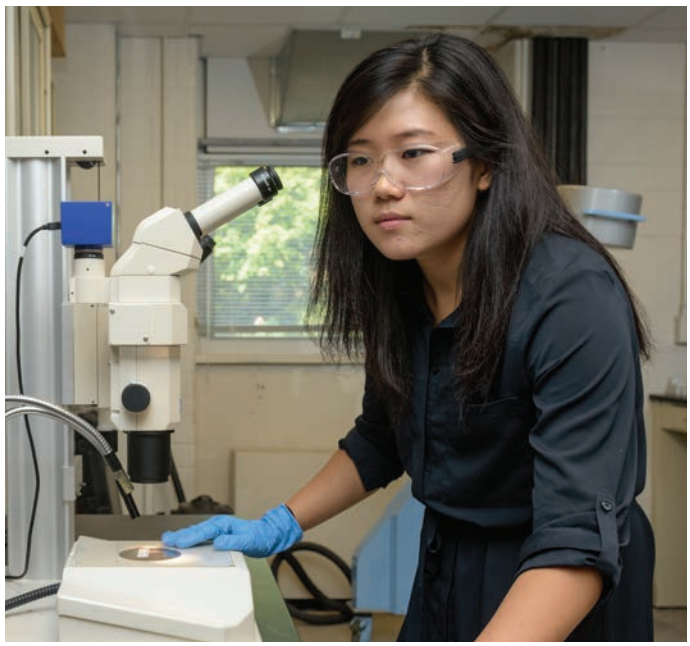
BME Director's Award:
Bimal Amin
Manuela Restrepo-Parra

BME Distinguished Junior Award:
Avery White
John Lowman
Daniel Charytonowicz

BME Distinguished Senior Award:
Mary Doolin
Brittany Fay
Timothy West

BME Distinguished Sophomore Award:
Peter Sariano

Matthew Maguire Celebration of Life Memorial Award:
(given to junior or senior who: provides significant service to BME program)
Patrick Crane



GRADUATE STUDENT HONORS

• Keely Heinz (in John Slater's lab) has received a 2015 Laird Merit Fellowship that is given to one first year grad student in the College of Engineering each year to honor the memory of George W. Laird. This prestigious fellowship is awarded to candidates who exhibit character, creativity, imagination and perseverance, and it encourages recipients to engage in broadening intellectual pursuits that may or may not directly apply to their chosen field. Heinz is researching the fabrication of biomimetic microfluidic hydrogel constructs for advanced cell culture platforms. She has also won a 2015 Graduate Teaching Assistant award.

• Omar Banda (in John Slater's lab) has received a 2015 IGERT fellowship. Banda investigates engineering cellular environments to guide stem cell differentiation. He has also won a 2015 Graduate Teaching Assistant award.

• Andrea Lee (in Dawn Elliott's lab) has received a 2014 Gore Fellowship and 2015 IGERT fellowship. Lee investigates recovery mechanisms in tendons after injurious loading.

• Rachel Edelstein (in Emily Day's lab) has received Honorable Mention in the 2015 NSF Graduate Research Fellowship Program competition for her proposed research on using actively targeted nanoparticles coated with antibodies and small interfering RNA for the treatment of Triple Negative Breast Cancer, a breast cancer ineligible for conventional treatments because it lacks the appropriate receptors.

• Jilian Melamed (in Emily Day's lab) was awarded a National Defense Science and Engineering Graduate Fellowship. Her PhD research involves developing a nanoparticle-based treatment to overcome the resistance of cancer cells to chemotherapy.

• Ashutosh Parajuli and Michael David were awarded first and second place, respectively, for podium presentations of their research at UD's 12th annual Biomechanics Research Symposium hosted by the Center for Biomechanical Engineering Research. Parajuli (in Liyun Wang's lab) presented "A Cross-Sectional Age-Wise Assessment of Morphology and Bone Formation in Perlecan-Deficient Mice"; David (in Christopher Price's lab) presented "Detailed Quantification of Early Structural Joint Changes in the Murine Destabilized Medial Meniscus Model of Post-Traumatic Osteoarthritis."

Photograph 1: (Left to right) John Slater and Keely Heintz

Photograph 2: (Left to right) Omar Banda and Marika Smith

Photograph 3: Andrea Lee

SARAH ROONEY

Sarah Rooney received her doctoral degree in bioengineering at the University of Pennsylvania. Her PhD work focused on identifying the role of inflammation in the mechanical and biological adaptations of rotator cuff tendon and muscle to exercise and the impact on these adaptations of treatments such as ibuprofen and doxycyline. At Penn, Rooney helped implement active learning techniques in an undergraduate biomechanics course. At UD she will focus on bringing evidence-based teaching practices to the classroom in order to enhance the undergraduate UD BME experience and to prepare our students to be leaders in the field.

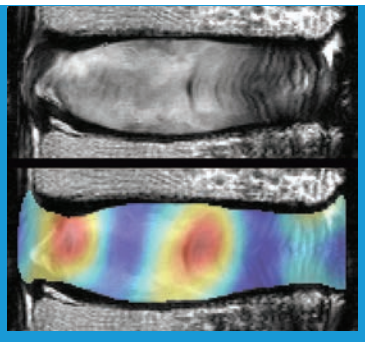
FABRIZIO SERGI

Fabrizio Sergi earned his doctoral degree in biomedical engineering from Università Campus Bio-Medico di Roma in Italy where he developed and validated methodologies for the mechatronic design of wearable robots for gait assistance. Then during his postdoctoral research at Rice University, he explored rehabilitation robotics for the upper limbs, robot-aided therapy for patients with spinal cord injuries, and Magnetic Resonance-compatible robotics for functional neuroimaging. Sergi's main research interest lies in biorobotics, a multidisciplinary field combining robotics, biomechanics, neuroscience and rehabilitation. At UD, he plans to develop novel robotic devices for motion assistance and rehabilitation, and to use such technologies to derive quantitative models of healthy and impaired human motor control.

In January we will welcome two more to our faculty

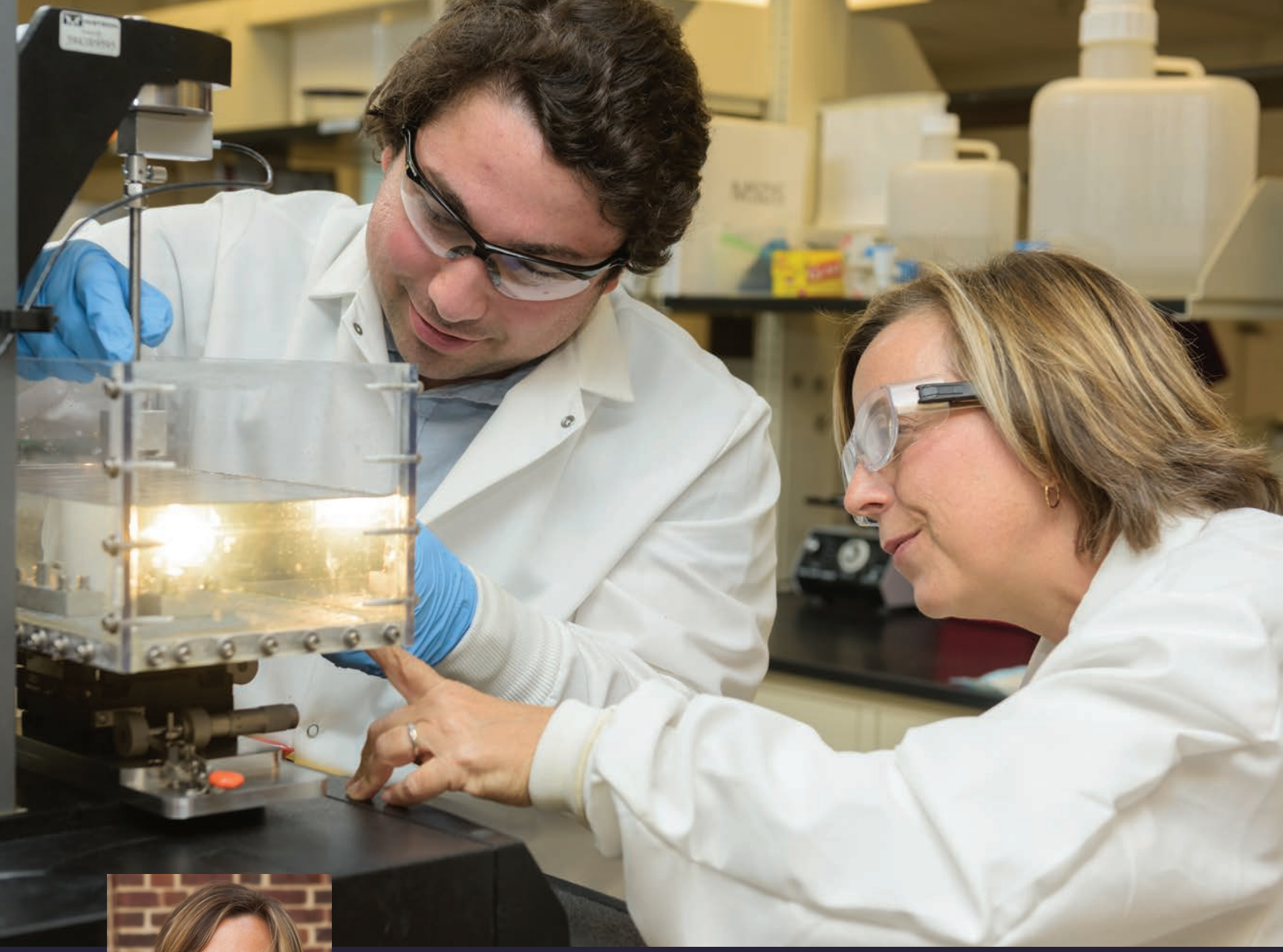
Curtis Johnson received his PhD in mechanical engineering from the University of Illinois at Urbana-Champaign. He currently serves as Assistant Director for Magnetic Resonance Operations of their Beckman Institute Biomedical Imaging Center and specializes in developing magnetic resonance elastography (MRE), a novel imaging method, to noninvasively measure the mechanical properties of brain tissue.

Megan Killian earned her PhD in biomedical engineering from the Michigan Technological University, and is presently completing her postdoctoral work at the Washington University School of Medicine. Her research integrates basic science approaches, applied engineering, and mathematical modeling to identify the effects of mechanical forces on the development and adaptation of soft musculoskeletal tissues.



UD will house Delaware's first functional MRI

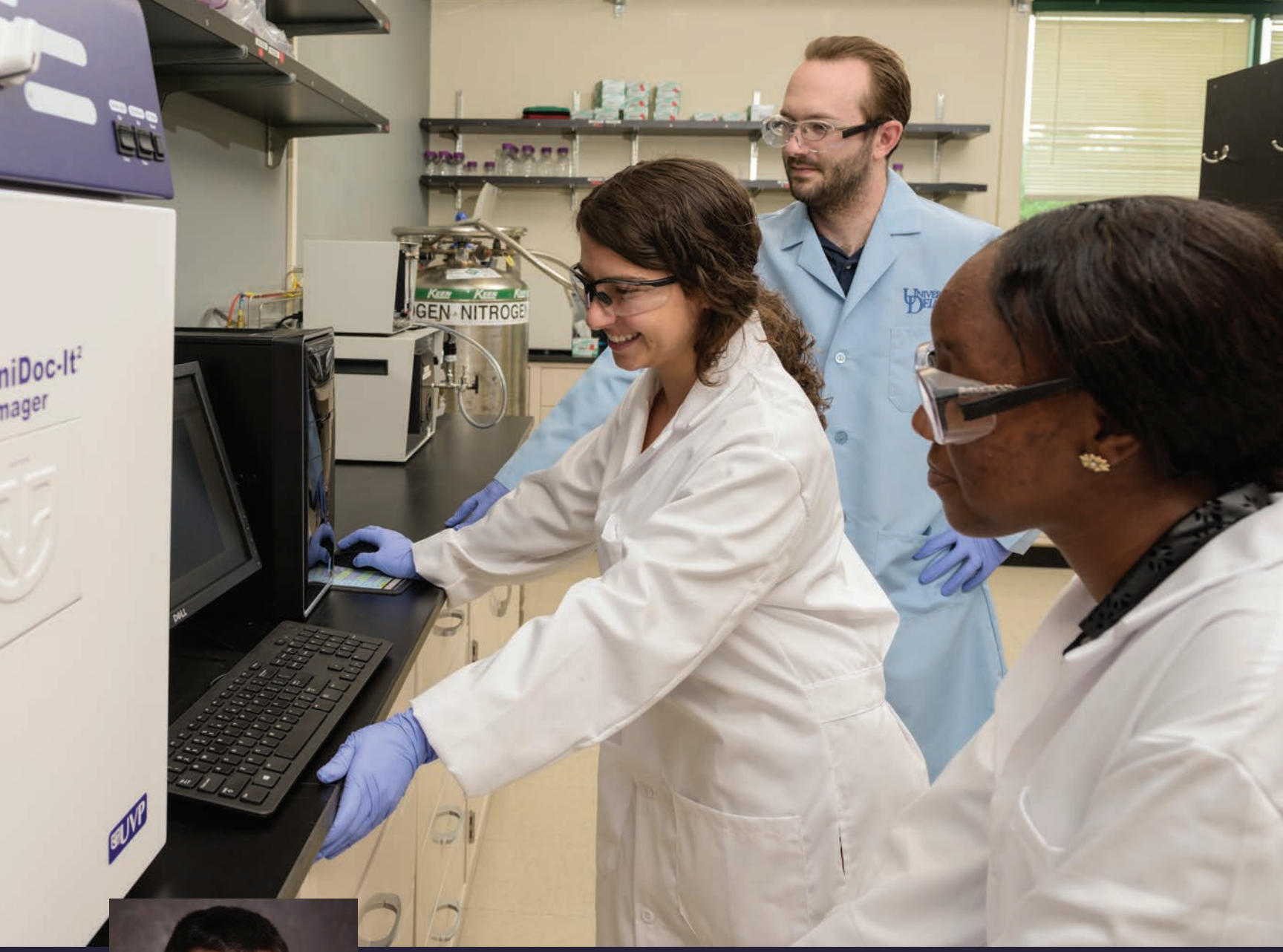
UD will be getting Delaware's first functional MRI (fMRI) in early 2016. In addition to structural imaging throughout the body, this type of MRI will enable researchers to see which structures and neural networks in the brain are being used while engaged in a particular task. "Magnetic resonance imaging is critically important for biomedical engineering and health sciences," said Dawn Elliott, chair of UD's biomedical engineering department. "Having this instrument on campus will be a big benefit to my research and to many others."



FACULTY RESEARCH

DAWN ELLIOTT

Dawn Elliott, professor and the founding chair of biomedical engineering, joined UD in 2011 after spending 12 years on the faculty in orthopedic surgery and bioengineering at the University of Pennsylvania. Elliott studies intervertebral discs as they undergo progressive and irreversible degeneration with age that often leads to low back pain. Since surgical treatment options to remedy this condition are extremely limited and don't restore disc function, new treatments such as surgical repair and tissue engineering are necessary. For the past 20 years Elliott has been studying the biomechanical function of these discs and other orthopedic soft tissues by developing and applying innovative, cutting-edge technologies, including novel mechanical tests, rigorous mathematical models, and state-of-the-art magnetic resonance imaging and analyses. This year Elliott has received the Van C. Mow Medal by ASME for significantly advancing the field of biomedical engineering through her contributions in musculoskeletal tissue structure-function research, her student mentorship with a focus on mentoring women, and her leadership in the bioengineering division of ASME. She also received the inaugural Outstanding Achievement in Mentoring Award from the Orthopaedic Research Society for her exceptional achievement in mentorship and advocacy on behalf of new investigators in orthopedic research.



FACULTY RESEARCH

JASON GLEGHORN

Jason Gleghorn joined UD as an assistant professor of biomedical engineering in fall 2014. He researches how cells assemble into complex multicellular tissues and organs, recently focusing on how newborn lungs emerge with the capacity to sustain life. As lungs grow and develop, their airways branch - a process called morphogenesis. Gleghorn has found that branching is influenced by mechanical forces, specifically pressure, within the developing airways. He has created ways to study morphogenesis using small microfluidic devices that allow him to test how cells within the organ respond to changes in pressure over time. Over 72 hours, what starts off as a single airway adds hundreds of branches, and much more lung capacity. With higher pressures, new branches are added more quickly. Gleghorn's group studies the spatial communication between cells and how the genes and proteins within these cells factor into this branching process, producing enough airways to supply the body with the oxygen it needs. This year Gleghorn has been recognized for this work by Oak Ridge Associated Universities, a network of 115 research-oriented schools around the nation, which awarded him a Ralph E. Powe Junior Faculty Enhancement Award. He has also received a UDRF grant and a pilot project grant from NIH COBRE for the Molecular Design of Advanced Biomaterials to study kidney and blood vessel morphogenesis.

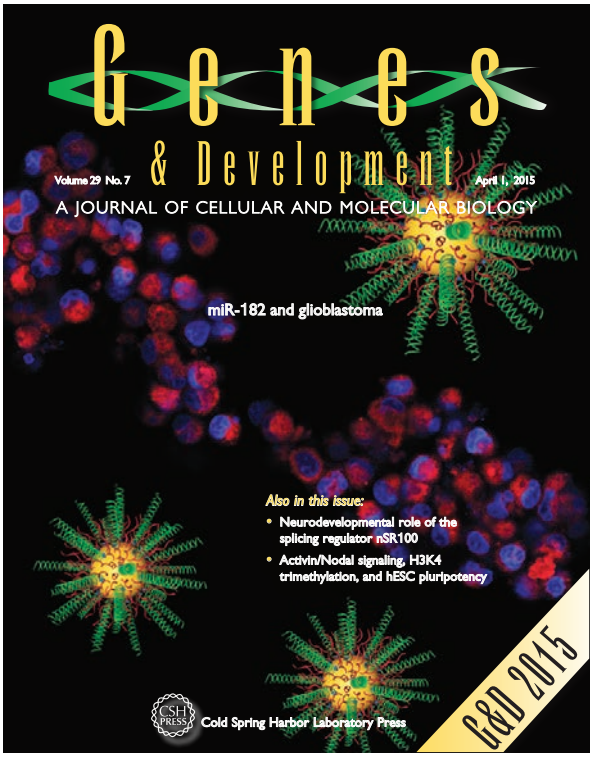
FACULTY RESEARCH

RYAN ZURAKOWSKI

Ryan Zurakowski, after being part of UD's electrical and computer engineering department for 8 years, joined BME as associate professor in fall 2014, becoming director of its graduate program. His lab applies advanced modeling and data analysis techniques to better understand the behavior of HIV in order to suggest novel approaches for its treatment. HIV treatments do not kill infected cells, but instead, stop the infection of new cells and rely on the virus itself to kill the infected cells. Unfortunately, particular infected cells—memory T-cells—are not killed by the virus and can live for years or decades, forming "quiescent" infections that cause HIV to rebound whenever a patient stops treatment. Collaborating with physicians who have followed HIV patients over a decade, Zurakowski has found that a particular group of infected memory T-cells, called "Stem-Cell Memory T-cells" (Tscm) are not only not killed by the virus, but can also produce daughter cells, sustaining the infection indefinitely even though the patient is being treated. HIV-infected Tscm cells in patients on HIV therapy decay more slowly than any other type of T-cell, playing an increasingly significant role in sustaining HIV infection in these patients. However, drugs currently being developed to target stem-cell metabolic pathways may be able to target this cell type, and eliminating these cells will be a major step in developing a true 'cure' for HIV infections.

FACULTY GRANTS & HIGHLIGHTS

Emily Day



Emily Day has received an Innovation and Career Development Award from the Biomedical Engineering Society and a NIH/DE-CTR ACCEL grant to develop nanotechnology to treat breast cancers that are resistant to available drug therapies. She's also part of a research team that was awarded a W.M. Keck Foundation grant to study transforming low-energy light to high-energy light with nanoscale materials in order to improve solar cells, medical imaging and cancer treatments.

She has co-authored a paper that has been selected as the cover of an upcoming issue of Genes & Development (image at left). The paper identifies a small RNA molecule that can suppress cancer-causing genes in mice with glioblastoma multiforme (GBM), a deadly and incurable type of brain tumor. Her group has also published an invited perspective in ACS Nano that overviews nanoparticle-mediated photothermal therapy (PTT) and discusses recent insights into the mechanisms of cell death induced by this technique.

Swati Pradhan Bhatt, scientist in biological sciences, has received a grant from L'Oreal Paris for regenerating eccrine glands for use in artificial skin equivalents.

David Colby, assistant professor of chemical and biomolecular engineering, has received a NSF CAREER Award for cellular reprogramming.

Dawn Elliott was awarded the Van C. Mow Medal by American Society of Mechanical Engineers (ASME) and the Outstanding Achievement in Mentoring Award by the Orthopedic Research Society.

Cole Galloway, professor of physical therapy, joined 75 other internationally recognized thought leaders at TEDMED 2014, "Unlocking Imagination in Service of Health and Medicine." His TED Talk shares the story of the GoBabyGo Program, focusing on the importance of independent mobility for children to fully develop cognitively, emotionally and physically.

Jason Gleghorn has received a NIH COBRE pilot project grant, a UDRF grant and a Ralph E. Powe Junior Faculty Enhancement Award from Oak Ridge Associated Universities (ORAU) to study the mechanics of lung and kidney morphogenesis using microfluidic platforms.

Jill Higginson, associate professor of mechanical engineering, has received a 5-year NIH educational grant with **Jenni Buckley**, **Jeannie Stephens** and **Liyun Wang** to bridge the clinical immersion experience into practical interdisciplinary design as part of the capstone senior design course and a 3-year NSF grant with **Lucas Lu** to run a summer research experience for undergraduates for underrepresented minority students interested in biomechanics. She has also received a 2014 Outstanding Junior Faculty Award and the 2015 Excellence in Teaching Award from UD's College of Engineering.

Kristi Kiick, professor in materials science and engineering and deputy dean of engineering, has been named to the 2014 American Chemical Society (ACS) Class of Fellows for her outstanding accomplishments in scientific research, education and public service.

April Kloxin, assistant professor in chemical and biomolecular engineering, with her mentor **Millicent Sullivan** has received a Strategic Initiative Grant from the UD Research Foundation (UDRF) to study synthetic materials to promote bone regeneration after fractures.

Christopher Kloxin, assistant professor in materials science and engineering, with his mentor **Wilfred Chen** has received a Strategic Initiative Grant from UDRF to research a novel way to deliver drugs to targeted cells.

FACULTY GRANTS & HIGHLIGHTS

Daniel Cortes

Jill Higginson

Kristi Kiick

Jeannie Stephens

Millicent Sullivan

Christopher Kloxin

Cole Galloway

Arun Kumar, assistant professor in medical laboratory sciences, has received a NIH COBRE pilot project grant to develop a nanoparticle-based theranostic agent to treat inflammatory breast cancer metastasis.

Babatunde Ogunnaike, William L. Friend Chair of Chemical Engineering and dean of UD's College of Engineering, has been named a 2014 fellow of the National Academy of Inventors (NAI) for demonstrating a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development and the welfare of society.

Yvonne Ou, associate professor in mathematical sciences, has received a 3-year NSF Division of Mathematical Sciences grant to develop mathematical and computational methods arising from quantitative ultrasound techniques for detecting osteoporosis.

Chandran Sabanayagam, associate scientist at the Delaware Biotechnology Institute, presented work at the annual Biophysical Society and American Institute of Physics meeting that was picked up by media outlets Voice of America, BBC, and NPR. He is studying the effect of zero gravity on the genes of the common ground worm, C. Elegans, work that could produce new insights into the effect of long periods in space on humans.

Hagit Shatkay, associate professor in computer and information sciences, has received two NIH NLM grants: one to identify evidence for adverse drug reactions, and another, with **Chandra Kambhamettu** and **Cathy Wu**, to explore the utility of image-data for improving biomedical information retrieval. She is also on an ACCEL Big-Data grant (PI: Dr. Jurkovitz, Christiana Care) to explore hospitalization patterns in kidney patients. Shatkay was selected as a GLOBEX Fellow at Peking University teaching Computational Biomedicine.

Karin Silbernagel, assistant professor in physical therapy, and **Daniel Cortes**, research professor, have received a 2-year NIH NIAMS grant to evaluate tendon healing using mechanical properties as biomarkers.

April Kloxin

Chandran Sabanayagam

Hagit Shatkay

John Slater

Babatunde Ogunnaike

Liyun Wang

Karin Silbernagel

Swati Pradhan Bhatt

John Slater has received a Delaware INBRE Core Center Access Award and a 2-year Pilot Project award to develop highly vascularized 3D microfluidic systems for high-throughput drug screening. He's also part of a research team that was awarded a W.M. Keck Foundation grant to study transforming low-energy light to high-energy light with nanoscale materials in order to improve solar cells, medical imaging and cancer treatments. Slater has also published a high impact paper in ACS Nano that details a new high-resolution, image-based, cell-derived patterning strategy to produce arrays of homogeneous cells that display the cellular architecture with the anatomical and functional properties of the cells from which the user derived the pattern. This homogeneous cell platform can be used for high-throughput cellular assays.

Jeannie Stephens was chosen to be part of UD's Pathways to Innovation team, a group of faculty working to bring innovation and entrepreneurial education to students across disciplines. UD is one of the second cohort of universities selected by the National Science Foundation for the Pathways to Innovation Program, a program run by Stanford University and the nonprofit organization VentureWell that focuses specifically on undergraduate engineering curricula.

Liyun Wang, associate professor of mechanical engineering, leads a multidisciplinary team who was awarded a 5-year NIH grant to study if the matrix in bone serves to detect mechanical signals.

Ryan Zurakowski has received a NIH NIAID grant and a grant from Merck, Sharp and Dohme to extend his modeling work that shows evidence of uncontrolled HIV replication in sanctuary sites in treated patients with no measurable HIV in their blood.

Biomedical Engineering Faculty

MUSCULOSKELETAL & NEURAL ENGINEERING

Includes aging, degeneration, injury, repair, and regeneration of musculoskeletal and neural tissues and systems

CANCER DIAGNOSIS AND THERAPY

Includes the study, detection, and treatment of cancer

TISSUE AND REGENERATIVE ENGINEERING

Includes harnessing developmental biology, systems biology, and mechanobiology to develop organs and systems to treat human diseases

DISEASE MODELING

Includes determining underlying mechanisms of human disease using computational models of molecular, cellular, or higher level systems

BIOL=Biology; BME=Biomedical Engineering; CBE=Chemical & Biomolecular Engineering; CEE=Civil & Environmental Engineering; CIS=Computer & Information Sciences; DBI=Delaware Biotechnology Institute; ECE=Electrical & Computer Engineering; KAP=Kinesiology & Applied Physiology; MATH=Mathematical Sciences; ME=Mechanical Engineering; MLS=Medical Laboratory Sciences; MSE=Materials Science & Engineering; NEM=Nemours/Alfred I. duPont Hospital for Children; PSYCH=Psychological & Brain Sciences ; PT=Physical Therapy

PRIMARY & JOINT FACULTY	Department	Musculoskelatal & Neural Engineering	Cancer Diagnosis & Therapy	Disease Modeling	Tissue and Regenerative Engineering
Buchanan, Thomas	ME	x			
Day, Emily	BME		x		
Elliott, Dawn	BME	x			
Gleghorn, Jason	BME				x
Higginson, Jill	ME	x			
Jia, Xinqiao	MSE				x
Johnson, Curtis	BME	x			
Killian, Megan	BME				x
Mirotznik, Mark	ECE			x	
Price, Christopher	BME	x			
Rooney, Sarah	BME	x			
Sergi, Fabrizio	BME	x			
Singh, Abhyudai	BME			x	
Slater, John	BME		x		x
Stephens, Jeannie	BME				x
Zurakowski, Ryan	BME			x	
AFFILIATE & ADJUNCT FACULTY					
Akins, Robert	NEM				x
Attoh-Okine, Nii	CEE			x	
Barner, Kenneth	ECE			x	
Beris, Antony	CBE			x	
Binder-MacLeod, Stuart	PT	x			
Braun, Richard	MATH			x	
Buckley, Jennifer	ME	x			
Burris, David	ME	x			
Chen, Wilfred	CBE			x	
Colby, David	CBE			x	
Driscoll, Tobin	MATH			x	
Duncan, Randall	BIOL	x	x		
Epps, Thomas	CBE			x	
Fok, Pak-Wing	MATH			x	
Forbes, Chad	PSYCH	x			
Galloway, Cole	PT	x			
Kambhamettu, Chandra	CIS			x	
Kiick, Kristi	MSE				x
Kirn-Safran, Catherine	BIOL				x
Kloxin, April	CBE				x
Kloxin, Chris	MSE				x
Kumar, Arun	MLS		x		
Lee, Kelvin	CBE			x	
Lee, Samuel	PT	x			
Lenhoff, Abraham	CBE			x	
Lu, Xin (Lucas)	ME	x			
Manal, Kurt	ME	x			
Martin, David	MSE				x
McCulloch, Michael	NEM			x	
Nohe, Anja	BIOL	x			
Ogunnaike, Babatunde	CBE			x	
Ou, Yvonne	MATH			x	
Papoutsakis, Eleftherios	CBE				x
Pochan, Darrin	MSE				x
Poulakakis, Ioannis	ME	x			
Pradhan-Bhatt, Swati	BIOL		x		x
Rabolt, John	MSE				x
Reisman, Darcy	PT	x			
Sabanayagam, Chandran	DBI				x
Santare, Michael	ME	x			
Schleiniger, Gilberto	MATH			x	
Shatkay, Hagit	CIS			x	
Silbernagel, Karin	PT	x			
Snyder-Mackler, Lynn	PT	x			
Stanhope, Steven	KAP	x			
Sullivan, Millicent	CBE				x
Taufer, Michela	CIS			x	
Wang, Liyun	ME	x			
Wu, Cathy	CIS			x	

The BME External Advisory Council held its annual meeting in November 2014. From left: Lynda Myrick, Jack Kramer, Bruce Robertson, Michael Axe, Helen Stimson, John Flynn, Dawn Elliott, Michele Marcolongo

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2015 Summer Scholars Pranita Muralidhar is one of sixteen BME students selected to participate in our 2015 Summer Scholars program.