annual report

SCHOOL OF

Biological AND Health Systems Engineering

IRA A. FULTON SCHOOLS OF engineering

ARIZONA STATE UNIVERSITY

Enrollment Fall 2014

Total Enrollment
1,065

Bachelor
878

Master
112

Doctoral
75

Undergraduate
878

Graduate
187

New First-time Freshman (Full-time and Part-time)

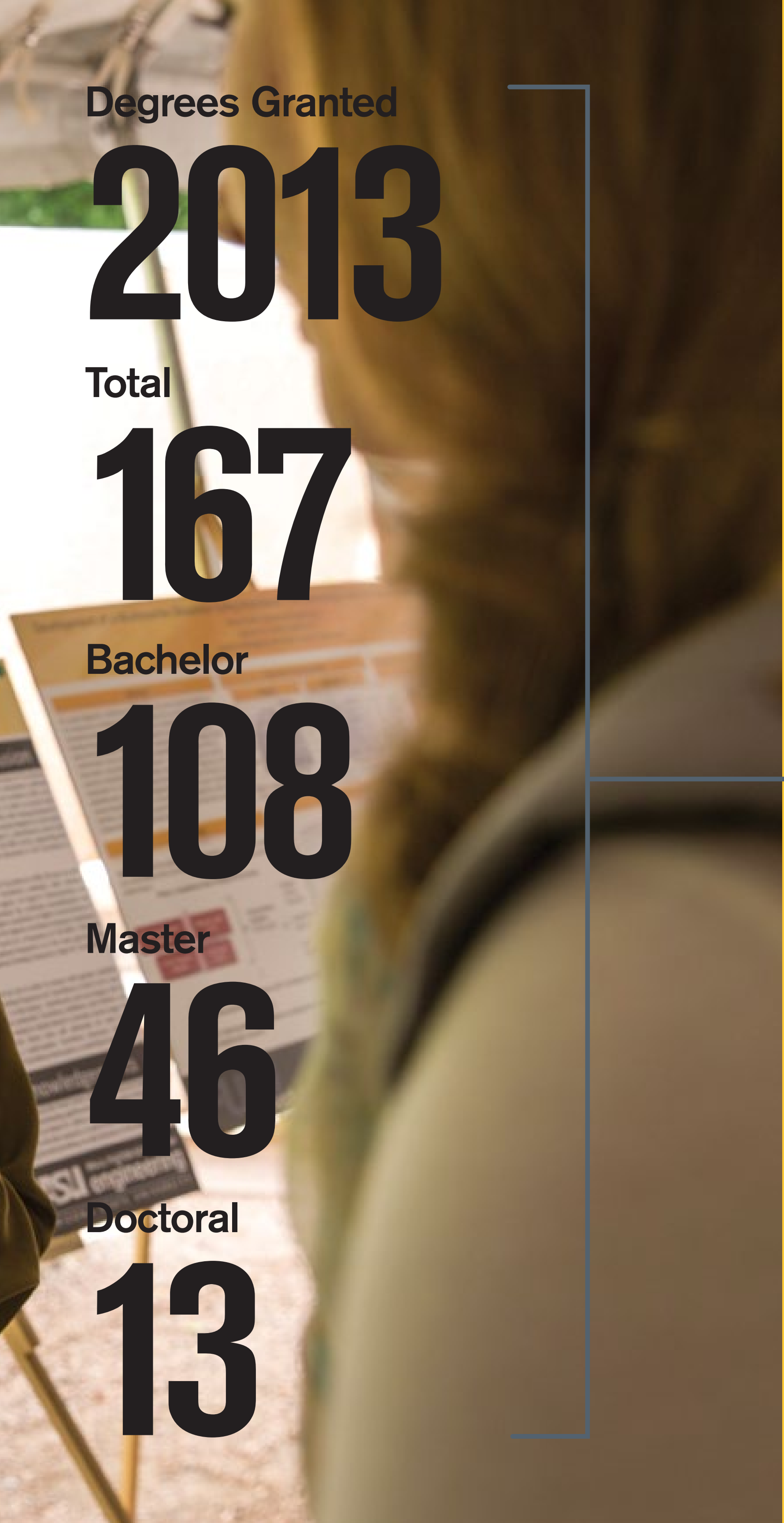
Average ACT
27.5

Average SAT
1,253

95% First-time Full-time Freshman Retention

39% Female

36.4% Undergraduate Students in Barrett, The Honors College



Degrees Granted

2013

Total

167

Bachelor

108

Master

46

Doctoral

13

IRA A. FULTON SCHOOLS OF **engineering**

ARIZONA STATE UNIVERSITY

engineering.asu.edu

Transcending the traditional

Focusing on the student experience and student success

Inspiring future engineers

Pursuing use-inspired research

Attracting top faculty

School of Biological and Health Systems Engineering

Harrington Bioengineering program

sbhse.engineering.asu.edu

Biomedical Engineering, B.S.E, MS., Ph.D.

Biological Design, Ph.D.

Message from the Director

our vision

To become a leading biomedical engineering program that effectively engineers novel solutions to improve human health and provides unique interdisciplinary training for the next generation of biomedical engineers.

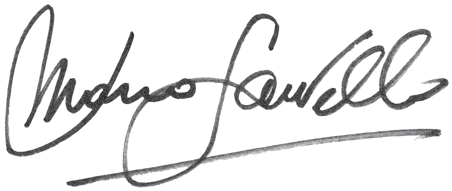
Dear friends and colleagues,

I am happy to share with you our annual report about the School of Biological and Health Systems Engineering at Arizona State University. As biomedical engineering continues to be the fastest growing profession, our school is dedicated to providing the next generation of biomedical engineers with the skills necessary to become problem solvers, innovators, leaders and entrepreneurs.

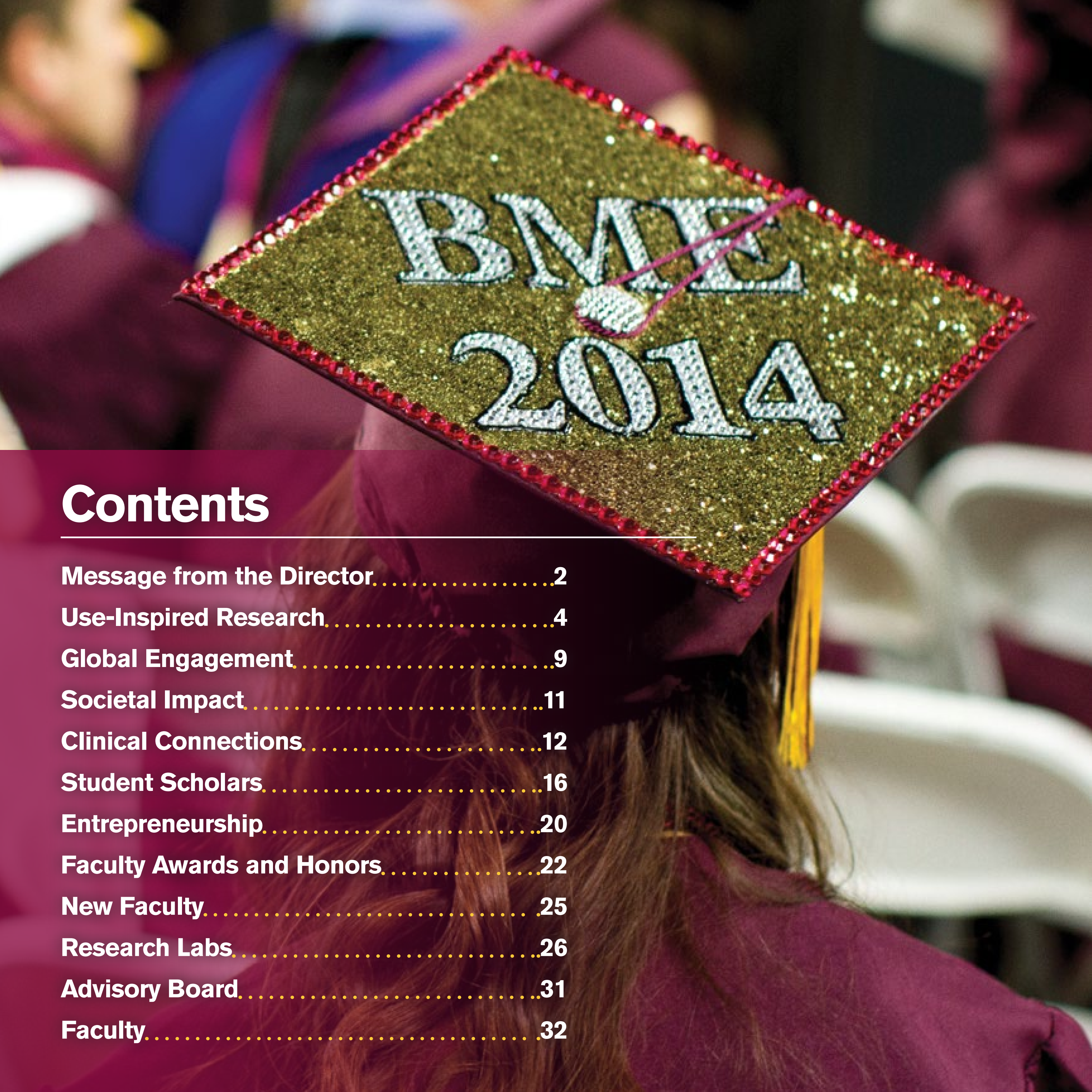
The school continues to evolve and grow in terms of students and faculty, as well as breadth and depth of expertise. The impact of the work of our faculty and students has been recognized in a wide variety of ways, ranging from honors and awards to prestigious publications and extramural funding. Yet, the ultimate metric is the difference our scholars are able to make in the quality of life and health of our community. To further this objective, we continue to engage the biomedical industry and clinical community in tackling challenging clinical problems, while leveraging our faculty's interdisciplinary expertise and attracting talented students and faculty.

Please remember that this report focuses on our past year. If you want to stay up to date with our most recent achievements, please visit our website at sbhse.engineering.asu.edu, or drop by for a visit to experience firsthand what makes our students and faculty unique.

We look forward to hearing from you.



Marco Santello, Ph.D.
Director
School of Biological and Health Systems Engineering
Harrington Endowed Chair and Professor



Contents

Use-Inspired Research

NIH grants reflect vibrant biomedical engineering research environment

Researchers from the school have had a remarkable year in terms of funding from the National Institutes of Health, receiving grants amounting to more than $7 million in research support.

Bioengineering professor and school director Marco Santello, also an NIH proposal reviewer, said the hyper-competitive environment, as well as federal budget tightening, is what makes it remarkable that the biomedical engineers, physicists, neurophysiologists and synthetic biologists on the school's faculty have been awarded this volume of NIH research grants within the past year.

Assistant professor Rosalind Sadleir has been awarded NIH grants of $1.8 million and more than $400,000 for separate research pursuits to develop new imaging techniques for examining the fundamental processes of the brain and for understanding mechanisms of treatments for neurological disorders and stroke.

Assistant professor Sarah Stabenfeldt has a $2.3 million NIH grant for a project aimed at developing methods to better detect, diagnose and treat traumatic brain damage.

Associate professor Jeffrey Kleim recently received an NIH award for $411,000 to support his work with Stabenfeldt investigating new therapies for treating traumatic brain injuries.

Research led by assistant professor Karmella Haynes to design proteins that will prevent or arrest the development of cancer is being funded by a $390,000 NIH grant.

Xiao Wang, an assistant professor, will lead research supported by an NIH grant of more than $1.5 million to better understand the functions and behavior of the human body's network of genes.

The project is expected to provide knowledge to aid development of medical therapeutics, particularly regenerative medicine techniques.

The NIH awarded $400,000 to a project teaming Santello with researchers at the Mayo Clinic and the Italian Institute of Technology to pursue advances in technology to improve prosthetic hands.

Associate professor Brent Vernon's $150,000 NIH Small Business Technology Transfer grant is supporting his partnership with Sonoran Biosciences to develop an innovative delivery system for antibiotics to fight infection in open fracture wounds. Sonoran Biosciences was founded by a team led by Derek Overstreet, who worked in Vernon's lab while earning his doctoral degree in biomedical engineering at ASU. The project involves a clinical partnership with Dr. Alex McLaren, who is with the Banner Health Orthopedic Residency Program.

"For the school's faculty to get this number of NIH grants in a short span of time is impressive considering the competition," said professor Raymond DuBois, executive director of the Biodesign Institute at ASU. "One of ASU's great strengths is the blending of technology science and basic science, and these new grants reflect a coming-of-age for that intersection."

Just as extraordinary, Santello said, is that faculty members are earning the kinds of grants that have historically been awarded predominantly to researchers at universities with medical schools on campus.

"These grants are a stamp of approval, a recognition that we are doing research in a wide range of critical endeavors in health and biomedical engineering, and that we have developed a high-quality and thriving research environment," Santello said.

Expanding the tool kit for detecting, treating traumatic brain injury

Traumatic brain injury is currently revealed by using a series of physiological and cognitive tests along with standard medical imaging, such as magnetic resonance imaging (MRI). The techniques are excellent for diagnosis of moderate to severe traumatic brain injury, but less effective for diagnosing mild injury and for predicting the extent of its impact.

Assistant professor Sarah Stabenfeldt believes one element missing from the diagnostic tool kit is the ability to detect signs of brain injury at the molecular and cellular levels. She has received the National Institutes of Health (NIH) Director's New Innovator Award to support her work to develop such molecular tools. The grant is providing $2.3 million to fund her work for five years.

Stabenfeldt has been studying the possibilities of using nanoscale devices for enhanced detection and treatment of brain injuries ranging from mild to severe.

Her goal is to develop a nanoparticle system decorated with engineered nanobodies that can be introduced into the bloodstream as "targeting probes" that have the ability to locate the molecular and cellular source of brain damage. Stabenfeldt describes the probes as similar to balls with Velcro or suction cups on them, facilitating the nanoparticles to attach themselves to the injured areas in the brain.

Once attached, they would then serve a multitude of functions ranging from diagnostic contrast agent for medical imaging to delivering doses of medicinal drugs to the area—drugs that would jump-start the healing process.

She will be collaborating with three fellow faculty members, assistant professor Vikram Kodibagkar, associate professor Jeffrey Kleim, and professor Michael Sierks. She also will work with medical professionals at the Barrow Neurological Institute at Phoenix Children's Hospital including Dr. David Adelson, director of the institute, and Jonathan Lifshitz, director of the Translational Neurotrauma Research Program.

Use-Inspired Research

Mapping flow of bio-electrical current to reveal brain's inner workings

Assistant professor Rosalind Sadleir is leading research to develop methods of producing images of the most fundamental signatures of brain activity—and ultimately bringing a deeper understanding of the workings of the brain as a whole.

Sadleir is working to "directly image the cells that are involved and look at the detailed characteristics of these active brain structures." Employing her expertise in bio-electricity and neural engineering, she is pursuing the goal by devising techniques to reveal the electrical properties of these cells.

She is looking for action potentials—the hallmark of the processes that take place during the firing of a neuron. As that begins to happen, channels in neural membranes open and ions move into and out of the cell. The process causes a rapid increase in the voltage across nerve fiber. The electrical impulse can then spread down the fiber. As an action potential happens, the conductance of a neural cell membrane changes, becoming around 40 times larger than it is when the cell is at rest.

Sadleir's lab team is conducting further measurements and validations of this observation using both sophisticated imaging and modeling approaches, with help from fellow faculty members, assistant professor Vikram Kodibagkar and research professor Mark Spano.

The research is also targeted at mapping the broad distribution of conductivity throughout the head. By mapping the distribution of current—formed when an external electrical field is applied to the scalp—researchers hope to get a clearer idea of the mechanism underlying emerging therapies such as transcranial direct current stimulation, called tDCS. This therapy is being used for many applications, for example to affect cognitive performance, promote recovery after stroke and to treat epilepsy and depression.

To accomplish this in her Neuro-Electricity Lab at ASU, she is using an advanced form of imaging known as magnetic resonance electrical impedance tomography (MREIT). The technology enables examinination of the behavior of single cells and the detection of small changes in neural activity at the cellular level.

Her progress in these studies has earned support from the National Institutes of Health (NIH). One grant is providing about $1.8 million over four years. A second NIH grant, through the National Institute for Neurological Disorder and Stroke is providing about $410,000 over two years.

The imaging techniques she is trying to refine promise to give scientists and engineers more effective ways to seek answers to questions about how the brain operates. In addition, her research findings could be applied to improving medical electrical-stimulation techniques used as therapeutic treatments for movement disorders –primarily Parkinson's disease, but also epilepsy, muscular dysfunction, chronic pain and depression.

Quest to unravel mysteries of our gene network

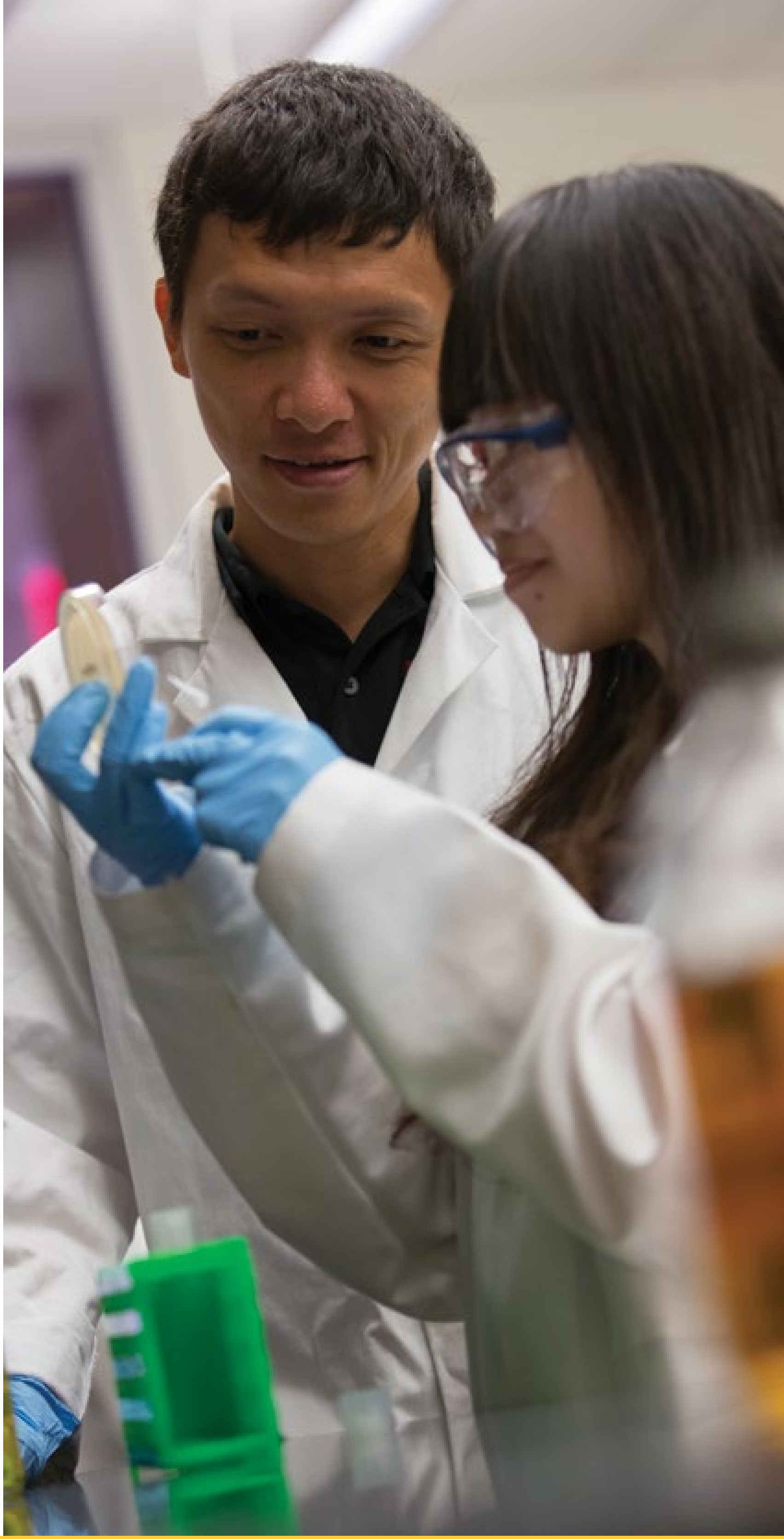
The human genome contains roughly 27,000 genes, interconnected through an intricate and complex network that operates to shape both the structure and function of our bodies.

Assistant professor Xiao Wang is leading research to understand the fundamental nature of gene networks. He wants to produce a systematic and quantitative picture explaining how and why these networks behave the way they do, and pinpoint what guides them in their "decision-making" at the cellular level.

The novel techniques Wang's team will apply in pursuit of new knowledge have led to a $1.5 million grant from the National Institute of General Medical Sciences, one of the National Institutes of Health.

Also participating in the research is Jeff Hasty, a professor of microbiology and bioengineering at the University of California, San Diego, and ASU biomedical engineering doctoral students David Menn and Fuqing Wu.

The result could be a base of knowledge supporting a springboard to progress in vaccine development, cancer treatment, prevention of infectious diseases and molecular prosthesis.



Use-Inspired Research

Building proteins to counteract cancer

Assistant professor Karmella Haynes wants to help the body fight cancer by designing proteins to stop the disease.

She is leading research to explore the capability of genetically engineered proteins to reactivate tumor suppressors in the cells of the body to prevent the onset of cancer, or arrest its development.

Cancer can set in when certain genes in the nucleus of cells lose their ability to restrain tumor development. That happens when chromatin—DNA and proteins that are folded together in chromosomes—becomes overactive. Cancer causes too many folding proteins to be produced. Then the tumor-restraining genes are folded too much and genes lose their ability to function properly.

Supported by a grant from National Cancer Institute through the National Institutes of Health (NIH) providing $390,000 over three years, she is working on a technique for effectively introducing the engineered proteins into chromatin structures. The new proteins would be programmed to attach to genes in a manner that should restore the tumor-suppressing function "and start killing cancer cells," she said.

Haynes will be aided by fellow ASU researchers. Mark Spano, an SBHSE research professor, will do the computing work to develop the modeling Haynes will need to predict the behavior of cells in growing cell populations. Joshua LaBaer, professor of chemistry and biochemistry and director of the Virginia G. Piper Center for Personalized Diagnostics at ASU's Biodesign Institute, will provide expertise in proteomics, genomics and use of big data.

bioMEDIC helps to commercialize medical devices in Vietnam

SBHSE is making strides on a bi-national consortium of academic, industry, clinical and government partners to foster innovation, entrepreneurship and economic development in Vietnam. The work is in partnership with the ASU Office for Global Outreach and Extended Education.

The effort has led a three-year grant proposal, “BioMedical Engineering Device Innovation Consortium” (bioMEDIC) in response to the call of the “Fostering Innovation through Research, Science and Technology” (FIRST) Project by the Vietnamese Ministry of Science and Technology (MoST).

The funding from MoST is made available through a loan by the World Bank. The Biomedical Engineering departments at the International University, Vietnam National Universities (IU-VNU) and the University of Technology and Education (UTE), both at Ho Chi Minh City, will be the leading and co-leading member, respectively, and ASU will be the international partner. Although the FIRST Project provides funding for three years, the sustainability of the consortium will be enabled through membership fees from industry partners.

The bioMEDIC bi-national consortium will establish a new and urgently needed network of professionals from industry, clinical and academic institutions to design, test, create and commercialize biomedical devices. The consortium will foster the creation of new Vietnamese biomedical companies while supporting the growth of existing industry by enabling collaboration among partners.

Additional deliverables include patents related to biomedical devices and technology, professional training of a competitive workforce ready to support the accelerated growth of biomedical industry in Vietnam, and innovative biomedical solutions that can effectively meet the need of the Vietnamese population.

Latin American efforts target use of technology in public health

The school is targeting ways to increase the use of technology in public health and higher education initiatives in biomedical technology throughout Latin America. Ongoing collaborations include ASU faculty from the Department of Chemistry and Biochemistry, the School of Human Evolution and Social Change and the Biodesign Institute.

In Panamá, the school is completing an agreement with the Ministry of Health to launch a pilot project on the Pre-Surveillance of Arboviruses in 2016. The agreement is built upon research in mathematical epidemiology, the development of portable prototype diagnostics and predictions of the emergence of a newly introduced arbovirus (Chikungunya) into the Caribbean.

In Venezuela, presentations and planning meetings have led to a strong letter of interest from the Health District Authority (Salud Chacao) for the district of Chacao in Miranda State, Venezuela. The interest letter allows efforts to seek joint funding from international organizations to stage a field demonstration using mathematical methods and portable PCR testing of diseases in the environment.

In Mexico, Solex-Vintel—a software and sensor company in the Santa Fe district of Mexico City—added a social benefit component to their business development proposal submitted to the Mexican National Research Council (Conacyt). If the funding goes through, the school would develop a contract to fulfill their social benefit component by testing early disease diagnostics systems in several states hard hit by environmental effects of arbovirus diseases.

In Ecuador, the school has provided reviews and guidance to the new Biomedical Engineering degree program at Yachay University. Yachay University will begin developing the degree program in 2015 as part of a national strategy to develop a City of Knowledge in Yachay, near Quito, Ecuador.

Additionally, ASU has developed demonstrations of analytics and systems model software tools for the Ecuadorian Pharmaceutical Public Enterprise (Enfarma), which could lead to a proposal to create disease-specific analytics. The school, in collaboration with Yachay University and Enfarma, has also initiated discussions to develop a strategy for a national registry of genetics in order to support translational medicine for the National Secretary for Higher Education, Science, Technology and Innovation (Senescyt).

India initiative provides training for students

ASU is working with the Department of Biotechnology at PES (People's Education Society) University in Bangalore, India, to build biomedical engineering research, through work with students and the university as a whole.

The goal is to provide students with the tools to meet important academic and industrial needs in healthcare, both nationally and globally.

The collaboration includes SBHSE and ASU's Office of Knowledge Enterprise Development and has led to the submission of a proposal for the "Centres with Potential For Excellence in Particular Areas" (CPEPA) in response to the call from the "University Grants Commission" (UGC) by the Department of Higher Education and the Ministry of Human Resources, through the Indian Government.

While this initial project is awaiting a decision on funding support, the international partnership is aiming to be initiated this summer; where 15-20 Indian undergraduate students will be travelling to ASU to complete an 8-week summer course.

This partnership will serve to meet the essential needs of the local Indian community, by connections between academic institutions and collaborating industries, to train the next generation of global engineers and scientists.

Additional efforts will include professional training of students to be competitive and highly prepared for the workforce; promoting international collaborations; providing the bi-national faculty with additional funding opportunities; establishing a channel for talented students to continue their education at ASU; advancing strong industrial connections; fostering innovative and entrepreneurial initiatives; and translating relevant research into commercially-available products.

Workshop helps to spark pursuit of rehabilitation robotics progress

When the Rehabilitation Robotics Workshop started in 2013, it was hoped it would generate at least enough interest to justify a second workshop two years later. The event was such a success the plan changed right away and a second workshop was organized for the following year.

The events have resulted in participants forming research collaborations and teaming up to develop grant proposals, and to propose ideas for taking new directions for studies, research and technology development in the field.

“We got overwhelmingly positive feedback from the people who came to speak and present, from faculty and from students,” said SBHSE Director and workshop organizer Marco Santello.

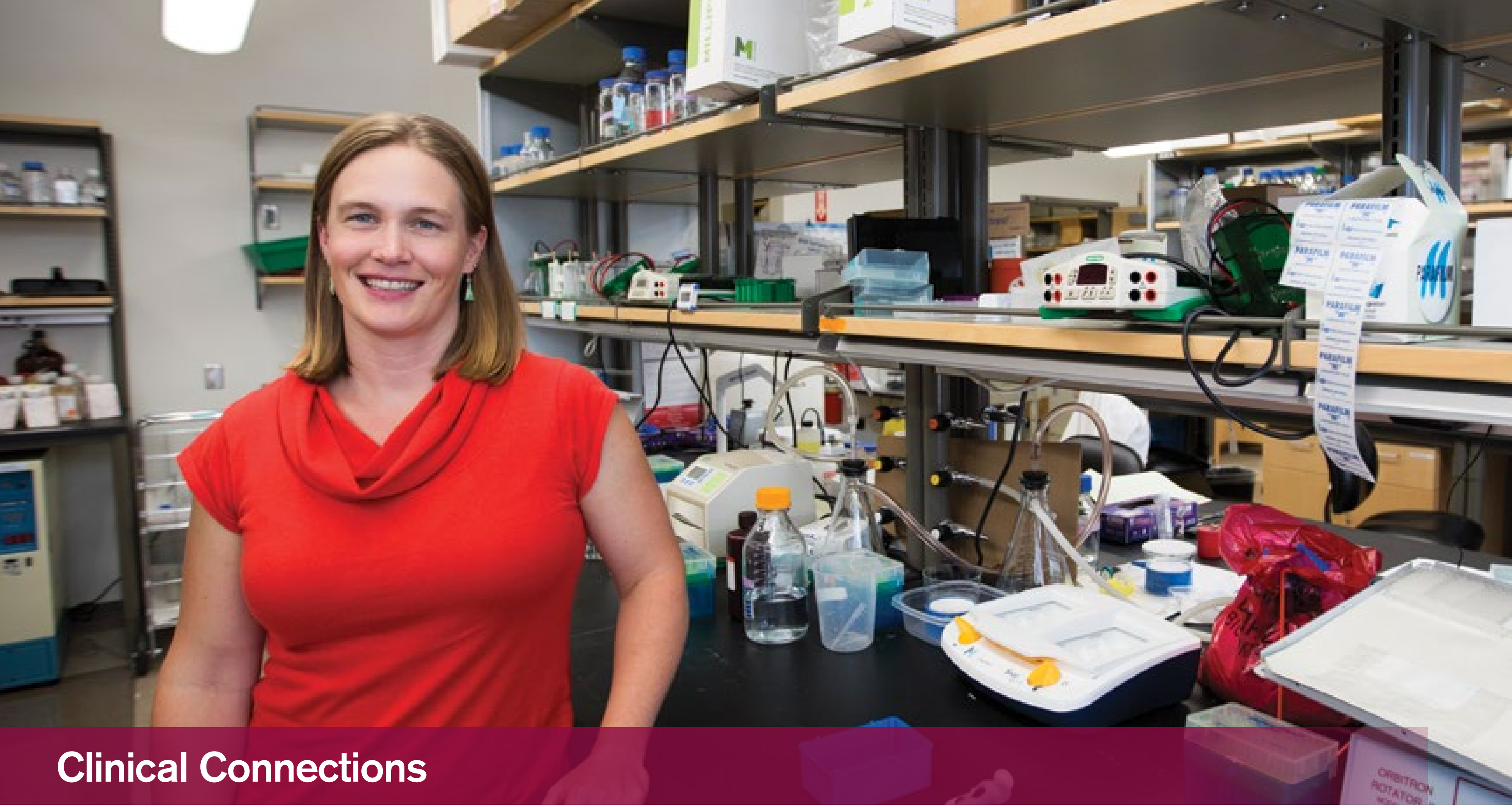
The workshop is supported by a Virginia G. Piper Charitable Trust Health Solutions grant.

The first two workshops attracted several leading experts in the booming field of applying robotic technologies to improving devices and systems for physical rehabilitation therapy.

ASU’s workshop explores the state-of-art robotics technologies being used in healthcare, the challenges in advancing rehabilitation robotics, and looks at a multitude of areas in science and engineering that are increasingly studying the potential of human-robot interaction.

“Rehabilitation robotics is drawing more people for various fields, from different branches of engineering, from physiologists, physical therapists, medical clinicians and others,” Santello said. “So interest should be high enough that we can continue to do the workshop every year.

For students, the event has offered a valuable opportunity. “They are able to meet and talk to leading experts, something they would rarely be able to do otherwise,” he said.



Clinical Connections

Stabenfeldt helps produce new material to prevent excessive bleeding

A new synthetic material, developed in part from the research of assistant professor Sarah Stabenfeldt, promises to aid the natural process of blood clotting and the emergency treatment of traumatic injuries.

Stabenfeldt, a co-first author of the paper in Nature Materials, was on the team of physicians, scientists and engineers that created the new class of synthetic platelet-like particles, which are based on soft hydrogel materials.

The new particles are proving to be effective in slowing bleeding and circulating safely in the bloodstream. The advancement could potentially help reduce the number of deaths from excessive bleeding, according the lead author of the paper.

Stabenfeldt's role in the research focused on fibrin, a protein that is critical in the blood clotting process. It forms a fibrous mesh that helps impede blood flow.

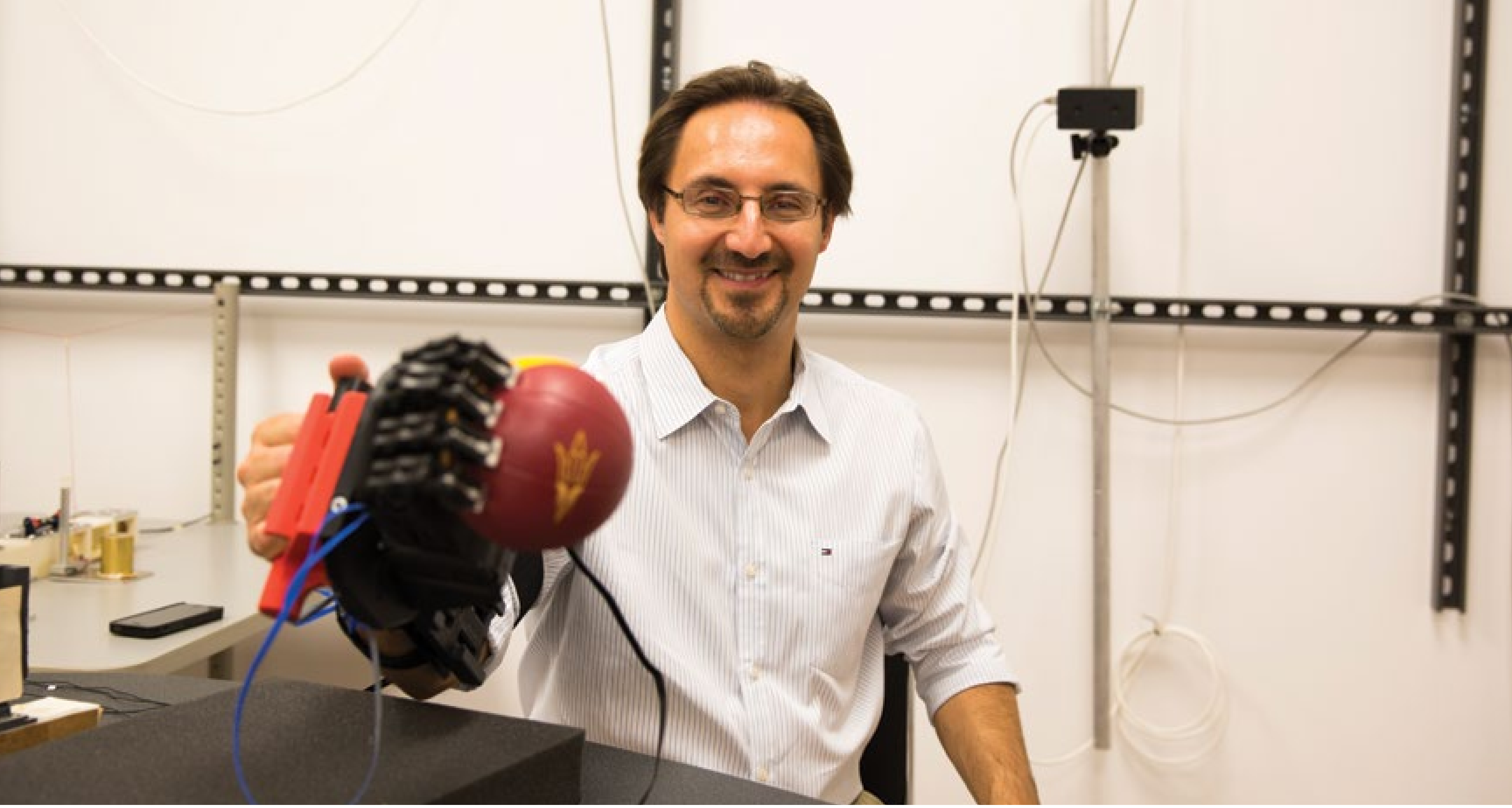
She identified a unique single-chain antibody fragment that specifically recognizes polymerized fibrin—the fibrin mesh found in blood clots.

The antibody fragment was then attached to the synthetic hydrogel particles to enable specific interaction with native fibrin clots that ultimately enhanced the effectiveness of the clotting process by decreasing the time it took for blood to clot.

"To achieve this targeting specificity," she explained, "I used a molecular biology technique known as phage display, which is essentially using biological machinery to screen a large array of biological motifs to identify the motif with the highest affinity and specificity to your target of interest."

In her ASU lab, Stabenfeldt has been using the same phage display screening process to identify novel targeting motifs in her research to improve the detection and diagnosis of traumatic brain injuries.

Her collaborators on the overall project reported on in Nature Materials included researchers at Georgia Institute of Technology, Chapman University, Children's Healthcare of Atlanta and Emory University.



Advances in robotics technology promise performance boost in prosthetic hands

Work on the design, development and testing of next-generation prosthetic hand technology by a team of researchers from ASU, Mayo Clinic and the Italian Institute of Technology will proceed with support from the National Institutes of Health (NIH).

Neurophysiologist Marco Santello, professor and school director, is collaborating with physician Karen Andrews of the Mayo Clinic and roboticist Antonio Bicchi of the Italian Institute of Technology on a project that employs new advances to simplify the control of grasping movements by a robotic hand.

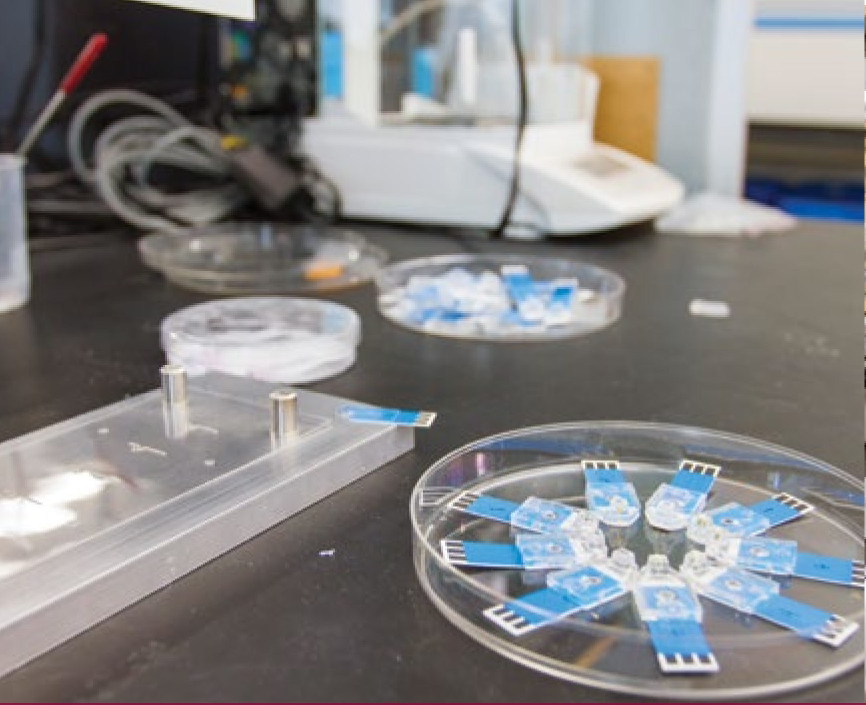
Their progress has earned an NIH R21 grant that will provide them approximately $400,000 over two years to pursue improvements in artificial hand technology.

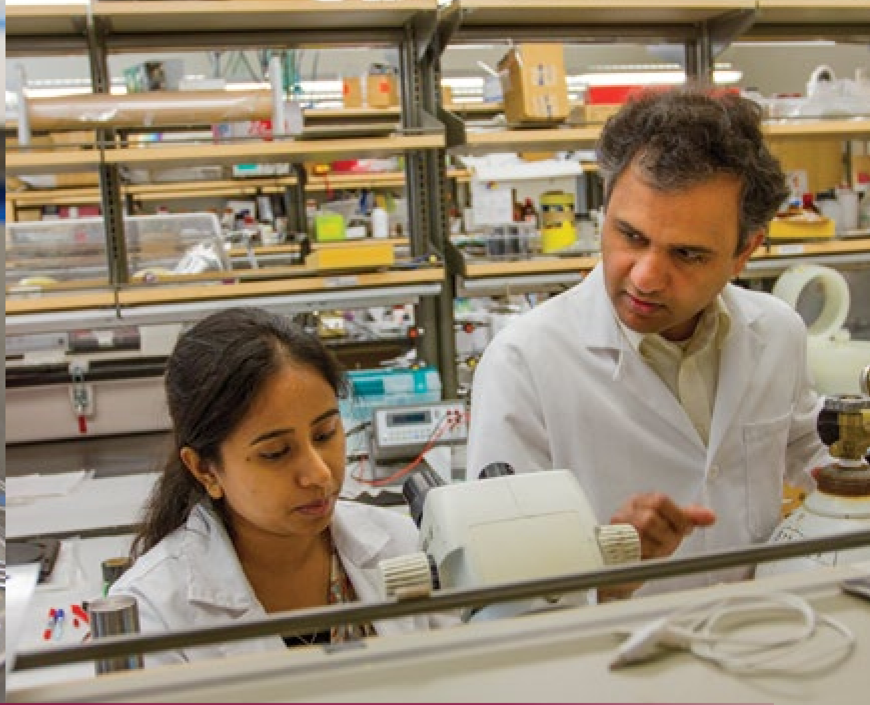
Despite advances in prosthetic hands, current technologies still provide only limited functionality and lack adequate grasping capabilities. Costs, the weight of devices, durability and maintenance are additional drawbacks to existing hand prostheses, he said.

To improve the technology in each of these areas, a new prosthetic hand will be fashioned using designs originated by Bicchi and his collaborators at IIT and the Italian Centre for Health and Safety at Work (INAIL). They have been developing a prosthetic hand based on the innovative robotic hand called the Pisa/IIT SoftHand, developed by the researchers at the University of Pisa and IIT.

The design of the SoftHand is based on “soft synergies” that capitalize on human hand synergies and novel “soft” robotics technologies. The Softhand was initially designed and used for robotics applications, but preliminary data indicate it can be adapted to enable people to grasp and manipulate a wide variety of objects with minimal training.

The ASU, Mayo and IIT research project will focus on the adaptation of the SoftHand to people with amputations, with the aim of providing clinical feedback that will guide design modifications of the SoftHand to develop new myoelectric prosthetic hands.





Clinical Connections

Mayo grant will give boost to development of device to aid diabetics

An award of $65,000 from Mayo Clinic in Arizona will help assistant professor Jeffrey La Belle continue development of a tear-based glucose meter designed to help people living with diabetes monitor their health.

The funding will enable La Belle's research team to take the next step toward preparing for clinical trials of the device that can assess glucose levels by drawing tear fluid from the eyes. Current devices for measure blood glucose levels require piercing the skin to draw blood samples.

La Belle has been working on the tear glucose sensor for more than three years in collaboration with Curtis Cook, M.D., and chair of endocrinology at Mayo Clinic-Scottsdale and Dharmendra Patel, M.D., the clinic's chair of ophthalmology.

The tears sensor project began with support from a Mayo Clinic seed grant in 2011. BioAccel, an Arizona nonprofit that works to bring emerging biomedical technologies to the marketplace, is also supporting development of the tear glucose sensor. Clinical trials are to be conducted at Mayo Clinic.

Muthuswamy helping to unlock mysteries of the brain

Associate professor Jit Muthuswamy has been collaborating with researchers at Sandia National Laboratories to gain deeper knowledge about brain function.

Through work in his Neural Microsystems Laboratory, he is developing microscale and nanoscale robotic technologies that record and measure the electrical signals generated by the neurons that determine how the brain and the nervous system function.

He and fellow researchers are striving to create more reliable and intelligent neural interfaces to better understand changes in the wiring of the brain. Their goal is to improve techniques to prevent, diagnose and treat brain disorders.

Muthuswamy and his ASU team have been doing research on autonomous neural interfaces for the past 13 years, with ongoing support from the National Institutes of Health, the Whitaker Foundation, the Arizona Biomedical Commission and the U.S. Defense Advanced Research Projects Agency. His lab has been leading the collaborative research effort with Sandia National Laboratories, which is a subcontractor on the project.

Frakes' research team helps advance virtual artificial heart implantation

A team led by associate professor David Frakes has performed what they believe is the first virtual implantation of a pioneering artificial heart. And not only that, the surgery needed to be planned for an undersized adolescent patient instead of the adult-sized patients who normally receive the artificial heart.

Frakes has been working with technology developed by the Tucson-based company SynCardia Systems Inc., which has developed the Total Artificial Heart for adult patients with end-stage biventricular heart failure who are waiting for a permanent heart transplant. Frakes is using advanced software developed by the Belgium-based company Materialise to generate 3-D reconstructions of cardiovascular, respiratory and skeletal structures that provide a virtual screening of pediatric patients that helps ensure a proper fit of the artificial heart in the patients.

Through that technique, Frakes aided a Phoenix Children's Hospital team to map procedures for the first-ever virtual implantation of the Total Artificial Heart. The actual device was implanted into a 14-year-old boy, one of the smallest pediatric patients to date to receive a Total Artificial Heart as a bridge until actual heart transplantation can be performed.

He says that initially the Total Artificial Heart was implanted into the teen, but complications arose. Images were obtained at the hospital and an accurate 3-D model was made by engineers at ASU. The 3-D data set helped reveal the reason for the complication, allowing the team to create virtual implantations for small patients who will need the Total Artificial Heart in the future.

After the implantation, a clinical review and a series of measurements–called a virtual fit analysis–determined whether the Total Artificial Heart could properly fit into the boy's chest cavity. Phoenix Children's Hospital has adopted this procedure for use with all future Total Artificial Heart candidates.

Frakes says his team and partners at Phoenix Children's Hospital plan to continue the use of virtual implants pre-operatively to identify suitable candidates for the Total Artificial Heart and other cardiac-support devices. Frakes' team has since performed four other pre-operative planning scenarios with virtual implantations performed by research assistant and doctoral student Justin Ryan.

Hospital's cardiac care boosted by ASU biomedical engineers

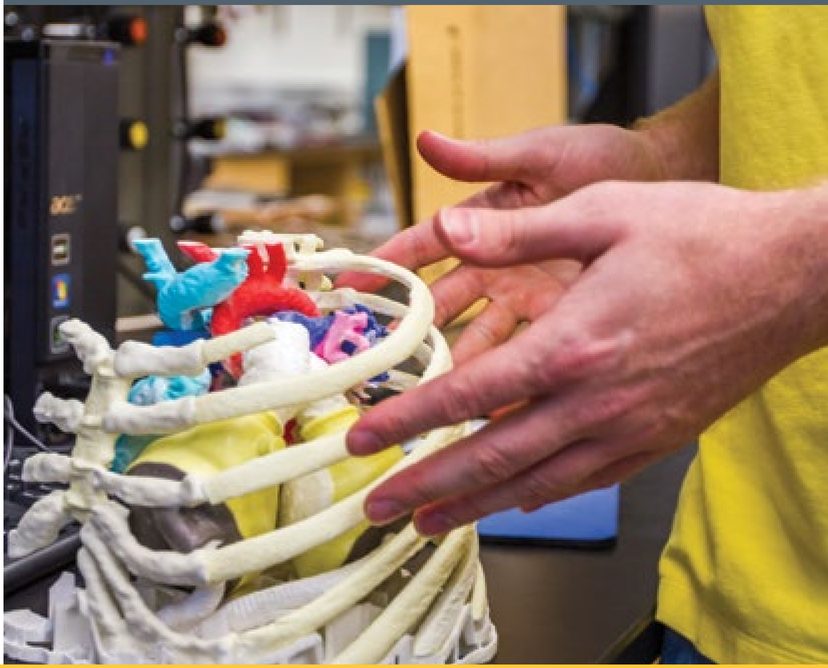
The ASU 3-D Cardiac Print Lab at Phoenix Children's Hospital (PCH) will expand its contribution to improving cardiac care for the hospital's patients.

The PCH Leadership Circle, a philanthropic group that supports improvement in healthcare for the local community, has awarded a $60,000 grant to ASU biomedical engineer David Frakes and PCH cardiologist Stephen Pophal to advance the work of the ASU 3-D Cardiac Print Lab.

For the past two years the lab has produced more than 100 3-D models of hearts, using medical images to replicate the hearts of individual patients. The models are used to aid physicians in planning strategies for heart surgery and other cardiac care procedures.

The grant will enable development of a library of 3-D model hearts that depict common pediatric heart defects. The collection will be used to educate family members of pediatric patients about specific medical issues related to the health conditions of the children.

Frakes' research assistant Justin Ryan, who is pursuing his doctoral degree in biomedical engineering at ASU, is crafting most of the heart models for PCH.



Student Scholars

Brittany Duong Outstanding Graduate in Biomedical Engineering

Brittany Duong was named the 2014 Outstanding Graduate for the School of Biological and Health Systems Engineering.

A student in ASU's Barrett, The Honors College, with a concurrent major in biological sciences (genetics, cell and developmental biology), her mission is to become a physician with advanced experience in bioengineering. She plans to enter medical school after first earning a master's degree in biomedical engineering at ASU through the Fulton Schools of Engineering "4+1" accelerated degree program.

The graduate of Corona del Sol High School in her hometown of Tempe, Arizona, has collected a long list of awards for academic and extracurricular achievements. She won awards for her leadership in student organizations, a Deans' Award for educational outreach and for being a successful fundraiser for student engineering projects. Duong was a semifinalist for the national Dell Social Innovation Challenge award and a finalist for the Martin Luther King Jr. Student Servant-Leader award.

She was the implementation leader for an ASU chapter of Engineers Without Borders project to help communities in Kenya to develop sustainable water resources. The endeavor won a Premiere Project award from the national Engineers Without Borders administration. She served at various times as outreach director, grant writer, secretary and then president of the Engineers Without Borders ASU chapter. Next year she will be vice present of the steering committee for a regional branch of the organization.

She gained laboratory experience through the Fulton Undergraduate Research Initiative, doing work to advance the uses of magnetic resonance imaging (MRI) techniques. In 2013 she was a Summer Undergraduate Research Fellow at the National Institute of Standards and Technology.

Duong said her primary career goal is to help to discover ways for MRI technology to expand its role in medical diagnostics and preventative medicine.

Abbey Rose Soulek Distinguished Graduate in Biomedical Engineering

Abbey Soulek was named a 2014 Distinguished Graduate for the School of Biological and Health Systems Engineering.

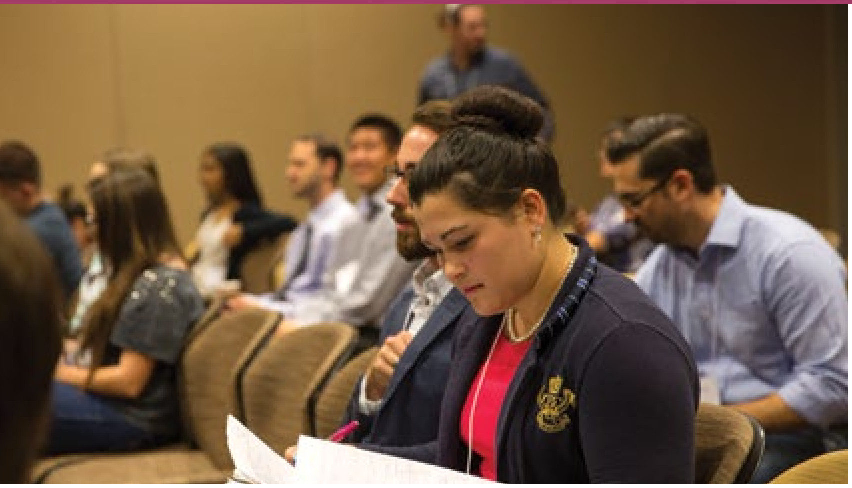
After originally planning on working toward an English degree, the South Dakota native discovered her love for applied mathematics. That love soon turned her attention to an engineering degree and eventually to ASU as a biomedical engineering major.

Her academic success helped her earn a Vicky and Troy Wilson Scholarship and a Black Hills Corporations Scholarship on the way to a 3.7 grade point average and making the dean's list in each semester but one.

Outside the classroom, she has gained valuable research experience in both the public and private sectors. Through the Fulton Undergraduate Research Initiative she worked on a project to improve prosthetic limbs. A full-time summer internship in 2012 with a private health and medical research institution gave her the opportunity to do further cardiovascular work.

Since the summer of 2013, she has been an intern for the Tempe operations of a multinational company that manufactures and develops new medical devices. Her work in the laboratory and as a developing biomedical engineer has earned Soulek the opportunity to remain in her intern position after graduation, but she is also interviewing with several medical device design and development companies.

"One of the most rewarding parts of my undergraduate years has been being able to apply a good portion of the lessons I learned in the classroom to the world of industry," she said. "All the hard work that went into gaining an understanding of difficult concepts has made my transition into industry go smoothly. This has made me really appreciate my education."



Internship provided valuable biomedical engineering research experience

Kaleia Krämer spent the summer before her junior year at ASU as a Flinn Scholar Intern, giving her an exceptional opportunity to broaden her experience in biomedical research.

The biomedical engineering major worked at the Arizona Center on Aging and the Interdisciplinary Consortium on Advanced Motion Performance, both based at the University of Arizona.

Krämer built on what she is learning at ASU, where she has been involved in research since her first semester as a freshman. She has been assisting in the Neural Control of Movement Laboratory, directed by professor and school director Marco Santello.

The Flinn Foundation internship award provided a stipend to cover some expenses and opportunities to make presentations about her work at the annual conference of the Arizona Aging and Cognition Collaborative and at other national gatherings of researchers.

Krämer said her research under the supervision of Santello and biomedical engineering postdoctoral fellow Pranav Parikh has given her a strong understanding of the neural processes underlying the control of human movement, and her internship assignments gave her a better understanding of cognitive processes involved in movement control.

Among her internship tasks related to research on aging and movement control, she helped explore new ways to enable and encourage patients to perform effective physical therapy in their homes—both for rehabilitation purposes and to prevent diminishing function due to aging.

Research experience reinforces passion to find medical cures

Naisargi Nandedkar is a pursing a master's degree in biomedical engineering after completing undergraduate studies in instrumentation engineering at the University of Mumbai in her home country of India.

As a summer intern, Nandedkar, was exposed to research in an industry setting at Amgen, a major pharmaceutical company located in Thousand Oaks, California. Her interdisciplinary experiences working with measurement and instrumentation setups and the research she has completed at ASU made her attractive to Amgen.

During her internship she worked with a team of engineers to determine numerical values for pressure as a specification on automated drug/medicine delivery devices. She said the work helped her truly understand the importance of multidisciplinary work and seeking answers from a variety of viewpoints.

"The reason I chose biomedical engineering as a specialization field is because it's a marriage between the things I am passionate about, science and technology, and changing people's lives," she said. "I like to believe that the work I am doing today is going to affect some person in a huge way and possibly even change it for the better forever."

Engineering students aim to boost social efforts at Clinton Global Initiative event

SBHSE students participated in the international Clinton Global Initiative University (CGI U) conference at ASU in March 2014. The leadership conference gathers more than 1,000 college students and as many as 200 mentors from about 70 countries.

The goal is to develop action plans for their endeavors to contribute solutions to societal challenges in education, environment and climate change, human rights, poverty alleviation and public health.

Hyder Hussain, a biomedical engineering and computational mathematics major, is part of a group of students in ASU's Barrett, The Honors College working on mobile biosensor technology to detect health-threatening pathogens in water. The group's efforts were presented at the event.

Hussain, who attended the 2013 CGI U conference in St. Louis, is the only engineering student among molecular biology, anthropology and global health majors working on the HydroGene Biotechnologies project.

They're striving to develop an affordable, mobile, easy-to-use sensor to detect pathogens in water that carry diseases—a device that would be a significant aid to protecting public health.

He and his fellow students are still testing out ideas in the lab and developing a biosensor prototype. Team leaders decided to get involved in CGI U in the hope of learning lessons from other participants that would help advance the HydroGene project.

At last year's CGI U conference, Hussain said, "We met many teams with connections to nongovernmental organizations from all around the world that would be able to help us transport and distribute our device in the future.

"We see it as an invaluable opportunity to meet people with similar goals, and people who have experience doing the kind of work we want to do," he said.

We see it as an invaluable opportunity to meet people with similar goals, and people who have experience doing the kind of work we want to do."

Biomedical engineering major Fionnuala McPeake is one of six engineers on Engineering Smiles, another team at the 2014 CGI U. Despite being in the initial planning and design stages, the team took advantage of the "big stage" offered by the event to promote their project and receive guidance.

The team plans to design and build fully equipped dental care units that are compact enough to fit four on a bus. They hope to be ready for an Interaction Medical Alliance Helps trip to Nicaragua in the summer of 2015.

Entrepreneurship

Innovative medical device modeling software sparks tech startup

A business startup formed to commercialize technology developed by associate professor David Frakes and his students has won an Arizona Innovation Challenge award from the Arizona Commerce Authority (ACA), the state's leading economic development agency.

The award brings the company, EndoVantage, a grant of $250,000 to support development of its business operations.

The venture is based on a novel software platform that simulates the effects of deploying small medical devices (stents, for example) into blood vessels, as well as simulating the resulting blood flow changes.

Frakes and postdoctoral research associate Haithem Babiker invented the EndoVantage technology platform in ASU's Image Processing Applications Laboratory, with help from Brian Chong, a physician at Mayo Clinic Hospital in Phoenix.

The startup was also recently selected to receive support from ASU's Edson Student Entrepreneur Initiative—$20,000 in seed funding, along with office space and other resources at SkySong, The ASU Scottsdale Innovation Center, and mentoring from business experts.

In addition, the venture was accepted into IBM's Softlayer Incubator, which is providing mentoring in software engineering and business-related services. In 2013, EndoVantage received a $100,000 grant from the Center for Individualized Medicine at Mayo Clinic and the Office of Knowledge Enterprise Development at Arizona State University.

Frakes is the chief science office for EndoVantage, Babiker serves as the chief technology officer. Justin Ryan, a biomedical engineering doctoral student working in Frakes' lab, is contributing to EndoVantage by providing 3-D virtual modeling of blood vessels.

With the EndoVantage platform, clinicians "now for the first time can design the optimal endovascular treatment strategy for each patient before surgery," Frakes said. "This improves the quality of treatment and reduces costs."

The technology will also enable medical device companies to perform virtual testing of medical devices in hundreds of different virtual patient anatomies. That capability will help improve product design and prevent product defects and other risks to patients, Frakes said.

State of mind: Startup receives funding for brain-optimizing wearable tech

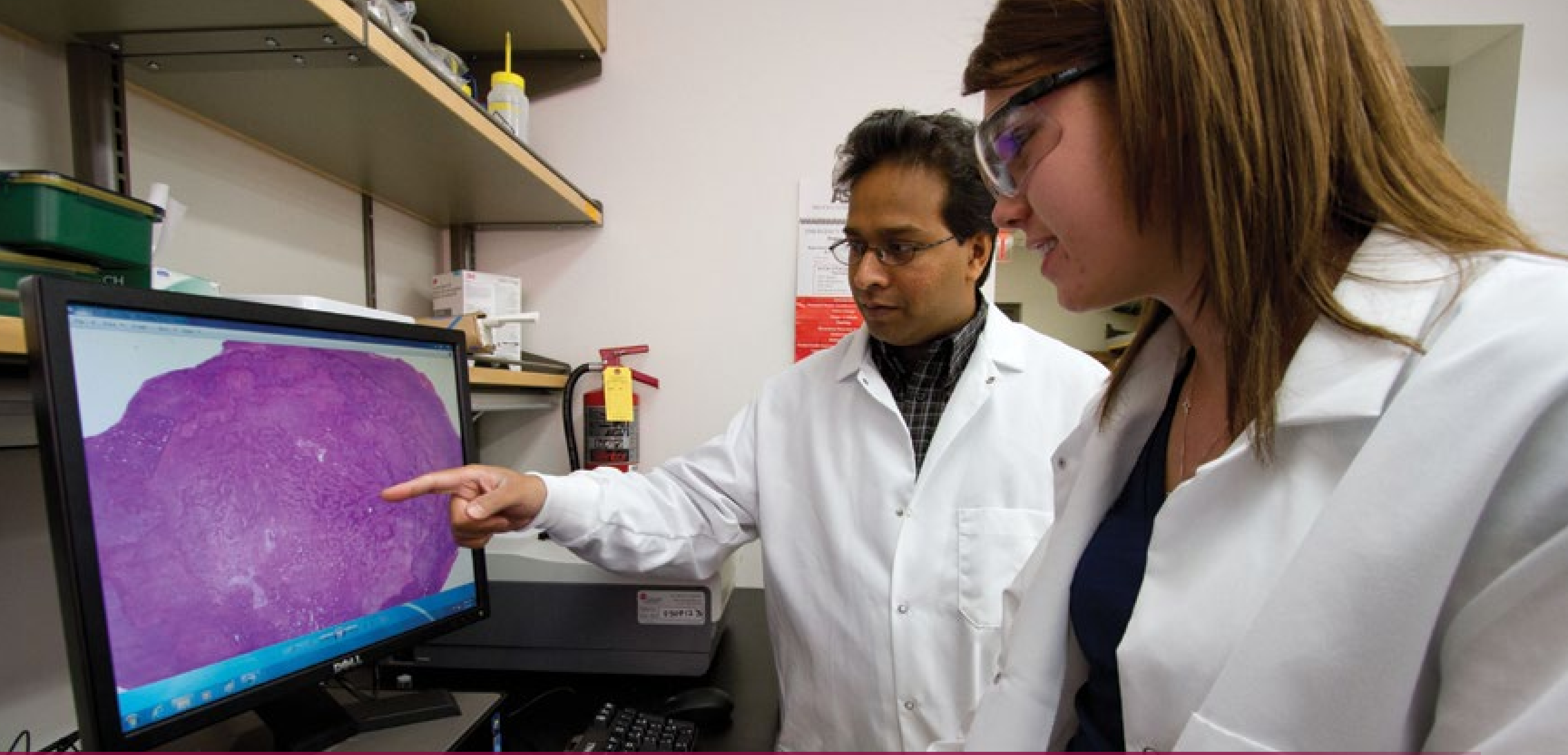
A spinout company, powered by discoveries made at ASU, has raised $13 million in funding, led by Khosla Ventures. Thync is engineering the first lifestyle wearable that uses neurosignaling algorithms—waveforms that signal neural pathways—to shift and optimize people's state of mind in areas related to energy, calm and focus.

Sales of products and services related to inducing energy and relaxed states exceed $400 billion per year globally. Recent market research indicates that in the U.S., energy drinks are a $12.5 billion per year industry, while coffee, alcohol and artificial stimulant use is at an all-time high. The wearables market is projected to top more than $7 billion in 2015, with an estimated 300 million wearables to be shipped. Thync encompasses all of these categories with a chemical-free product that will tap directly into the source—the user's brain.

Thync's technology platform comprises neurosignaling algorithms, hardware, software and biomaterials. The company is integrating the most advanced aspects of neuroscience and consumer electronics to create a new category of products that give individuals access to their own capabilities, without the need for chemicals or supplements.

Thync was founded by engineering and neuroscience experts from ASU, Stanford, Harvard and MIT. They have advanced neurosignaling by leveraging decades of research and extensive testing to ensure a safe, effective, aesthetically designed lifestyle device that anyone can use.

"The Thync team is working hard on introducing neuroscience to 21st century engineering," said Jamie Tyler, associate professor and co-founder of Thync. "For the first time, we are able to target and optimize neural pathways and brain circuits for personal benefit. Thync technology converges on many of these same pathways to achieve positive effects."



Faculty Awards and Honors

Promising work on imaging technology earns NSF CAREER award

Assistant professor Vikram Kodibagkar's progress in engineering tools and techniques to more precisely reveal the condition of body tissues, specifically tissue oxygen levels, has earned support for his research from the National Science Foundation (NSF).

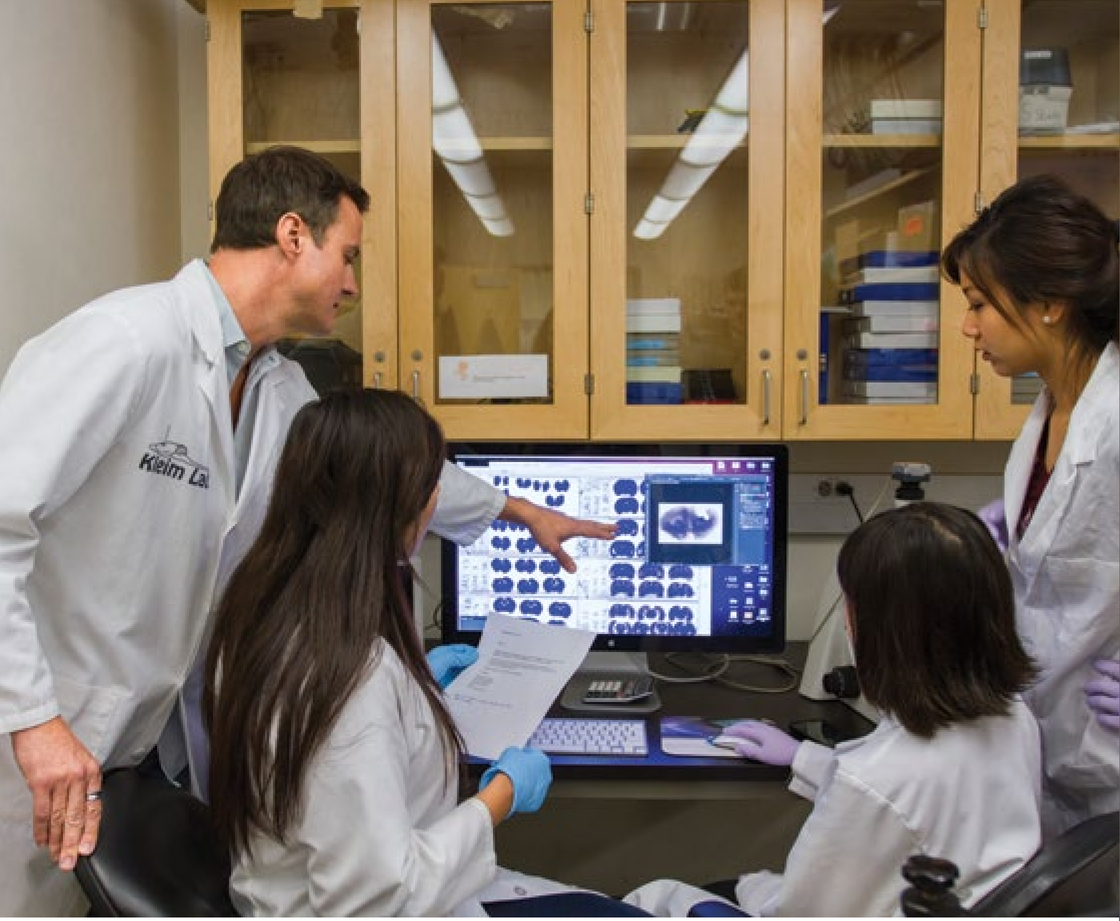
He's the recipient of an NSF CAREER award, which recognizes emerging education and research leaders in engineering and science. The award provides $440,000 over five years to fund Kodibagkar's work to expand the capabilities of medical imaging technology.

His focus is on developing techniques using magnetic resonance imaging (MRI) to perform oximetry—measuring the amount of oxygen in body tissue. He is working to "develop a theoretical framework for methods that would enable us to extract quantitative information about tissue oxygenation from MRI data," he said.

He'll pursue this objective by using two novel oximetry techniques he has developed. One technique involves binding a small molecular MRI contrast agent (a chemical compound) that targets specific areas of the body. The other involves examining changes in the MRI properties of a nanoprobe to determine oxygen levels.

The NSF CAREER award also will aid Kodibagkar's efforts to increase involvement of ASU graduate students in lab work related to his research, and to establish a hands-on training program in imaging technologies, to be called HOSPIT, for high school students and undergraduates.

His plan is to use the training programs as the basis for developing more extensive courses in medical imaging, including courses that could be offered online. The first trial of HOSPIT training program was successfully conducted in summer 2014 with five high school students.



Kleim gains new support for stroke rehab research

His promising work on ways to help the brain heal has brought associate professor and chair of the undergraduate biomedical engineering program Jeffrey Kleim support from a leading private medical research company.

Dart NeuroScience recently agreed to provide Kleim $200,000 each year for an indefinite period to contribute to the company's endeavors to develop pharmacological therapies to maintain human brain health.

His research focuses on neural plasticity, also called brain plasticity, which explores changes in the brain's synapses and neural pathways resulting from learning, environmental factors and injury. In his ASU laboratory, Kleim is seeking to find more effective treatments for Parkinson's disease, stroke and traumatic brain injury—by looking at new drugs and electrical and magnetic stimulation of the brain to reverse the impacts of brain disease and injury.

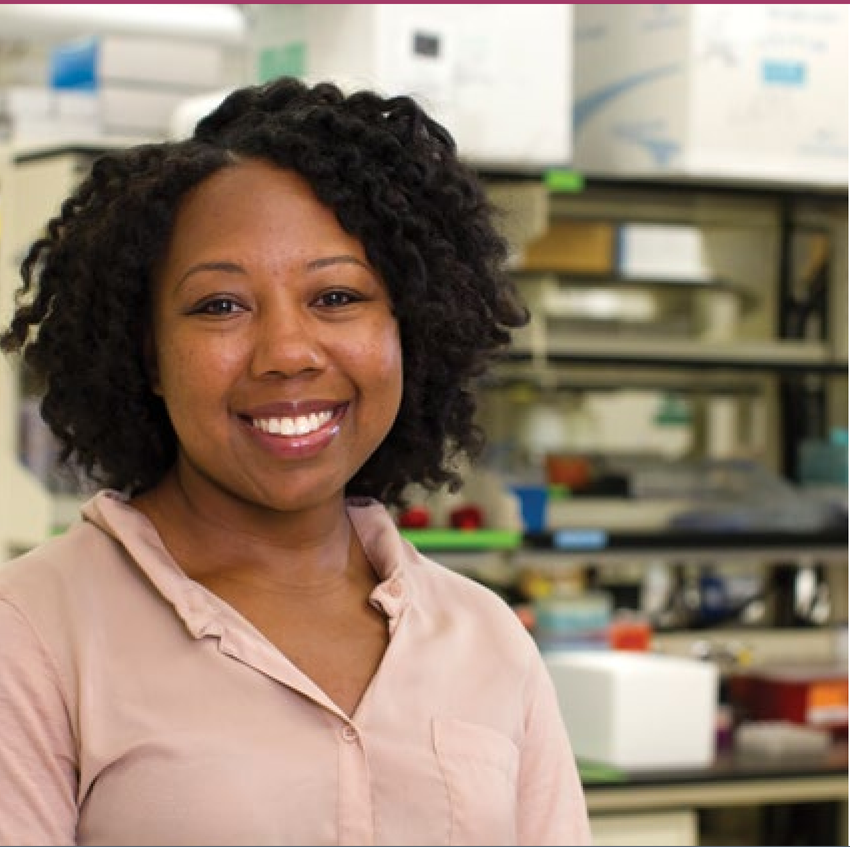
He will work with Dart Neuroscience to test newly designed chemical compounds for their potential effectiveness in helping regain cognitive and physical abilities after strokes.

Kleim will design and carry out experiments to test about three to four new drugs a year developed at Dart NeuroScience. He will then compile data from the experiments and review results with the company's neurologists and clinicians.

Ankeny earns Top 5% Teaching Award

SBHSE lecturer Casey Ankeny received a Top 5% teaching award thanks to positive student feedback. Currently, she is investigating cyber-based student engagement strategies in flipped and traditional biomedical engineering courses. She aspires to understand and improve student attitude, achievement and persistence in student-centered courses.

Each year the Fulton Schools of Engineering recognizes excellence in instruction through the annual Top 5% Teacher's List. Awardees are nominated by students and are reviewed by a faculty committee. Recommendations for the list are made to the Fulton Engineering Dean's Office, where the final selections are made.



Haynes looks to create global resource for synthetic biology researchers

An idea for accelerating innovation in biology and medicine has earned assistant professor Karmella Haynes support from Women & Philanthropy, a philanthropic program of the ASU Foundation for A New American University.

The grant award will provide more than $75,000 to support Haynes' goal of creating a large online data and knowledge base on the behavior of synthetic DNA in living cells—one that would establish ASU as the epicenter of a global resource for researchers attempting to make breakthroughs in synthetic biology, a fast-emerging field that combines biology, mathematics, engineering and computer science.

Having such knowledge readily available would help researchers streamline their efforts to "find the recipes" for engineered DNA that would help fight diseases or provide other health and medicinal benefits.

For her project, called Synthetic Biology at ASU (SB.ASU), Haynes will collaborate with Catherine Seiler, an associate research professor at the ASU Biodesign Institute.

Karmella Haynes was among leading experts who recently spoke at a Congressional hearing about the importance of supporting work to make advances in synthetic biology.

Researchers are using the capabilities of synthetic biology to probe the fundamental makeup of biological systems, enabling them to do things such as modifying and reprogramming body cells and DNA to perform medicinal functions.

The rapid advance of synthetic biology has prompted discussions about how to weigh the benefits of the research against potential social and ethical implications, and concerns about safety.

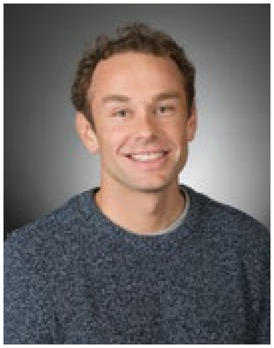
Haynes and two colleagues—Steve Evans and Jay Keasling—gave presentations on those questions to staff members representing members of Congress, National Science Foundation officials, science journalists and other interested parties.

"We want to inform more people to prevent unfounded fears that might hinder work that has great value for addressing society's needs," Haynes said after the briefing. "We hope we convinced everyone at the briefing that sustained support for biomedical engineering is in the best interests of the nation," Haynes said.

New Faculty

David Brafman
Assistant Professor
Ph.D., University of California San Diego

expertise: pluripotent stem cells, drug discovery, disease modeling, biomaterials, Alzheimer's disease, cardiac diseases, pulmonary fibrosis.



Scott Parazynski
Professor of Practice and University Explorer
M.D., Stanford University School of Medicine

expertise: point of care medical diagnostic and therapeutic technologies, telemedicine, remote medical care delivery and human factors engineering.

Emma Frow
Assistant Professor
Ph.D., University of Cambridge

expertise: synthetic biology, science and technology studies, engineering studies, standard-setting, design and values

Barbara Smith
Assistant Professor
Ph.D., University of Maryland

expertise: noninvasive, point-of-care medical diagnostics

Claire Honeycutt
Assistant Professor
Ph.D., Georgia Institute of Technology and Emory University

expertise: neural control of balance, reaching and grasp

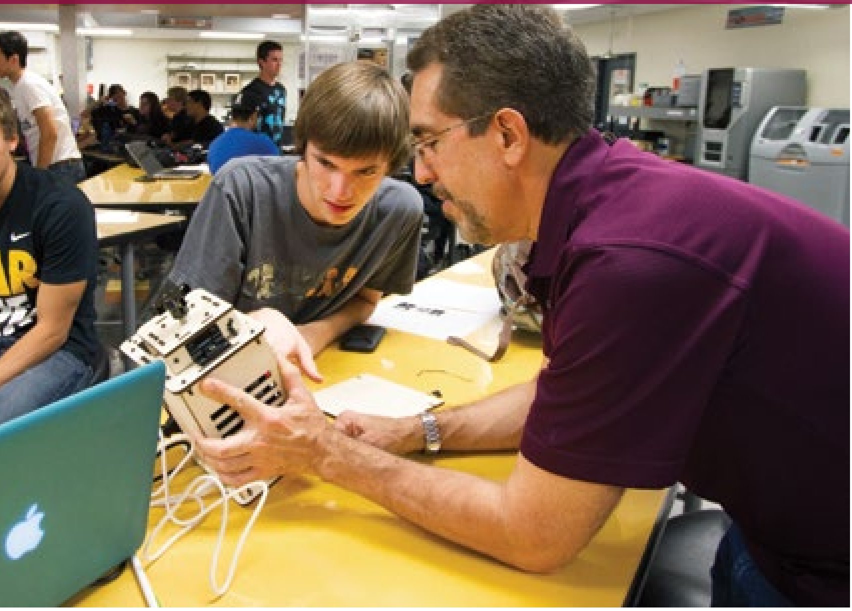
Jamie Tyler
Associate Professor
Ph.D., University of Alabama at Birmingham

expertise: neural engineering

Thurmon Lockhart
Professor
Ph.D., Texas Tech University

expertise: biomechanics, biodynamics, biosensors, neurorehabilitation, gait and posture, fall prevention

Research Labs



Center for Adaptive Neural Systems Director: James Abbas

The Center for Adaptive Neural Systems (ANS) seeks to design and develop technology to offset the effects of spinal cord injury, orthopedic injury, Parkinson's disease and cerebral palsy. Driven by the needs of potential users, the engineers and scientists at ANS utilize a wide variety of interdisciplinary research techniques and technologies to aid individuals whose lifestyles may be significantly affected or impaired by traumatic injury or neurological disease.

Visuomotor Learning Director: Christopher Buneo

The Visuomotor Learning laboratory seeks to understand how the brain combines different forms of sensory and motor information to help plan, execute and adapt movements ("sensorimotor integration"). Of particular interest is how uncertainty associated with movement planning and execution leads to variability in motor performance. The long-term goals of the lab are to improve and enhance human motor performance through the development of brain-centered training protocols and assistive technologies that interface directly with the nervous system.

BioActive Materials Laboratory Director: Michael Caplan

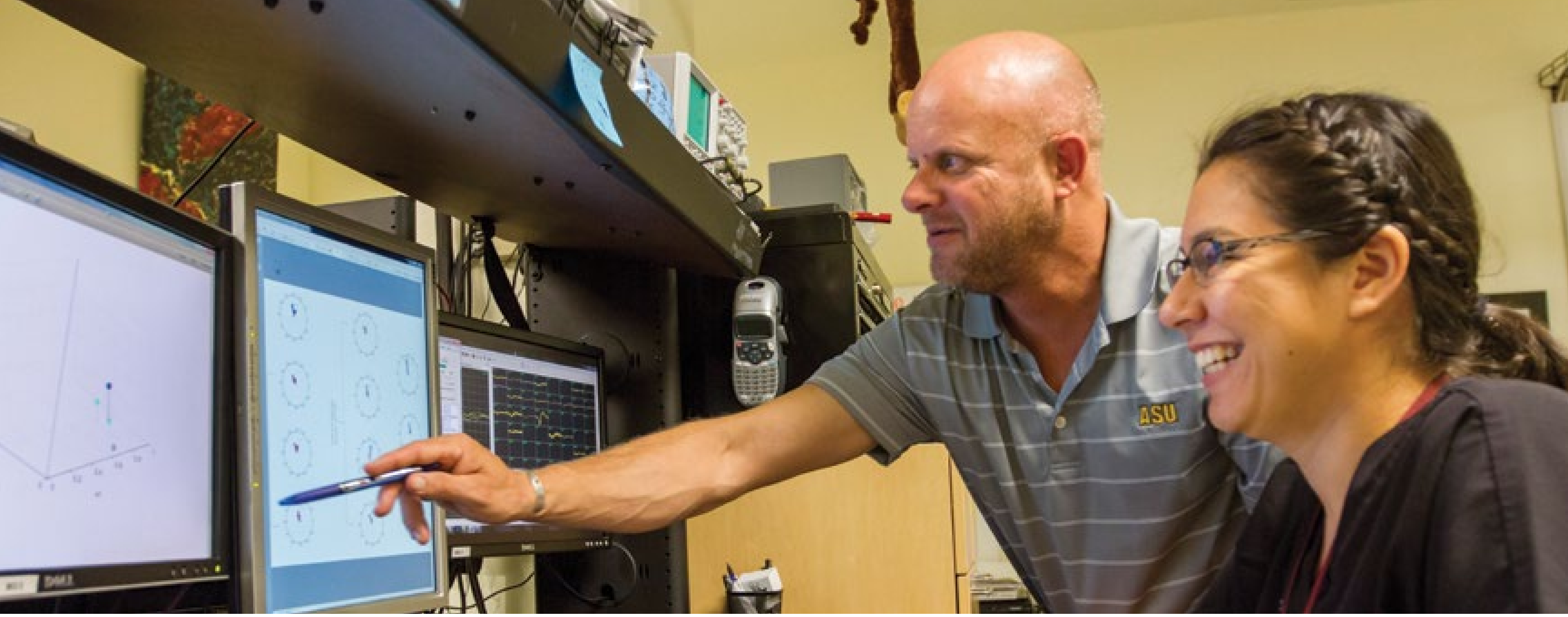
Caplan's lab applies engineering mathematics to understand and engineer solutions for problems related to biomaterials and drug delivery. One ongoing study, in collaboration with Dr. Alex McLaren at Banner Hospital, seeks to understand and control where antimicrobials mixed into bone cement go when the cement is placed in an orthopaedic wound to fight infection. Another study seeks to understand and control endothelial response to the material used to construct medical devices (such as stents or vascular grafts) and other aspects of the cells' microenvironment. A third study seeks to develop multivalent (more than one binding site) molecular probes for biosensing or drug targeting applications.

Image Processing Applications Laboratory Director: David Frakes

The Image Processing Applications Laboratory (IPALab) addresses current and important image processing problems in a variety of different fields. Ongoing research at IPAL includes projects that are biomedical, industrial and military in nature. The ultimate goal is to improve human quality of life through the development and use of advanced image processing technologies.

Personalized Molecular Diagnostics Laboratory Director: Antonio Garcia

The Personalized Molecular Diagnostics Laboratory (PMDL) uses global technology to develop highly sensitive, yet low-cost and robust diagnostic devices using nanotechnology. Special emphasis is given to tailor devices that can make public health systems in emerging nations more effective for infectious disease prevention. Recent advances have been featured in Spanish, English and Portuguese media outlets and are of interest to several Latin American countries.



Neural Engineering Laboratory
Director: Bradley Greger

The overarching goal of the lab is to utilize current neuroscientific understanding and neural engineering principles to translate clinical needs into devices which improve quality of care and patient outcomes. Electrophysiological recordings and electrical micro-stimulation are used to gain an understanding of how the nervous system processes information related to various sensory, motor and cognitive functions. The results of these experiments are then used to guide implementation of novel devices for the treatment of various neural pathologies. Neural prostheses for treating the profoundly blind or paralyzed are being developed. Additionally, the lab is undertaking electrophysiological research in human patients using penetrating and non-penetrating electrode arrays aimed at improving our understanding of epilepsy and improving the diagnostic tools available to clinicians.

Haynes Synthetic Biology Laboratory
Director: Karmella Haynes

The Haynes Synthetic Biology laboratory uses synthetic systems and quantitative biology to engineer useful gene and protein-based biological devices and deepen our understanding of molecular cell biology. The ultimate goal of the laboratory is to accelerate the pace of therapeutic technologies through modular design.

The Sensorimotor Research Group
Director: Stephen Helms Tillery

Helms Tillery's group analyzes sensorimotor learning and representations in the nervous system and neural mechanisms which enable the brain to carry out fine motor skills. By duplicating that process, the goal is to advance the ability to create more lifelike prosthetics that respond to brain signals.

Kleim Laboratory
Director: Jeffrey Kleim

The Kleim lab studies how neural plasticity supports learning in the intact brain and "relearning" in the damaged or diseased brain. Research is directed at developing therapies that optimize plasticity in order to enhance recovery after stroke and Parkinson's disease.

Research Labs

Prognostic Biomedical Engineering Laboratory Director: Vikram Kodibagkar

The Prognostic Biomedical Engineering (ProBE) Laboratory focuses on engineering solutions for prognostic imaging of the tissue microenvironment in the diseased state. Current research involves development of techniques for fast Magnetic Resonance Imaging of tissue hypoxia and metabolites, engineering novel MRI and optical imaging probes, and theranostics. The group works on all aspects of MRI: physics of the acquisition, hardware development, sequence development, in vivo studies, image reconstruction and processing. Current disease states under study include cancer and traumatic brain injury. The group's emphasis is on non-invasively obtaining prognostic information early, in response to disease and treatment.

La Belle Laboratory Director: Jeffrey La Belle

La Belle's laboratory is developing point-of-care medical technologies that enable more accurate detection, monitoring and management of disease. Work is use-inspired, and the goal is to help make rapid advances in healthcare with innovations that can be brought to market today.

Massia Laboratory Director: Stephen Massia

The Massia laboratory focuses primarily on cell material interactions. The principles of cell biology, biochemistry, organic and inorganic chemistry are utilized to better understand the interaction of cells with synthetic materials, and to exploit this knowledge to enhance the compatibility of these materials with tissues that contact them. Current projects include developing nanofabrication methods to construct biomimetic scaffolds for tissue regeneration and replacement.

Neural Microsystems Laboratory Director: Jitendran Muthuswamy

The primary focus of the Neural Microsystems laboratory is to understand the molecular and cellular mechanisms of neuronal plasticity that will naturally enable development of ways to achieve greater functional recovery through neuronal repair and plasticity, specifically the molecular interactions between the neurons and extra-cellular matrix/substrate, and the role of specific intracellular proteins in the development of spontaneous electrical activity and subsequent synaptic function in single neurons. Using in vitro primary neuronal culture models and in vivo rodent models and innovative microtechnologies developed in our lab, the goal is to understand the mechanisms of structural and functional plasticity.

Nikkhah Laboratory
Director: Mehdi Nikkhah

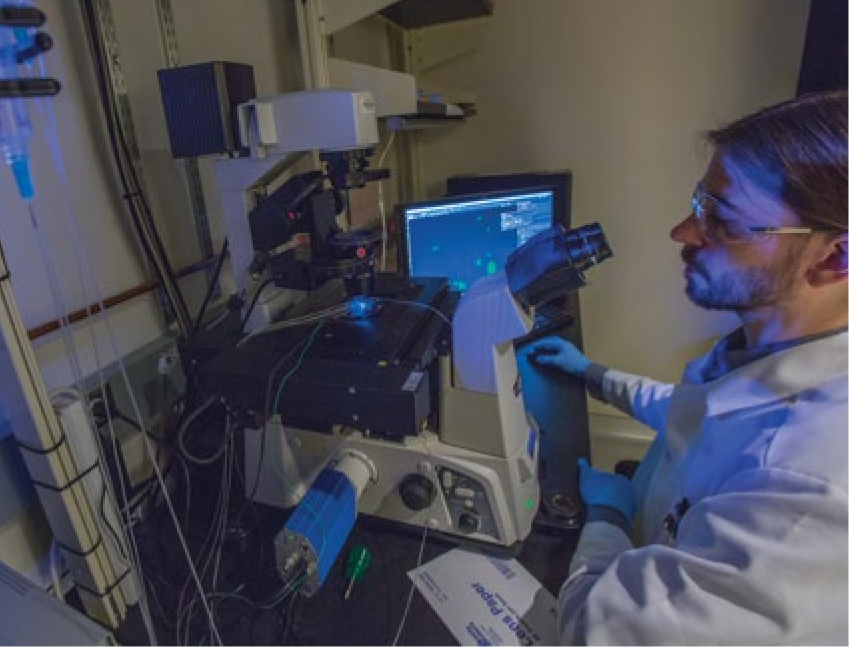
The current research interests in our lab lie at the interface of micro/nanotechnology, advanced biomaterials and biology. Specifically our research is centered on integration of advanced biomaterials, stem cells and micro- and nanoscale technologies to develop functional vascularized tissue substitutes. In addition, our lab is actively involved in the development of highly innovative microscale platform for cell-biomaterial interactions and cancer metastasis studies.

Laboratory of BioInspired Complex Adaptive Systems
Director: Vincent Pizziconi

The BioICAS laboratory seeks to understand the biodesign heuristics of integrative bionanosystems that can lead to the design and development of bioinspired advanced diagnostic and therapeutic components, devices and systems.

Neuro-electricity Lab
Director: Rosalind Sadleir

Research in the neuro-electricity lab is concerned with modeling and imaging biological conditions using targeted electrical methods. Work in the lab varies from the very practical (including device design and commercial development) to the conceptual and theoretical.



Neural Control of Movement Laboratory
Director: Marco Santello

Work at the Neural Control of Movement laboratory focuses on the hand as a model to investigate the mechanisms underlying sensorimotor integration responsible for motor learning and control. The questions addressed by Santello's laboratory include the role of vision and tactile input for learning and controlling dextrerous manipulation, neural mechanisms underlying the synergistic control of multiple hand muscles, and the effects of neurological disorders and neuropathies on neural control of the hand. This research has potential for improving the efficacy of rehabilitation of hand function following surgery as well as neuromuscular and neurodegenerative diseases such as stroke, dystonia and carpal tunnel syndrome.

Laboratory for Applied Nonlinear Dynamics
Director: Mark Spano

The Applied Nonlinear Dynamics laboratory's primary research focus is nonlinear dynamics of complex systems. The research seeks to use nonlinear dynamical techniques to understand epilepsy and to develop techniques for prediction and intervention. Projects include development of iPad and iPhone programs integrated with biomedical instrumentation for the collection and processing of medical data and integration of the iPad/iPhone platforms into medical data acquisition and record keeping.

Stabenfeldt Laboratory
Director: Sarah Stabenfeldt

Each year in the United States over one million individuals will experience a traumatic or ischemic-related brain injury, with 350,000 persons sustaining a severe to moderate traumatic brain injury (TBI) and an additional 800,000 people suffering from stroke. While the inherent regenerative potential of nervous tissue has been realized, the hurdles and barriers formed by scar and inhibitory molecules limit endogenous regeneration and repair. In evaluating current clinical therapies, there is an obvious need for improving diagnostic imaging and in turn targeted delivery of therapeutics to injured or ischemic tissue. This laboratory specifically focuses on engineering novel targeted diagnostic and therapeutic ("theranostic") biomaterials for neural injury/disease and identifying endogenous neural stem cell homing mechanisms after injury and incorporating such biosignals into tissue-engineered matrices.

Bioengineering Instrumentation Laboratory
Director: Bruce Towe

The Bioengineering Instrumentation Laboratory (BIL) applies principles of engineering and physics to the design of new types of medical electronic, ultrasonic and optical instrumentation. A special emphasis is placed on developing bionic neuroprostheses, needed in both the study of the human brain and the development of devices, which allow direct man-machine connections.

Biomaterials Laboratory
Director: Brent Vernon

The Biomaterials laboratory uses principles of polymer science and chemistry to design and develop in situ gelling materials for drug delivery, tissue engineering and tissue reconstruction.

Xiao Wang Laboratory
Director: Xiao Wang

Wang's laboratory seeks to understand and exploit the effects of nonlinear dynamics and stochasticity in engineered gene networks in microbes, and extrapolate this knowledge to the understanding of cell differentiation and development in higher organisms. The focus is on synthetic multistable gene networks, systems biology on small network motifs with feedbacks, the role of noise in cell differentiation and development and molecular evolution.

Advisory Board: Priorities, Relevancy, Connections

The career paths that our students aim for can be divided into three main categories: industry, graduate school and medical school. That's why we have put together a school advisory board with professionals and representatives from all of these career paths, chosen based on their knowledge, leadership and experience in industry, academia and the medical community.

Our advisory board's goals are to identify key educational and research priorities for students, to help forge partnerships with industry that bring bioengineering technologies to the market, and to connect our students with industry and clinical partners for internships and job placement.

In May 2013, the director and faculty presented an overview of the school, along with its vision, initiatives and long-term plans to the newly formed advisory board, and are now working with the board in implementing strategic initiatives.

Industry

Deb Dahl
Senior Director
Clinical Innovation,
Banner Health

Nicholas Leonardi
Director
Premier Semiconductor
Services

Rio Vetter*
Director of Research
and Development
NeuroNexus, Inc.

Maziar Farzam*
President and Co-Founder
Inhance Digital

Lisa Mesias*
Principal Quality Engineer
Medtronic

Michael Vonesh
Divisional Technology Leader
W.L. Gore

MaryAnn Guerra
Co-founder and CEO
BioAccel

David Thomas
Principal Regulatory
Affairs Specialist
Merit Medical Systems, Inc.

* ASU Alumni

Graduate School

Jack Linehan
Consulting Professor
of Bioengineering in
the Department of
Bioengineering and the
Biodesign Program
Stanford University

Molly Shoichet
Tier 1 Canada
Research Chair
University of Toronto

John Watson
Director and Profesor
of Bioengineering
University of California,
San Diego

Medical School

Keith Lindor, M.D.
Executive Vice Provost
Arizona State University,
Health Solutions

Joseph Grande, M.D.
Associate Dean
Academic Affairs,
Medical School
Mayo Clinic Rochester, MN

Jeremy Friese, M.D.
Vascular and Interventional
Radiologist, Assistant
Professor of Radiology
Mayo Clinic, Rochester, MN

Faculty

James Abbas
Associate Professor
Ph.D., Case Western Reserve University
james.abbas@asu.edu

Expertise: functional neuromuscular stimulation systems, neural engineering, neuromotor rehabilitation, technology for global health

Biosketch: Abbas received his B.S. in bioelectrical engineering from Brown University, and his M.S. and Ph.D. in biomedical engineering from Case Western Reserve University. After completing his postdoctoral work at the Shriners Hospital in Philadelphia, he held faculty positions at the Catholic University of America and at the University of Kentucky. Abbas is a member of the graduate faculty in Mechanical Engineering and in the Interdisciplinary Graduate Program in Neuroscience at ASU and has a joint appointment in the Department of Physical Therapy at the Arizona School of Health Sciences. Recently, Abbas was also a visiting professor at the World Health Organization, where he contributed to a number of projects directed at increasing access to medical devices for people in low-resource settings. He serves on the editorial boards of several neural and biomedical engineering journals and biomedical engineering conferences.

Casey Ankeny
Lecturer
Ph.D., Georgia Institute of Technology and Emory University
casey.ankeny@asu.edu

Expertise: cardiovascular research, bioreactors, microRNAs, shear, endothelial cell mechanobiology/pathology, student-centered engineering education research

Biosketch: Ankeny is a lecturer in SBHSE. She received her bachelor's degree in biomedical engineering from the University of Virginia in 2006 and her Ph.D. in biomedical engineering from Georgia Institute of Technology and Emory University in 2012, where she studied the role of shear stress in aortic valve disease. Currently, she is investigating cyber-based student engagement strategies in flipped and traditional biomedical engineering courses. She aspires to understand and improve student attitude, achievement and persistence in student-centered courses.

David Brafman
Assistant Professor
Ph.D., University of California San Diego
david.brafman@asu.edu

Expertise: pluripotent stem cells, drug discovery, disease modeling, biomaterials, Alzheimer's disease, cardiac diseases, pulmonary fibrosis

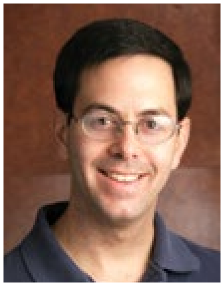
Biosketch: Brafman joined SBHSE as an assistant professor in January 2015. Prior to joining ASU, he was the Kaehr Stem Cell Young Investigator at the Sanford Consortium for Regenerative Medicine at the University of California San Diego and the Burnham Family Foundation Fellow at the Rady School of Management. Brafman's laboratory uses an interdisciplinary approach that combines various aspects of developmental biology, genetic engineering and bioinformatics to investigate the chemical, biological and physical stimuli that govern human pluripotent stem cell fate. His laboratory uses these approaches to elucidate the mechanisms and design targeted therapies related to three disease areas—idiopathic pulmonary fibrosis, heart failure, and Alzheimer's disease. Brafman's research has been funded by the California Institute of Regenerative Medicine, National Science Foundation and University of California Biotechnology and Research Program.

Christopher Buneo
Assistant Professor
Ph.D., University of Minnesota
cbuneo@asu.edu

Expertise: motor control, neurophysiology, neural prosthetics, rehabilitation

Biosketch: Buneo has worked in both the healthcare and higher education sectors, and has expertise in physical rehabilitation, neuroscience and bioengineering. He received his B.S. and M.S. in physical therapy from Long Island University in 1988, his Ph.D. in physiology from the University of Minnesota in 1996, and was a postdoctoral fellow and research fellow in neurophysiology at Caltech from 1997-2004. Buneo's Visuomotor Learning Lab (VMLL) works to understand how the brain combines sensory and motor information to help plan, execute and adapt movements. Two laboratories currently support this research, one for studying human performance under altered sensory conditions, the other for studying the neural circuits underlying sensorimotor integration. Buneo's research has been featured in Science, Nature and the Annual Review of Neuroscience. In 2008, he received the CAREER award from the National Science Foundation, which honors the integration of outstanding research and educational excellence.

Michael Caplan
Associate Professor
Ph.D., Massachusetts Institute of Technology
michael.caplan@asu.edu



Expertise: rational design of bioactive materials, local drug delivery, multivalent drug-targeting, cooperative bio-sensing

Biosketch: Caplan earned his undergraduate degrees from the University of Texas at Austin and his Ph.D. from the Massachusetts Institute of Technology. Following postdoctoral research at Duke University Medical Center in cell biology, he joined the faculty of ASU in 2003. Caplan's research focuses on molecular cooperativity in drug targeting, bio-sensing, and cell signaling. Current projects align along three main themes: local drug delivery, endothelial dysfunction in diabetes, and cooperative DNA diagnostics. Caplan is conducting educational research to assess the impact of student-graded and student-corrected homework on student learning in his class Biotransport Phenomena. Caplan is also conducting educational research to assess the effectiveness of interactive design activities conducted in large sections (~150 student) of a sophomore-level class by using virtual tools for alpha prototyping. Recent awards include a Fulton Top 5% Teaching Award.

David Frakes
Associate Professor
Ph.D., Georgia Institute of Technology
dfrakes@asu.edu

Expertise: image and video processing, cardiovascular fluid mechanics, medical device modeling

Biosketch: Frakes received B.S. and M.S. degrees in electrical engineering, an M.S. degree in mechanical engineering, and a Ph.D. degree in bioengineering, all from the Georgia Institute of Technology. In April 2008, he joined the ASU faculty and serves as a jointly appointed associate professor in SBHSE and the School of Electrical, Computer and Energy Engineering. Frakes was the ASU Centennial Professor of the Year in 2009, received the National Science Foundation CAREER Award in 2012, and won the World Technology Network Award in the Health and Medicine category in 2014. He manages the Image Processing Applications Laboratory (IPALab) at ASU, which focuses on problems in image and video processing, fluid dynamics and machine vision. IPALab was recognized as Academic Innovator of the Year in the state of Arizona in 2014. Frakes is currently serving as a Technical Program Lead in mobile imaging at Google ATAP and will return to ASU in 2017.

Jerry Coursen
Lecturer
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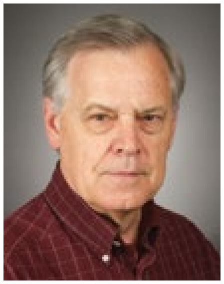

Expertise: neuroscience, healthcare systems

Biosketch: In 1987, while Coursen was the corporate director for Organizational and Human Resource Development at Samaritan Health Systems (now Banner Health), he joined the ASU bioengineering department as a faculty associate and developed and taught the "Physiology for Engineers" course, which is an integral part of the BME undergraduate curriculum. He left Samaritan in 1999 to become a full time instructor at ASU. He served as associate chair for the department for five years. Coursen's Ph.D. is from the University of Arizona College of Medicine. The emphasis of his research was primarily in neuroscience, in particular the anatomy, physiology and biochemistry of the mouse locus coeruleus. After obtaining his doctorate Cousen, did postdoctoral work at Harvard Medical School in the department of Neuropathology and the Boston Children's Medical Center Department of Neuroscience. Recently he has been involved with biomedical ethics and transhumanism.

Emma Frow
Assistant Professor
Ph.D., University of Cambridge
emma.frow@asu.edu

Expertise: synthetic biology, science and technology studies, engineering studies, standard-setting, design and values

Biosketch: Frow joined ASU in February 2015 as an assistant professor with a joint appointment in SBHSE and the Consortium for Science, Policy and Outcomes. Frow received her B.A. in natural sciences (neuroscience) and her Ph.D. from the University of Cambridge. She spent two years working as a subeditor for Nature in London, and then re-trained in the social sciences, gaining an M.Sc. in science and technology studies from the University of Edinburgh. She completed postdoctoral research at the ESRC Genomics Policy & Research Forum at the University of Edinburgh and at Harvard's Kennedy School of Government, before returning to Edinburgh in 2012 as an assistant professor in science, technology and innovation studies. Her research focuses on standards and governance in contemporary life sciences, with a particular focus on synthetic biology. She serves as co-chair of Policy & Practices for the international Genetically Engineered Machine (iGEM) competition.

Tony Garcia
Foundation Professor
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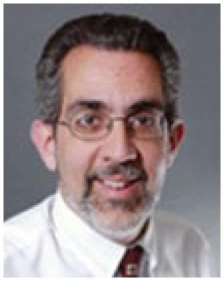

Expertise: biosensors, point-of-care technologies, sensing systems for health and environmental purposes

Biosketch: García is the associate director of the Hispanic Research Center and Foundation Professor of Bioengineering in the Fulton Schools of Engineering where he has focused on designing and characterizing surfaces and colloids for diagnostic and biosurveillance devices. He obtained a Ph.D. in chemical engineering from the University of California, Berkeley and a B.S. in chemical engineering from Rutgers University, New Brunswick. His work has been published in a wide variety of chemistry, engineering, and biology journals including J. of Physical Chemistry, I&EC Research, and J. of Microbiological Methods. He co-authored the textbook Bioseparation Process Science (Blackwell Science). García is also actively involved in education and human resource projects aimed at improving math, science, and engineering education as well as meeting the demand for a technological workforce as the nation's demographics changes. He was associate editor of the Journal of Research in Science Teaching 2003-2005 and is currently co-project director of National Science Foundation programs to enhance opportunities for undergraduate and graduate students in science, math and engineering.

Bradley Greger
Associate Professor
Ph.D., Washington University
bradley.greger@asu.edu

Expertise: vision restoration, neural prostheses, epilepsy

biosketch: Greger earned his B.A. and B.S. degrees in philosophy and biology from Washington State University. He went on to obtain his Ph.D. in neuroscience from Washington University in St. Louis, and then completed a postdoctoral fellowship in neural engineering at Caltech. He is the principal investigator in the Neural Engineering Lab, focusing on increasing scientific understanding of neural systems and then using this understanding to drive the engineering of medical devices that improve patients' lives. Specifically the lab is studying restoring sight in cases of profound visual impairement, restoring communication and movement in cases of paralysis or amputation and the understanding and treatment of seizure disorders.

Leland Hartwell
Nobel Laureate and Professor
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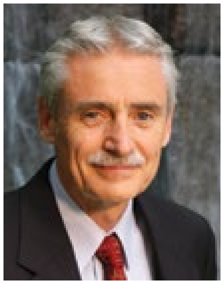

Expertise: identify biomarkers to enable personalized, pre-symptomatic diagnoses, develop tools for providing the intelligence needed for better patient outcomes

Biosketch: Hartwell is the Virginia G. Piper Chair in Personalized Medicine, the chief scientist for the Center for Sustainable Health, and president and director emeritus for the Fred Hutchinson Cancer Research Center. At the center, his work focuses on creating effective learning environments. The first is a course required for all K-8 teachers, Sustainability Science for Teachers, and the second is Project Honey Bee, an interdisciplinary research project to validate wearable devices for ambulatory patient management. He also oversees a project to develop biomarkers for the clinical management of many diseases at the Chang Gung Memorial Hospital and University in Taipei, Taiwan. Hartwell was awarded the 2001 Nobel Prize in Physiology or Medicine for identifying genes that control cell division in yeast.

Karmella Haynes
Assistant Professor
Ph.D., Washington University, St. Louis
karmella.haynes@asu.edu

Expertise: synthetic biology, molecular genetics, controlling cell development, chromatin

biosketch: Haynes earned her Ph.D. studying epigenetics and chromatin in Drosophila at Washington University, St. Louis. Postdoctoral fellowships at Davidson College and Harvard Medical School introduced her to synthetic biology. Her HHMI postdoctoral fellowship project on bacterial computers at Davidson was featured on NPR's Science Friday and was recognized as "Publication of the Year" in 2008 by the Journal of Biological Engineering. Her research aims to identify how the intrinsic properties of chromatin can be used to control cell development in tissues for medical applications. She is currently a NSF Synthetic Biology Engineering Research Center (SynBERC) Affiliated PI, an alumna of the Synthetic Biology Leadership Excellence Program, and Judge Emeritus for the International Genetically Engineered Machines competition (iGEM). She has received an NIH NCI young faculty award (K01) and the Arizona Biomedical Early Stage Investigator Award (AZ ESI) for using DNA-protein engineering to study and treat cancer. Haynes has received support from the ASU Foundation's Women & Philanthropy for her project to innovate the validation and distribution of DNA building blocks for medical bioengineering.

Stephen Helms Tillery
Associate Professor
Ph.D., Georgia Institute of Technology
steve.helmstillery@asu.edu

expertise: cortical neurophysiology, neural control of movement, neural prosthetics

Biosketch: Tillery earned his B.S. in Psychology from ASU and his Ph.D. in Neuroscience from the University of Minnesota. In that time he has focused his research on the neural structures which participate in the control of arm and hand movements. He is particularly interested in understanding how sensory inputs are used to guide and modulate movement and manipulation. Since arriving back at ASU in 2000, he has added in neuroprosthetics to his interests, and in particular has developed systems which allow for interfaces between the nervous system and electronic systems including computers and robots. He views neuroprosthetics partly as a biomedical system that can be developed to benefit patients, and partly as a novel platform to use in studying adaptive processes in the brain.

Jeff Kleim
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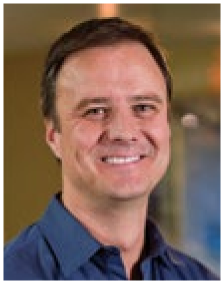

expertise: neural plasticity, neurorehabilitation, stroke, Parkinson's disease

Biosketch: Kleim completed his undergraduate work in psychology at Nipissing University in Ontario, Canada, and he received his M.S. and Ph.D. in neuroscience from the University of Illinois in 1997. He completed a postdoctoral fellowship in the Department of Physiology at the Kansas University Medical Center in 1998 before taking a faculty position at the Canadian Center for Behavioral Neuroscience at the University of Lethbridge in 1998. In 2005 he moved to the Department of Neuroscience and the Brain Rehabilitation Research Center at the University of Florida. He joined the SBHSE in 2011. His research strives to identify the fundamental behavioral and neural signals that drive neural plasticity and mediate functional recovery after brain injury or disease. Specifically he uses animal models of stroke, TBI and Parkinson's Disease to develop treatments that harness endogenous neural plasticity and enhance functional improvement.

Claire Honeycutt
Assistant Professor
Ph.D., Georgia Institute of Technology and Emory University
claire.honeycutt@asu.edu

Expertise: neural control of balance, reaching and grasp

Biosketch: Honeycutt completed her Ph.D. in the department of Biomedical Engineering housed jointly at Georgia Institute of Technology and Emory University. She completed postdoctoral work at the Rehabilitation Institute of Chicago (RIC) where she received the NIH Institutional Research and Career Development Award. Through this program she taught at Northeastern Illinois University and co-taught the Biomedical Instrumentation and Experimental Design course at Northwestern University. She joined SBHSE in January 2015. Her research focuses on the neural control of balance, reaching and grasp with the long-term goal of developing targeted therapies and interventions that increase mobility, decrease falls, and enhance functional arm control in the elderly and stroke survivors.

Vikram Kodibagkar
Assistant Professor
Ph.D., Washington University, St. Louis
Vikram.Kodibagkar@asu.edu

Expertise: cellular and molecular imaging of cancer and traumatic brain injury, MR oximetry, Magnetic resonance (MR) physics and technique development

Biosketch: Kodibagkar received his M.S. in Physics from the Indian Institute of Technology, Mumbai, in 1997 and his Ph. D. in Physics at Washington University, St. Louis in 2002. He joined the University of Texas Southwestern Medical Center as an instructor in the department of Radiology in 2002 and was promoted to assistant professor in 2005. In September 2011, he joined SBHSE. He was awarded an NSF CAREER award in 2014. His research has been supported by DOD, NIH, NSF, State of Texas and the Flinn Foundation. His research program spans cellular and molecular imaging of cancer and traumatic brain injury, hypoxia imaging, development and multimodality imaging of novel nanoprobes and reporter molecules, MR physics and MRI sequence development and image reconstruction techniques for fast MRSI.

Jeffrey La Belle
Assistant Professor
Ph.D., Arizona State University
jeffrey.labelle@asu.edu

Expertise: biosensors, point-of-care technologies, and sensing systems for health and environmental purposes

Biosketch: La Belle earned his B.S. and M.S. in electrical engineering from Western New England University and an M.S. and Ph.D. from ASU. He is currently an assistant professor in the Harrington Biomedical Engineering Program in SBHSE and the Biodesign Institute at ASU. He is also adjunct faculty with the College of Medicine at the Mayo Clinic, Arizona and ASU's mechanical engineering program. La Belle's lab includes more than 60 undergraduate and graduate students (and more than 200 alumni) from computer science engineering, electrical engineering, biology, chemistry, bioengineering and chemical engineering. La Belle's research focus revolves around label-free, noninvasive wearable sensing, point-of-care technologies, and prosthetic design. Other interests include commercialization of biomedical devices and prototyping, advanced materials synthesis, product design and methods of manufacturing.

Thurmon Lockhart
Professor
Ph.D., Texas Tech University
thurmon.lockhart@asu.edu

Expertise: biomechanics, biodynamics, biosensors, neurorehabilitation, gait and posture, fall prevention

Biosketch: Lockhart earned his B.S., M.S. and Ph.D. in industrial and systems engineering with a biomechanics concentration from Texas Tech University. Lockhart is currently a professor of biomedical engineering in SBHSE, an adjunct professor at Barrow Neurological Institute and a guest professor at Gent University in Belgium. Previously Lockhart was a professor at Virginia Tech in industrial and systems engineering and Wake Forest School of Biomedical Engineering and Science. Lockhart's research concerns the identification of injury mechanisms and quantification of sensorimotor deficits and movement disorders associated with aging and neurological disorders on fall accidents. His research efforts have included contractual research and development from the NSF, Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH), National Institute of Occupational Safety and Health (NIOSH), Office of Naval Research (ONR), Department of Labor, Whitaker Foundation, Los Alamos National Laboratory, UPS and ITT.

James Levine
Professor
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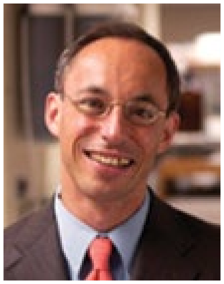

Expertise: obesity initiative research

Biosketch: Having trained in clinical nutrition as a scholar at the University of Cambridge, Levine, MBBS, Ph.D., has dedicated his scientific career to promoting health in adults and children through education and innovation. Levine currently serves as a principal investigator for NIH-funded studies focused on improving health for immigrant families through increased activity and better nutrition, interactions between sleep and obesity, and multilevel approaches to reduce obesity in working mothers and their children. Levine is a world authority on obesity, serving as a named expert at the United Nations, an invitee to the President's Cancer Panel, and a consultant to governments internationally. He is the Richard F. Emslander Professor of Endocrinology and Nutrition Research at Mayo Clinic. He holds five tenured professorships at ASU, is the Dean's Distinguished Professor of Medicine at Case Western Reserve University and the Regents Professor at Umea University in Sweden. He also serves as the co-director of Obesity Solutions, a collaboration between Mayo Clinic and ASU, and is the international director of Obesity Solutions' sister center in Sweden. Levine is also an international advocate for child rights and safety and serves on the board of the International Centre for Missing & Exploited Children.

Stephen Massia
Associate Professor
Ph.D., University of Texas
smassia@asu.edu

Expertise: cell-material interactions

Biosketch: Massia completed his undergraduate work in biology and chemistry at Southwestern University and received his Ph.D. in biological sciences from the University of Texas in 1992. He was a postdoctoral fellow and research assistant professor in the Cardiology Division at the University of Arizona School of Medicine from 1992-1996 before taking a faculty position at Clemson University in the Bioengineering Department. He joined SBHSE as an associate professor in 1998. His research involves developing implantable biomaterials that mimic the host tissue environment and promote tissue regeneration and restoration of healthy function. Massia was a recipient of an NIH Career Development Award and is currently working collaboratively on projects with surgeons at Mayo Clinic Scottsdale.

Troy McDaniel
Research Assistant Professor
Ph.D., Arizona State University
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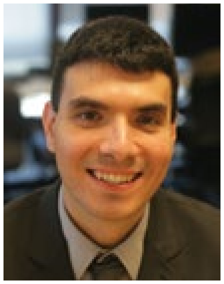

Expertise: haptics, ubiquitous computing, human-centered computing, assistive/rehabilitation technology

Biosketch: McDaniel is an assistant research professor in the School of Computing, Informatics, and Decision Systems Engineering, and SBHSE. He is the associate director of the Center for Cognitive Ubiquitous Computing at ASU, and the research rirector of ASU's IGERT project, "Alliance for Person-centered Accessible Technologies" (APAcT). McDaniel's research interests include human-computer interaction, haptics, assistive technology and rehabilitative technology. For almost a decade, he has explored how our sense of touch can be better utilized by technology as a communication channel. He has more than 25 peer-reviewed papers in premier haptics and human-computer interaction conferences and journals. He is an IEEE and ACM member.

Jit Muthuswamy
Associate Professor
Ph.D., Rensselaer Polytechnic Institute
jit@asu.edu

Expertise: neural interfaces, micro-electromechanical systems (MEMS), microscale and nanoscale implants, gene delivery and modulation

Biosketch: Muthuswamy has an M.S. in electrical engineering and an M.S. in biomedical engineering and a Ph.D. in biomedical engineering from Rensselaer Polytechnic Institute. He did postdoctoral fellowship in biomedical engineering at Johns Hopkins University. He is currently an associate professor in bioengineering in SBHSE and an affiliate faculty in electrical engineering at ASU. His research program in neural interfaces and high-throughput biochip platforms have been supported by NIH, Whitaker foundation, DARPA, and the Arizona Biomedical Research Commission. He is a senior member of the IEEE and a member of the Society for Neuroscience. His research interests are in Neural engineering, robotic systems, neural interfaces, gene delivery and modulation and BioMEMS. His research interests are in Neural engineering, robotic systems, neural interfaces, gene delivery and modulation and BioMEMS.

Robert Mittman
Professor of Practice
M.P.P., University of California, Berkeley
robert.mittman@asu.edu

Expertise: biomedical strategy and knowledge development, complex adaptive systems

Biosketch: Mittman earned his B.S. in electrical engineering and computer science, M.S. in computer science, and M.P.P. in public policy, all from the University of California, Berkeley. He is the director of biomedical strategy and knowledge development with the Complex Adaptive Systems group at ASU. His work there centers on developing standards for the discovery and validation of biomarkers. Mittman specializes as a scientific strategist. He helps large groups of scientists from diverse disciplines articulate shared areas of interest, frame significant and innovative research questions, and identify opportunities for new partnerships and collaborations to advance the development of new fields of science. His interests include cancer, diabetes, retinal diseases, inflammatory bowel disease, angiogenesis, aging and geriatrics, clinical trial methodologies, medical education and medical informatics.

Mehdi Nikkhah
Assistant Professor
Ph.D., Virginia Tech
mehdi.mikkhah@asu.edu

Expertise: cardiovascular tissue engineering, BioMEMS, cancer detection and metastisis, cell biomechanics

Biosketch: Nikkhah earned his B.S. in mechanical engineering and M.S. degree in biomedical engineering from Tehran Polytechnic University. He also has an M.S. degree in mechanical engineering from Villanova University and Ph.D. degree in mechanical engineering from Virginia Tech. He completed his postdoctoral fellowship training at Harvard Medical School and Brigham and Women's Hospital where he was awarded National Institute of Health (NIH) Ruth L. Kirschstein National Research Service Awards for his work on cardiovascular tissue engineering. Nikkhah joined SBHSE in 2014 and the research in his lab is focused on use of micro- and nanoscale technologies to develop vascularized tissue models for regenerative medicine and disease modeling applications.

Scott Parazynski
Professor of Practice and University Explorer
M.D., Stanford University School of Medicine
parazynski@asu.edu

Expertise: point of care medical diagnostic and therapeutic technologies, telemedicine, remote medical care delivery and human factors engineering.

Biosketch: During his 17-year career with the NASA Astronaut Corps, Parazynski flew on five shuttle missions and conducted seven spacewalks, traveling over 23 million miles in orbit, spending more than eight weeks in space and 47 hours outside the vehicle. As a shuttle crew member, he served as crew medical officer, shuttle flight engineer, lead spacewalker, assembly and maintenance worker and operator of robotic arms. Since leaving the space agency in 2008, he has worked in senior leadership positions in both the aerospace and medical research industries, and has been instrumental in the development of numerous medical devices and other technologies for supporting life in extreme environments. As a commercial, multiengine, seaplane and instrument-rated pilot, he has logged over 2,500 flight hours. As a mountaineer, he has climbed in the Alaska Range, the Cascades, the Rockies, the Alps, the Andes, and the Himalayas. On his second attempt to summit Mt. Everest in May 2009, he became the first astronaut to stand on top of the world. Parazynski joined ASU in October 2014 as a professor of practice and university explorer with a joint appointment in SBHSE and the School of Earth and Space Exploration.

Vincent Pizziconi
Associate Professor
Ph.D., Arizona State University
vincent.pizziconi@asu.edu

Expertise: bioresponsive and biomimetic materials, biointerfaces, medical device design and development

Biosketch: Pizziconi is an associate professor of Bioengineering and the director of the SBHSE Design Studio. He received his formal training in both chemical engineering and biomedical engineering with an emphasis in medical device artificial organ transport systems. He has subsequently focused on the development of biomedical engineering education, research, and public service programs involving the innovation, design, development, as well as legal, regulatory and technology assessment of medical devices and technologies. His current research centers on the development of bioinspired 3-D multiscale biomaterial, tissue and solid organ therapeutic systems for regenerative medicine, as well as microfluidic and engineered biohybrid molecular and cellular sensors and systems for personalized diagnostics.

Rosalind Sadleir
Assistant Professor
Ph.D., University of Western Australia
rosalind.sadleir@asu.edu

Expertise: neuro imaging and neural activity detection, dynamic physiological monitoring, computational modeling

Biosketch: Sadleir is an assistant professor in SBHSE, where she leads the Neuro-electricity Laboratory. She received the B.S. degree in physics and the Ph.D. degree in physics and electrical engineering from the University of Western Australia. Her core strengths are in computational modeling, neuroimaging and inverse problems. Her present research foci are finite element modeling and measurement of current flows in tDCS and deep brain stimulation, and bulk measurements of neural tissue activity using functional magnetic resonance electrical impedance tomography. She has been involved in development and commercialization of electrical impedance tomography devices for applications such as detection of intraperitoneal bleeding and intraventricular hemorrhage in newborns. She is also involved in research into the etiology of perinatal brain injury using combined electrical impedance tomography and EEG recordings. Sadleir was the chair of the 11th International Conference on Biomedical Applications of Electrical Impedance Tomography and the 14th International Conference on Electrical Bioimpedance, Gainesvillle, Florida, in April 2010. She also serves on the EIT steering committee.

Marco Santello
Director and Professor
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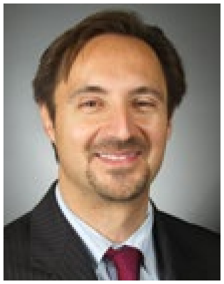

Expertise: motor control, neurophysiology, biomechanics

Biosketch: Santello received a bachelor degree in kinesiology from the University of L'Aquila, Italy, in 1990 and a doctoral degree in exercise sciences from the University of Birmingham, UK, in 1995. After a postdoctoral fellowship at the Department of Physiology (now Neuroscience) at the University of Minnesota, Minneapolis, he joined the Department of Kinesiology at Arizona State University in 1999. He joined SBHSE in 2010 and has been the Director of the school since 2011. His research aims at identifying neural mechanisms responsible for sensorimotor control and learning, and applications to rehabilitation of sensorimotor function. Santello's work has been supported by the National Institutes of Health (NIH), the National Science Foundation (NSF), the Whitaker Foundation, and the Mayo Clinic. He serves as associate editor for Neuroscience and Biomedical Engineering and IEEE Transactions on Haptics, associate member of the Editorial Board for Scientifica, regular member of Motor Function, Speech, and Rehabilitation NIH Study Section, and the NSF College of Reviewers.

Barbara Smith
Assistant Professor
Ph.D., University of Maryland
barbarasmith@asu.edu

Expertise: Noninvasive, point-of-care medical diagnostics

Biosketch: Smith joined SBHSE as an assistant faculty in January 2015. Her career began in industry, with the initiation of a company and the design of commercial products. After completing her Ph.D. in tissue engineering and nanotechnology, Barbara joined the Whitesides' Lab at Harvard University where she developed paper-based diagnostics. She formed connections across India to translate diagnostic devices, designed on the bench top, into the hands of user in India. At ASU, Smith's laboratory is actively working to develop noninvasive, point-of-care diagnostics for improving women's health. These methods include paper-based molecular diagnostics, olfactory sensing and tissue imaging. Her innovative approach is aimed towards driving international exposure and product translation; connecting ASU students to relevant problems that exist both in our back yards and/or throughout the far-reaching areas of the world.

Sarah Stabenfeldt
Assistant Professor
Ph.D., Georgia Institute of Technology
sarah.stabenfeldt@asu.edu

Expertise: neurotrauma, neural regenerative medicine, drug delivery, theranostics, biomarker discovery

Biosketch: Stabenfeldt received her B.S. in biomedical engineering from Saint Louis University and her Ph.D. in bioengineering from Georgia Institute of Technology. She was awarded an NIH NRSA predoctoral fellowship for her doctoral thesis research on developing neural tissue engineering therapies for traumatic brain injury. As an NIH postdoctoral fellow at Emory University School of Medicine and Georgia Tech, she investigated fibrin-derived peptide-protein binding interactions, designing fibrin-based wound healing therapeutics. She joined SBSHE as an assistant professor in 2011 and leads her research team in developing regenerative medicine and diagnostic strategies for acute neural injury. Since joining ASU, Stabenfeldt has been awarded the Arizona Biomedical Research Consortium (ABRC) Early Stage Investigator Award and the NIH Director's New Innovator Award.

Mark Spano
Research Professor
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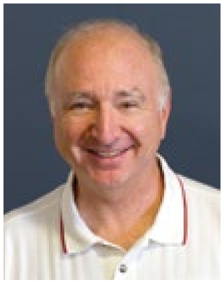

Expertise: nonlinear dynamics of biological systems, dynamics of epilepsy, portable medical device development

Biosketch: Spano received his B.S. in physics from St. Joseph's College in Philadelphia in 1975, going on to earn his M.S. in physics in 1977 and his Ph.D. in condensed matter physics in 1980, both from the University of Maryland. From 1981-2010, Spano served as a research physicist for the U.S. Navy, being promoted in 2000 to the rank of Distinguished Research Physicist. In 1990 Spano demonstrated the first experimental control of chaos and his activities in inventing, developing and demonstrating methods of chaos control and chaos maintenance have earned him an international recognition for his critical role in creating and expanding this important new field. He subsequently applied this technology to the biological arena by showing that certain cardiac arrhythmias, including atrial and ventricular fibrillation, are indeed examples of deterministic chaos, as are certain brain behaviors related to epilepsy. He was elected an Honorary Fellow of the Washington Academy of Sciences in 1998 and a Fellow of the American Physical Society in 2001.

Bruce Towe
Professor
Ph.D., Penn State University
bruce.towe@asu.edu

Expertise: microscale neural implants, bioelectronic instrumentation, biosensors, biological and medical instrumentation, medical ultrasound

Biosketch: Towe has a broad background in applying electronic and principles of physics to the design of biomedical devices and particularly microelectronic devices targeted for implantation. He performs research in the area of neurostimulation, microelectronic implants, bioelectronics and biomedical instrumentation. His research work has been supported by National Aeronatuics and Space Administration, National Institutes of Health, National Science Foundation, as well as by the American Heart Association, Arizona Disease Control Research Commission, Flinn Foundation and the Whitaker Foundation. A recent interest has been in the transfer of ASU neurostimulation technology to small business. He holds a Ph.D. in bioengineering from Penn State University.

Jamie Tyler
Associate Professor
Ph.D., University of Alabama at Birmingham
jamie.tyler@asu.edu

Expertise: neural engineering

Biosketch: Tyler is an associate professor in SBHSE. He received his B.S. and Ph.D. from the University of Alabama at Birmingham before conducting a postdoctoral fellowship in the Department of Molecular and Cellular Biology at Harvard University. Tyler was a National Institutes of Health, National Institute of Neurological Diseases and Stroke predoctoral and postdoctoral fellow. After completing his postdoc in 2006, he began as an assistant professor of neurobiology and bioimaging at ASU, then spent a few years as an assistant professor of biomedical engineering at Virginia Tech before returning to ASU.

Brent Vernon
Associate Professor
Ph.D., University of Utah
brent.vernon@asu.edu

Expertise: biomaterials drug delivery, tissue engineering

Biosketch: Vernon completed his undergraduate work in biomedical engineering at ASU 1993 and then his Ph.D. graduate work at the University of Utah in bioengineering in 1998. Following this graduate program, he completed a postdoctoral fellowship at the University of Zurich/ETHZ in Zurich, Switzerland, working toward the development of an injectable intervertebral disk patch. He joined the ASU biomedical engineering program as an assistant professor in 2000 and was promoted to associate professor in 2006. His research focus is the development of biocompatible polymers for drug delivery and tissue engineering. Specifically, he develops new injectable materials for delivery of chemotherapy agents for cancer treatment and for delivery of antibiotics and pain relieving drugs for orthopedic implant applications. He is also a co-founder of Sonoran Biosciences and Aneuvas Technologies that look to translate these materials to the clinic.

Michael VanAuker
Lecturer
Ph.D., University of Pittsburgh
michael.vanauker@asu.edu

Expertise: cardiovascular mechanics, prosthetic heart valves, targeted drug delivery systems

Biosketch: VanAuker received a Ph.D. in chemical engineering from the University of Pittsburgh in 1997. From 1997-2000, VanAuker engaged in translational and clinical research at teaching hospitals associated with the Albert Einstein College of Medicine in the Bronx, and then with the SUNY Health Sciences Center, Brooklyn. He served on the faculty of the Department of Chemical and Biomedical Engineering at the University of South Florida from 2001-2009, where he further developed research in cardiovascular disease: imaging, heart valve and arterial mechanics, and targeted drug delivery to the plaque of atherosclerosis. VanAuker earned a J.D. from the Santa Clara School of Law in 2012, with a focus in high tech and intellectual property law, and is an active member of the State Bar of California. Vanauker's interest is to bring interdisciplinary approaches to bear on challenging technological problems, specifically to find unique ways to blend medical research with engineering analysis to develop diagnoses and treatments of disease, and to traverse the intersection of medicine, engineering and the law to improve healthcare from both a technological and policy standpoint.

Xiao Wang
Assistant Professor
Ph.D., University of North Carolina at Chapel Hill
xiaowang@asu.edu

Expertise: synthetic and systems biology

Biosketch: Wang received his B.S. from Tongji University in China and his Ph.D. from University of North Carolina at Chapel Hill. His postdoctoral training at Boston University/HHMI focus on designing, constructing and studying synthetic gene circuits. He joined SBHSE as an assistant professor in 2010 and leads his research team in using both reverse engineering and forward engineering approaches to understand gene networks. Members in Xiao Wang's lab are from diverse background in biology, physics, engineering and mathematics. His lab is supported by grants from National Science Foundation, National Institutes of Health, and American Heart Association.

Professors Emeriti

Eric Guilbeau
Professor Emeritus

Expertise: thermoelectric detection of biological events, microfluidics, transport phenomena, heat transfer, modeling and simulation of biological systems, biosensors

Leon Iasemidis
Professor Emeritus

Expertise: advanced digital signal processing and global optimization techniques. Dynamics and control of spatio-temporal chaotic transitions in spatially coupled systems. Mathematical analysis and modeling of brain electrical and magnetic activity

James Sweeney
Professor Emeritus

Expertise: bioelectricity, biosensors, neural stimulations, cardiac pacing and defibrillation and computational modeling of bioengineering problems

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