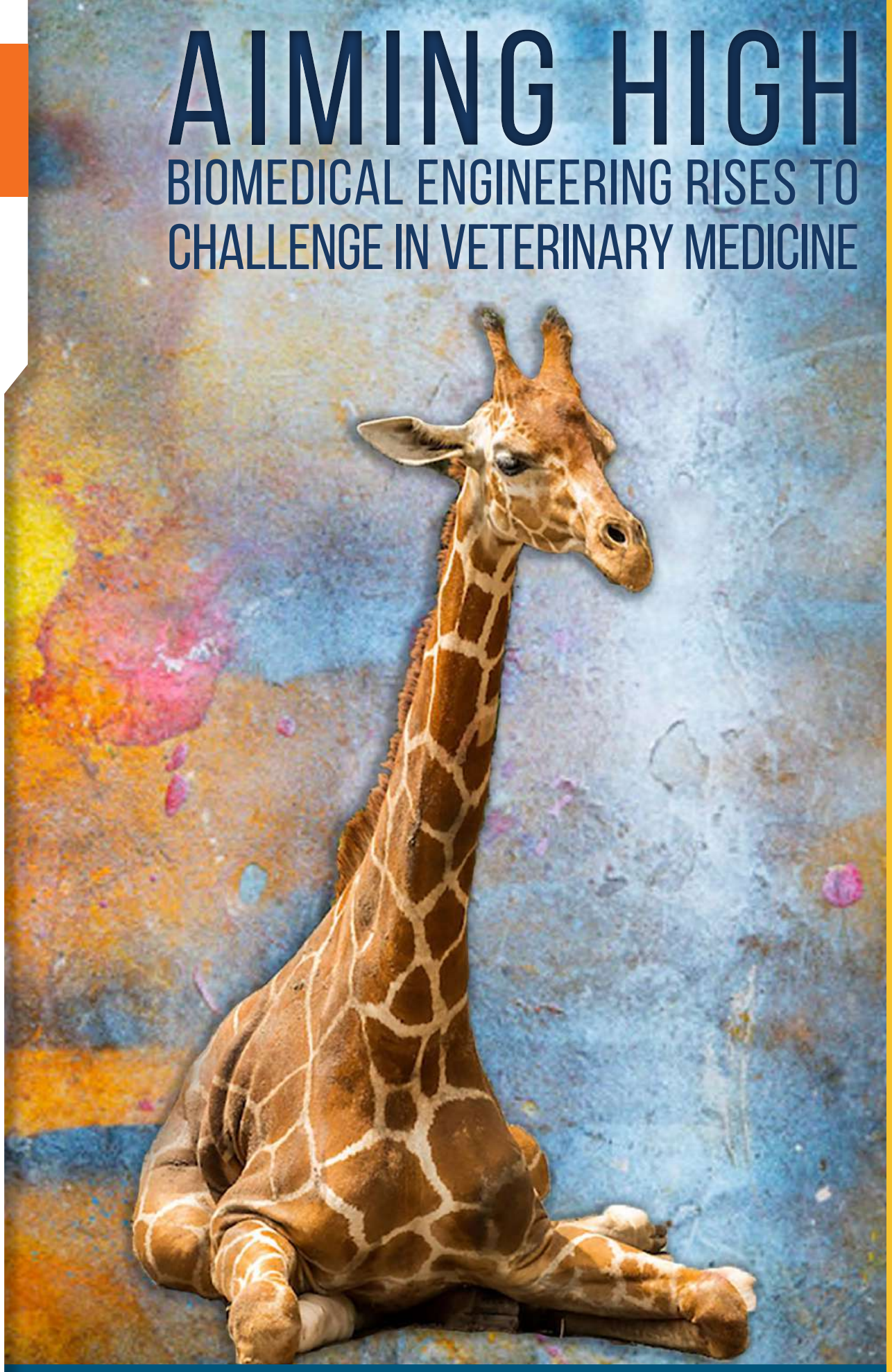
UF

CrossLink

AIMING HIGH

BIOMEDICAL ENGINEERING RISES TO CHALLENGE IN VETERINARY MEDICINE



BIOMEDICAL ENGINEERING *at the* UNIVERSITY *of* FLORIDA // ***FALL 2020***

UNIVERSITY OF FLORIDA

ARTIFICIAL INTELLIGENCE INITIATIVE

AS PART OF UF'S LAND GRANT MISSION AND THE STATE'S LARGEST RESEARCH INSTITUTION, THE UNIVERSITY WILL TAKE A LEAD ROLE AS THE AI UNIVERSITY FOR THE STATE AND NATION.

UF has launched an initiative to deploy and infuse Artificial Intelligence across its entire curriculum to foster an AI-enabled workforce and equip and position its researchers to solve some of our world's most pressing challenges.

- PREPARE STUDENTS WITH AI AND DEEP LEARNING TOOLS
- ADVANCE RESEARCH USING AI AND DATA SCIENCE
- FOSTER INDUSTRY PARTNERSHIPS
- LEVERAGE WORKFORCE OPPORTUNITIES

FROM THE CHAIR

This has been the year of change for so many reasons. It's been a year of transformation.

We here at UF BME are not only examining this unprecedented time – we want to embrace it. We are, in many ways, thankful for the strong push to reflect and to improve ourselves.

This year we changed how we approach CrossLink. In addition to our standard CrossLink magazine, we created a separate stand-alone supplement to focus explicitly on amplifying Black voices (coming soon!). I encourage you to read this supplement and to hear the touching and thoughtful stories from our faculty, students, alumni, and board members. I am grateful that our community has contributed and that so many voices are being heard. We are thankful to be a part of the larger movement.

We also need to address accessibility challenges faced by people with disabilities, expand LGBTQ+ rights, and continue to fight for gender equity. This is by no means a comprehensive list.

There is a lot to be thankful for - in the pages that follow, you will learn about a major gift from Mr. George Harper that will greatly impact student scholarships.

Collaborations and community outreach is also a critical part of our mission, and we are thankful for having so many amazing people and resources.

The university is embarking on a significant campus-wide transformation in Artificial Intelligence, stimulated by a combined major gift of $50 million from a UF alum and NVIDIA. Our faculty and students in AI will benefit greatly.

We also highlight a story in which Dr. McFetridge and his team use their research to help humankind and "giraffe-kind"! This amazing story showcases how advanced biological materials save an ailing giraffe.

We are thankful that one of our students, Heather Blackwell, shared her inspiring personal story of survival and courage and how she is using her own experiences to give back to the community.

One of our most significant accomplishments this year is reaching 52% of women faculty. I cannot stress how proud I am of this major achievement and personally want to acknowledge our entire UF BME faculty's team effort and the proactive measures by our faculty search committees over the years, headed by Dr. Ben Keselowsky and more recently by Dr. Greg Hudalla. Helping us reach this huge milestone is the most recent recruitment of Drs. Ivana Parker, Ana Maria Porras, Brittany Taylor, and Meghan Ferrall-Fairbanks. These four women (the "Fab Four") are an incredible addition to our team! We look forward to having them shape the future of UF BME!

Thank you for reading this issue of CrossLink and our special supplement on Black Excellence. Making a difference for humankind is at the heart of our department. But we can - and must - do better.

Everyone, please take care and be safe.

> "WE HERE AT UF BME ARE NOT ONLY EXAMINING THIS UNPRECEDENTED TIME - WE WANTED TO EMBRACE IT."

Sincerely,

CSchmidt

Christine E. Schmidt
Professor, J. Crayton Pruitt Family Chair and Department Chair

CrossLink

A publication of the J. Crayton Pruitt Family Department of Biomedical Engineering at the University of Florida

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UF UNIVERSITY of FLORIDA

IN THIS ISSUE

BME NEWS & NOTABLES

DEPARTMENT MISSION

Developing innovative and clinically translatable biomedical technologies, educating future generations of biomedical engineers and cultivating leaders by nurturing the integration of engineering, science, and healthcare in a collaborative and dynamic educational and research environment.

JON DOBSON, PH.D.
NAMED NATIONAL ACADEMY OF INVENTORS FELLOW

CHRISTINE SCHMIDT, PH.D.
INDUCTED INTO FLORIDA INVENTORS HALL OF FAME

KEY RESEARCH ADVANCES + INNOVATION

Dr. Wesley Bolch and **Dr. Peter McFetridge** are collaborating with Dr. Harald Paganetti from the Massachusetts General Hospital on a five year, $2.5 Million R01, "Developing Whole-Body Computational Phantoms for Blood Dosimetry to Model the Impact of Radiation on the Immune System"

Dr. Ruogu Fang awarded $500K NSF grant, "III: Small: Modeling Multi-Level Connectivity of Brain Dynamics"

Dr. Jennifer Nichols awarded $560K NIH R21 Trailblazer award, "A Transfer Learning Framework for Creating Subject-Specific Musculoskeletal Models of the Hand"

Dr. Cherie Stabler awarded $1.7 million five-year R01, "Engineering Immunomodulatory Nanoscale Coatings for Protecting Islet Transplants"

AIMBE FELLOWS

Kevin Otto, Ph.D.
Professor & Senior Associate Chair

Lakiesha Williams, Ph.D.
Associate Professor

Carlos Rinaldi, Ph.D.
Chemical Engineering Dept. Chair & Dean's Leadership Professor

Wesley Bolch, Ph.D.
Distinguished Professor

AIMBE FELLOWS REPRESENT THE TOP 2% OF MEDICAL AND ENGINEERING PROFESSIONALS IN MEDICAL AND BIOLOGICAL ENGINEERING.

NSF GRADUATE RESEARCH FELLOWS

Edgar Cubillo
Ph.D. Student Stabler Lab

Daniel El Basha
Bachelors, UF BME, 2019

Wisam Fares
Bachelors, UF BME, 2018

David Hall
Ph.D. Student Dobson/Otto Labs

Elisa Nieves
Bachelors, UF BME, 2020

NSF GRFP RECOGNIZES OUTSTANDING GRADUATE STUDENTS CONDUCTING RESEARCH IN THE FIELDS OF SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS.

BETWEEN FY15 AND FY19, UF BME RESEARCH FUNDING HAS INCREASED BY 108%

Distinguished Leadership Seminar Series

2020-2021 SPEAKERS

BIN HE, PH.D.
Trustee Professor and Department Head, Biomedical Engineering, Professor, Electrical & Computer Engineering, Neuroscience Institute, Carnegie Mellon University

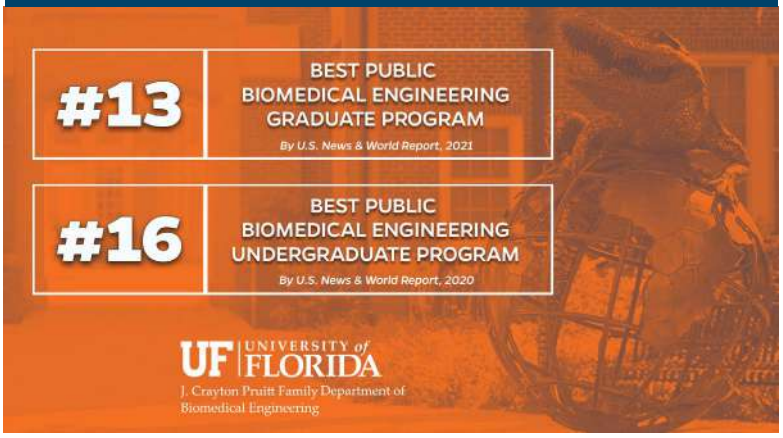
JENNIFER H. ELISSEEFF, PH.D.
Morton Goldberg Professor, Wilmer Eye Institute and Biomedical Engineering, Director, Translational Tissue Engineering Center, Johns Hopkins University
Lessons in Translation: How Clinical Experience Guides Discovery in Regenerative Medicine

DAWN M. ELLIOTT, PH.D.
Blue and Gold Distinguished Professor & Department Chair, Biomedical Engineering, University of Delaware
Multiscale Mechanics of Musculoskeletal Tissues

RODERIC PETTIGREW, PH.D., M.D.
Chief Executive Officer of Engineering Health, Executive Dean for Engineering Medicine, Texas A&M University
Engineering Better Medicine for Public Health Crises and the Future

REBECCA RICHARDS-KORTUM, PH.D.
Malcolm Gillis University Professor, Department of Bioengineering, Director, Rice 360 Institute for Global Health, Rice University
Engineering Technologies to Improve Health in Low-Resource Settings

UF BME ROSE IN RANK TO NO. 13, UP FROM NO. 15 IN 2021 AMONG PUBLIC PROGRAMS AND HAS CLIMBED 20 SPOTS SINCE 2013.



MAJOR FACULTY AWARDS + RECOGNITIONS

Dr. Wesley Bolch promoted to distinguished professor and received 2019-2020 UF Doctoral Dissertation/Advisor/Mentoring Award

Dr. Daniel Ferris appointed Chair of NIH Musculoskeletal Rehabilitation Sciences Study Section

Dr. Sarah (Rowlinson) Furtney received 2020 TERMIS-AM Educational Award

Dr. Gregory Hudalla received R35 Maximizing Investigators' Research Award from the National Institute of General Medical Sciences (NIGMS)

Dr. Walter Murfee elected President of the Alpha Eta Mu Beta International Biomedical Engineering Honor Society

Drs. Edward Phelps, Parisa Rashidi and **Blanka Sharma** awardees of Pruitt Family Endowed Faculty Fellowships

Drs. Parisa Rashidi and **Blanka Sharma** promoted to associate professor with tenure

Dr. Blanka Sharma recipient of the Pramod P. Khargonekar Junior Faculty Award for Excellence

Drs. Cherie Stabler and **Jennifer Nichols** named Anderson Scholar Faculty Honorees for UF College of Liberal Arts and Sciences

SELECT STUDENT AWARDS + RECOGNITIONS

Robert Accolla received 2020 Graduate School Mentoring Award from UF Graduate School

Kata Alilovic, Renae Burke, Tiffany Conklin, Koen Flores, Garrett Fullerton, Madison Kelberman, Parker Kotlarz, Sophia Saenz and **Baltasar Lopez Sardi,** selected to University Scholars Program

Altaful Amin, Justina Chan, Alexander Dluzneski, Youssef Elbanna, Marye Lee, Brian Nazareth, Henry Nguyen, and **Giancarlo Tejeda** won the 2019 BMES Medtronic Student Design Competition

Matthew Becker, Deanna Bousalis, Stephanie Cernera and **Taylor Yeater** awarded NIH F31 NRSA Fellowships

Edgar Cubillo, Elisa Nieves, Wisam Fares, David Hall and **Daniel El Basha** awarded National Science Foundation Graduate Research Fellowships

Anis Davoudi awarded 2020 MCI Symposium Young Investigator Travel Scholarship

Koen Flores selected to attend the McDonalds Conference for Leaders of Character

Julieth Gomez awarded 2020-21 Diversity Enchantment Award for UF Office of Graduate Diversity Initiatives

Noelle Jacobsen and **Erika Pliner** awarded NIH T32 Fellowship

Shreedevi Kumar awarded Tau Beta Pi Fellowship

Jiapu Liang awarded 2020 TERMIS-AM Mary Ann Liebert Inc. Outstanding Student Award

Peng Liu receives UF Informatics Institute Graduate Student Fellowship

Tran Ngo recipient of C. Williams Hall Scholarship from the Society of Biomaterials

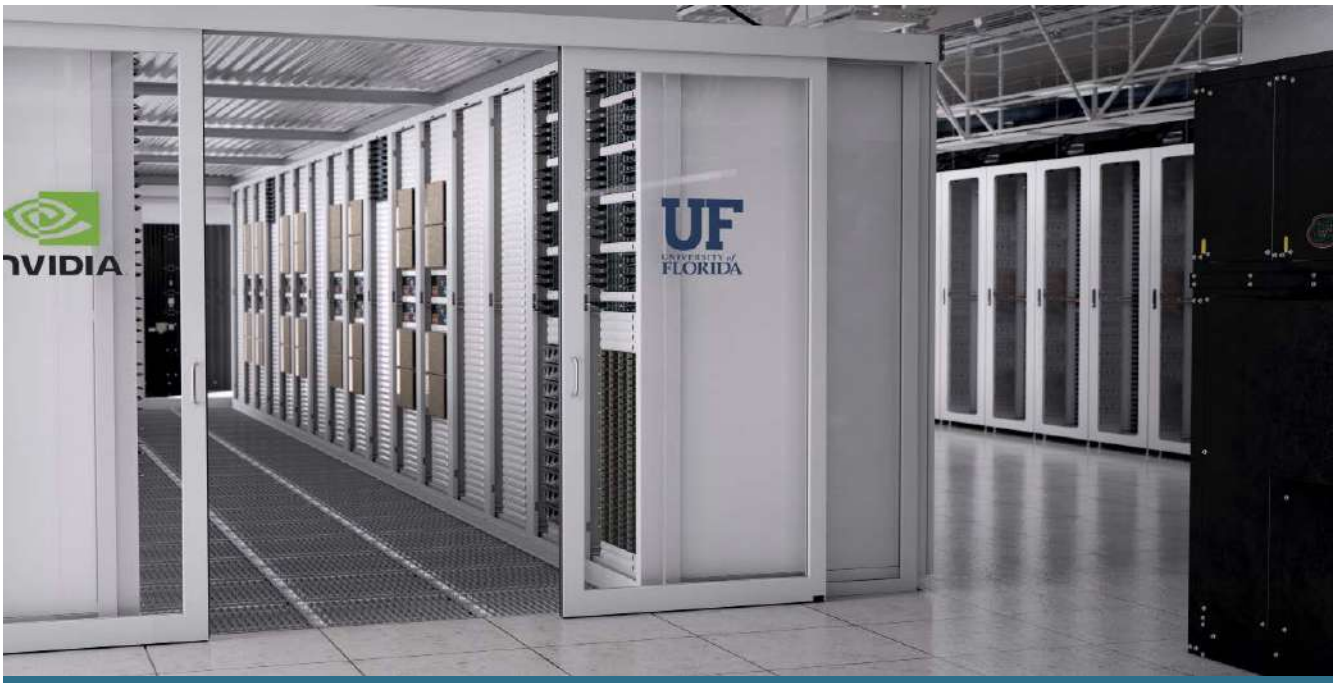
Angelie Rivera-Rodriguez selected to participate in Memorial Sloan Kettering Cancer Center's MSKVIEW Diversity Day

Yao Xiao received BMES CAREER Award and was a graduate student speaker at Spring graduation

UF ANNOUNCES $70 MILLION ARTIFICIAL INTELLIGENCE PARTNERSHIP WITH NVIDIA

The initiative will create an AI-centric data center that houses the world's fastest AI supercomputer in higher education.

TEXT WRITTEN BY
STEVE ORLANDO



NVIDIA
NVIDIA Corporation is an American multinational technology company incorporated in Delaware and based in Santa Clara, California. It designs graphics processing units for the gaming and professional markets, as well as system on a chip units for the mobile computing and automotive market.

ARTIFICIAL INTELLIGENCE
The theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making and translation between languages.

UF IS THE FIRST HIGHER EDUCATION INSTITUTION TO ACQUIRE THE WORLD'S MOST ADVANCED AI SYSTEM

The University of Florida recently announced a public-private partnership with NVIDIA that will catapult UF's research strength to address some of the world's most formidable challenges, create unprecedented access to AI training and tools for underrepresented communities, and build momentum for transforming the future of the workforce.

The initiative is anchored by a $50 million gift — $25 million from UF alumnus Chris Malachowsky and $25 million in hardware, software, training and services from NVIDIA, the Silicon Valley-based technology company he cofounded and a world leader in AI and accelerated computing.

Along with an additional $20 million investment from UF, the initiative will create an AI-centric data center that houses the world's fastest AI supercomputer in higher education. Working closely with NVIDIA, UF will boost the capabilities of its existing supercomputer, HiPerGator, with the recently announced NVIDIA DGX SuperPOD™ architecture. This will give faculty and students within and beyond UF the tools to apply AI across a multitude of areas to improve lives, bolster industry, and create economic growth.

"This incredible gift from Chris and NVIDIA will propel the state of Florida to new heights as it strives to be an economic powerhouse, an unrivaled leader in job creation and an international model of 21st-century know-how," said Florida Gov. Ron DeSantis. "Over the coming years, tens of thousands of University of Florida graduates with this unique AI-oriented background will create their futures and ours, transforming our workforce and virtually every field and every industry here in Florida and around the world."

UF'S NATIONAL AI LEADERSHIP

The partnership will be central to UF's vision to be a national leader in the application of AI, including an expansive plan to elevate its reach and impact in research, teaching, and economic development. It provides a replicable framework for future public-private cooperation, and a model for addressing society's grand challenges through interdisciplinary collaboration. By deploying AI across the curriculum, this powerful resource will address major challenges such as rising seas, aging populations and data security.

"UF's leadership has a bold vision for making artificial intelligence accessible across its campus," said Malachowsky, who serves as an NVIDIA Fellow. "What really got NVIDIA and me excited was partnering with UF to go broader still, and make AI available to K-12 students, state and community colleges, and businesses. This will help address underrepresented communities and sectors across the region where the technology will have a profound positive effect."

EXTENSIVE COLLABORATION WITH NVIDIA

NVIDIA's technology powers two-thirds of the world's 500 fastest supercomputers, including eight of the top 10. The third-generation HiPerGator will have access to NVIDIA's most advanced AI software and integrate 140 NVIDIA DGX™ A100 systems with 1,120 NVIDIA A100 Tensor Core GPUs and high-performance NVIDIA Mellanox HDR 200Gb/s InfiniBand networking to deliver 700 petaflops of AI performance.

UF is the first institution of higher learning in the U.S. to receive DGX A100 systems, which are designed to accelerate diverse workloads, including AI training, inference, and data analytics.

Along with an additional $20 million investment from UF, the initiative will create an AI-centric data center that houses the world's fastest AI supercomputer in higher education.

STRATEGIC PARTNERSHIP

NVIDIA will also contribute its AI expertise to UF through ongoing support and collaboration across the following initiatives:

- The NVIDIA Deep Learning Institute will collaborate with UF on developing new curriculum and coursework for students and the community, including programing tuned to address the needs of young adults and teens to encourage their interest in STEM and AI.

- UF will become the site of the latest NVIDIA AI Technology Center, where UF Graduate Fellows and NVIDIA employees will work together to advance AI.

- NVIDIA solution architects and product engineers will partner with UF on the installation, operation and optimization of the NVIDIA-based supercomputing resources on campus.

- Establishing UF's Equitable AI program, led by **Juan E. Gilbert, Ph.D.**, department chair. The effort is convening faculty members across the university to create standards and certifications in developing tools and solutions that are cognizant of bias, unethical practice and legal and moral issues.

INTEGRATED AI CURRICULUM, INTELLIGENT-DECISION SUPPORT, EQUITABLE ACCESS

As a comprehensive institution, UF has a goal of bringing together students and faculty from across campus and the state. It will be among the nation's first to integrate AI across all disciplines and make it a ubiquitous part of its academic enterprise. It will offer certificates and degree programs in AI and data science, with curriculum modules for specific technical and industry-focused domains. The initiative includes a commitment from UF to hire 100 more faculty members focused on AI.

"More than ever before in my lifetime, people around the country and the globe are looking to universities to expand access to higher education and technology and to level the field of opportunity for all," said UF **President Kent Fuchs**. "UF intends to meet that challenge, and this partnership will help us do it."

To ensure no community is left behind, UF plans to promote wide accessibility to these computing capabilities and work with other institutions to develop a talent pipeline able to harness the power of AI through several initiatives. These include:

- Creating partnerships with industry and other academic groups, such as the Inclusive Engineering Consortium, whose students will work with members to conduct research and recruitment to UF graduate programs. The effort is led by **Damon Woodard, Ph.D.**, an associate professor in the Department of Electrical and Computer Engineering.

"This initiative will allow us to recruit and equip a diverse, talented cadre of faculty and students across multiple disciplines and bring them together with colleagues from government and the private sector to find solutions to our most important problems," said **Cammy Abernathy, Ph.D.**, dean of the Herbert Wertheim College of Engineering.

"More than ever before in my lifetime, people around the country and the globe are looking to universities to expand access to higher education and technology and to level the field of opportunity for all," said UF **President Kent Fuchs**. "UF intends to meet that challenge, and this partnership will help us do it."

BME FACULTY ADVANCING AI IN HEALTHCARE

MEGHAN FERRALL-FAIRBANKS, PH.D.
ASSISTANT PROFESSOR

MACHINE LEARNING TO INVESTIGATE ECOLOGICAL AND EVOLUTIONARY DYNAMICS IN CANCER AT THE RESOLUTION OF INDIVIDUAL CELLS.

RESEARCH | Quantitative systems biology, mathematical modeling, cancer heterogeneity and evolutionary dynamics

MINGZHOU DING, PH.D.
DISTINGUISHED PROFESSOR & J. CRAYTON PRUITT FAMILY PROFESSOR

INTEGRATING AI/MACHINE LEARNING WITH MULTIMODAL NEUROIMAGING TO UNDERSTAND THE NORMAL AND PATHOLOGICAL MECHANISMS IN THE HUMAN BRAIN.

RESEARCH | Cognitive neuroscience, signal processing and neural imaging

PARISA RASHIDI, PH.D.
ASSOCIATE PROFESSOR & J. CRAYTON PRUITT FAMILY TERM FELLOW

INTELLIGENT ICU: SLEEP DISRUPTION DETECTION, PAIN RECOGNITION, ACTIVITY RECOGNITION BASED ON USING COMPUTER VISION IN THE INTENSIVE CARE UNIT.

OUTCOME PREDICTION: PREDICTION OF PATIENT OUTCOMES BASED ON REAL-TIME AND INTERPRETABLE PHYSIOLOGICAL SIGNALS ANALYSIS USING DEEP TEMPORAL MODELS IN THE PERIOPERATIVE AND CRITICAL CARE SETTING.

RESEARCH | Medical artificial intelligence (AI) and pervasive health

RUOGU FANG, PH.D.
ASSISTANT PROFESSOR

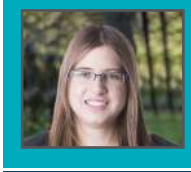
AI-POWERED RETINAL IMAGE ANALYSIS SYSTEM FOR EARLY DETECTION OF ALZHEIMER'S AND PARKINSON'S DISEASES FROM A QUICK EYE SCAN.

MACHINE LEARNING MODELING OF ELECTRICAL CURRENT DISTRIBUTION FOR PERSONALIZED NON-INVASIVE BRAIN STIMULATION - ALTERING THE TRAJECTORY OF COGNITIVE AGING AND ALZHEIMER'S DISEASE.

AI-DRIVEN PLATFORMS IN MEDICAL IMAGING TO IMPROVE IMAGE CLARITY AND REDUCE RADIATION EXPOSURE.

AI-ENABLED BRAIN SIGNAL ANALYSIS TO IDENTIFY RESPONDERS TO SPINAL CORD STIMULATION IN CHRONIC PAIN PATIENTS TO AVOID UNNECESSARY INVASIVE DEVICE IMPLANTATION.

RESEARCH | Artificial intelligence, brain dynamics and medical image analysis



JENNIFER NICHOLS, PH.D.
ASSISTANT PROFESSOR

TRANSFER LEARNING TO RAPIDLY CREATE PATIENT-SPECIFIC, COMPUTER MODELS OF THE MUSCULOSKELETAL SYSTEM.

MACHINE LEARNING TO ENHANCE UNDERSTANDING OF THE COMPLEX MUSCULOSKELETAL MECHANISMS UNDERLYING HEALTHY AND IMPAIRED HAND FUNCTION.

RESEARCH | Biomechanics, musculoskeletal modeling, predictive simulation and medical imaging

UNIVERSITY OF FLORIDA VETERINARIANS SUCCESSFULLY USING NEW PLACENTA-DERIVED TREATMENT FOR ANIMALS WITH SEVERE BONE LOSS

IMAGES BY
LOUIS BREMS

TEXT WRITTEN BY
SARAH CAREY

A human placenta-derived compound developed by a University of Florida faculty member in the Herbert Wertheim College of Engineering is being used with promising results by veterinarians at UF's College of Veterinary Medicine to treat animals with severe bone loss.

Without the compound, the animals – which included a giraffe at the Jacksonville Zoo and Gardens and two pet dogs – would have almost certainly faced amputation of the affected areas, the veterinarians said.

The product's developer, **Peter McFetridge, Ph.D. the Integra Lifesciences Term Professor in the J. Crayton Pruitt Family Department of Biomedical Engineering,** studies the engineering of viable "living" tissues and organs for the repair and regeneration of diseased tissues. Stan Kim, BVSc., an associate professor of small-animal surgery at UF, learned of McFetridge's work and was intrigued about the placental compound he had been testing in rodent models with some success.

McFetridge and Kim began discussing possibilities for the product's additional use in small animals. Kim treated the dogs with the new compound at UF's Small Animal Hospital earlier this year.

"Both dogs had very bad fractures that did not heal and had lost a lot of bone," Kim said. "Typical treatments usually fail in these types of cases." The dogs were completely healed after the placental treatment, he said, and are doing very well.

"The most exciting thing about the placental compound is that it seems to regenerate bone in a remarkable manner," Kim said. "Although our main excitement is with regenerating bone, we have also had very positive results with wounds."

Meanwhile, Kim's colleague, Adam Biedrzycki, BVSc., Ph.D., an assistant professor of equine surgery at UF, had been contacted in January by the Jacksonville Zoo and Gardens about the possibility of helping with the treatment of a 2-year-old reticulated giraffe, named JoJo, who had become severely lame in October 2019. Despite various treatments provided at the zoo, JoJo's foot problems had worsened.

"They asked if I or a colleague had any interest in consulting or participating in the case," Biedrzycki said.

JoJo had a severe case of septic arthritis in the medial claw of her right front foot, he said. The zoo had been treating the giraffe with analgesics, antibiotics and stall rest, and had even applied a custom-made boot from a farrier who works with exotic hoofstock. However, radiographs appeared to show severe bone loss around her joint with subsequent degenerative osteoarthritic changes, making it very uncomfortable for her to walk.

"I told them that giraffes are certainly not my area of expertise, but in a bovine or horse with this condition we would do massive bone grafts, place antibiotic beads, administer antibiotics directly into the limb and spend lots of time and money trying to save the digit. In a cow, we would drill out and remove the dead or damaged tissue surrounding the foot bone. Then we would cast it followed by regular bandage changes on the limb and leave it to heal."

That was essentially what was done with the giraffe, he said — but with the addition of the placental compound.

Biedrzycki spoke with Kim, who had used the placental compound successfully in a few cases. Kim put Biedrzycki in touch with McFetridge to further discuss the product and its potential for treating infections and stimulating bone growth.

JOJO THE GIRAFFE

DR. ADAM BIEDRZYCKI APPLIES A SWEAT WRAP TO DECREASE SWELLING IN JOJO'S METACARPUS AFTER FOOT SURGERY.

Biedrzycki then brainstormed with Jacksonville Zoo veterinarian Yousef Jafarey, D.V.M., and his team to develop a plan: They would cut out the diseased bone, clean out the area and put in bone allografts, antibiotic beads and the placental product "to try to speed things up."

The giraffe wore a cast on her foot, and three cast changes were performed six weeks apart. The second time, the area was cleaned out a bit more and additional placental compound was applied, Biedrzycki said.

"It was a very big deal," he said. "I was really impressed with the whole team effort."

That effort involved the zoo's keepers, its animal health team, an anesthesia crew and many more people performing various duties along the way, Biedrzycki said.

"You also had an army of people massaging the giraffe's neck, another team putting antibiotics in the vein, and the surgery team working on the foot, along with a farrier to help trim the foot," he said. "There were probably about 30 people altogether working on this giraffe. I think they have the whole procedure down to an art now."

He said the collaborative effort and range of expertise at the zoo was likely why JoJo did so well with the procedure and continues to improve.

"So far, the outcome is excellent," he said. "The infection is gone and there is new bone growth at the site showing fusion between the bones, which is really unheard of. She still has some limb swelling, which will take a while to go down. But JoJo seems pretty happy at this stage." Jafarey said the zoo was astounded at JoJo's progress since working with Biedrzycki and the UF team.

"The introduction of this new compound has been integral in her recovery and we are excited that our organization participated in this groundbreaking research," he said.

The material the UF veterinarians have been using started out being used to drive the regeneration of large vessels for heart bypass, McFetridge said.

"I never thought it could be used clinically, as it contains a lot of human maternal tissues, from the placenta, as well as the fetal side of the placenta," he said. "But after several animal studies, we discovered that there was no negative immune response at all, and that it had a potent healing effect across a range of different tissues."

Unlike typical biologic treatments that have one response, the placenta-derived material seems to promote healing in several vastly different tissues including bone, blood vessels and skin, McFetridge added.

McFetridge and two of his biomedical engineering department colleagues, **Jon Dobson, Ph.D., the J. Crayton Pruitt Family Professor, and Blanka Sharma, Ph.D., an associate professor and the J. Crayton Pruitt Family Term Fellow**, have cofounded a company in Gainesville, 42Bio, to commercialize the product for veterinary applications. They recently received private funding to move forward with research facilities at The Hub, UF's business incubator.

"So we're hoping to be able to provide this amazing material more widely, especially as we find out, almost daily, how well it helps heal critical injuries. The healing responses we've seen in the giraffe and the dogs are almost jaw-dropping."

42BIO

42BIO DEVELOPS NOVEL AND UNIQUE TECHNOLOGIES THAT ADDRESS EXISTING BARRIERS TO RESEARCH AND CLINICAL TRANSLATION IN TISSUE ENGINEERING AND REGENERATIVE MEDICINE.

FOCUS: COMBINING MAGNETIC NANOTECHNOLOGIES WITH BIO-ACTIVE MOLECULES AND BIOCOMPATIBLE MATERIALS TO MAKE ADVANCES IN GENE TRANSFECTION, BIOREACTORS, CELL AND BIOMOLECULE SEPARATION, AND CELL & TISSUE CULTURE FOR REGENERATIVE MEDICINE APPLICATIONS.

JERRY CHANG, CEO (BME BOARD MEMBER)
DR. PETER MCFETRIDGE, CHIEF SCIENTIFIC OFFICER (BME FACULTY)
DR. JON DOBSON, CO-FOUNDER, CHIEF TECHNOLOGY OFFICER (BME FACULTY)
DR. BLANKA SHARMA, CO-FOUNDER (BME FACULTY)
DR. SHANNON BROWN FEDENKO, VICE PRESIDENT, RESEARCH (BME ALUMNI)
ISAAC FINGER-BAKER, VP, PRODUCT DEVELOPMENT (BME ALUMNI)

NEW FACULTY

ANA MARIA PORRAS

BIOMATERIALS & TISSUE ENGINEERING TO STUDY HOST-MICROBE INTERACTIONS AND INCLUSIVE SCIENCE COMMUNICATION

BRITTANY TAYLOR

MUSCULOSKELETAL TISSUE ENGINEERING, BIOACTIVE BIOMATERIALS, TENDON INJURY AND REPAIR

ANA MARIA PORRAS, PH.D.,

is currently a Presidential Postdoctoral Fellow at Meinig School of Biomedical Engineering at Cornell University, where her research focuses on developing in vivo and in vitro models of disease to study host-microbe interactions in the context of the human gut microbiome and global health.

Porras' research interests encompass a wide variety of topics, including biomaterials, cardiovascular disease, the microbiome and infectious disease. Originally from Colombia, Porras arrived in the U.S. 14 years ago to pursue a B.S. in biomedical engineering at the University of Texas at Austin. Immediately after, she completed a Masters and Ph.D. at the University of Wisconsin-Madison, where she was an American Heart Association Predoctoral Fellow. At UW, she also obtained a Delta Certificate in Teaching and Learning with an emphasis on inclusive pedagogy. That passion for diversity and inclusion drives most of her work; most recently, she co-founded the Latinx in BME community and was selected as one of 125 AAAS IF/THEN Ambassadors for girls and women in STEM. Porras is also a science artist and bilingual communicator. Every #MicrobeMonday, she teaches microbiology on social media using crocheted microbes designed by herself.

BRITTANY TAYLOR, PH.D.,

received her B.S. in biomedical engineering from the University of Virginia in 2010 and her Ph.D. in biomedical engineering from Rutgers University in 2016. As a graduate student, she was an NIH T32 Biotechnology Training Fellow and NSF Graduate Stem Fellow in K-12 Education (GK-12). She is an author on numerous peer-reviewed journal and patent review articles, three book chapters, and a co-inventor on two patents. Taylor is also a Burroughs Wellcome Fund Postdoctoral Enrichment Program Fellow and the PI of a grant to investigate extracellular vesicles as a therapeutic and diagnostic for diseased and injured musculoskeletal tissues. Taylor has been recognized for her scientific achievements throughout her career. She has received awards such as the Rising Star on the list of Top 100 Inspiring Black Scientists in America, Associate Fellow to the Ernest E. Just Postgraduate program, MIT Rising Star in Biomedical Science Award, Orthopaedic Research Society Tendon Section Trainee Award, Mid-Atlantic PREP/IMSD Research Symposium (MARPS) Distinguished Alumni Award, and the Biomedical Engineering Society Cellular and Molecular Bioengineering (BMES-CMBE) Student Award. Her research will focus on tailored cell-free strategies to complement and improve the native musculoskeletal tissue regenerative and reparative processes.

MEGHAN FERRALL-FAIRBANKS

QUANTITATIVE SYSTEMS BIOLOGY, MATHEMATICAL MODELING, CANCER HETEROGENEITY, AND EVOLUTIONARY DYNAMICS

IVANA PARKER

TRAINED IMMUNITY, HIV PREVENTION, PROTEOMICS AND SYSTEMS BIOLOGY

MEGHAN FERRALL-FAIRBANKS, PH.D.,

is currently a Postdoctoral Fellow in the Department of Integrated Mathematical Oncology Moffitt Cancer Center and Research Institute, where her research focuses on using mathematical modeling to study single-cell heterogeneity and clonal hematopoiesis in cancer.

Ferrall-Fairbanks received her B.S. in mechanical engineering with a biomechanics minor at the University of Florida in 2012. She earned her Ph.D. in biomedical engineering in 2017 from the joint Georgia Tech and Emory program as a trainee in the NSF Science and Technology Center EBICS (Emergent Behavior of Integrated Cellular Systems). In her graduate dissertation work, Ferrall-Fairbanks focused on integrating wet-lab experiments and computational methods to tease apart complex enzyme-on-enzyme interactions in proteolytic networks up-regulated in tissue destructive diseases.

During her time at Georgia Tech, Ferrall-Fairbanks was an EBICS Student Leadership Council Member, selected for a Tau Beta Pi Fellowship for her scholastic achievement, and was awarded a Georgia Tech Faces of Inclusive Excellence Award for leading a local science club for 8-10th graders aimed at inspiring them to pursue careers in STEM.

Her new research program will focus on using computational and quantitative biology approaches to cultivate a mechanistic understanding of tumor heterogeneity and evolution. The BEAT (Battling Evolution through Adaptive Therapies) Cancer Lab will open in January 2021.

IVANA PARKER, PH.D.,

is a Fulbright Scholar who recently completed a year-long study at the University of Cape Town in South Africa. Her project assesses the risk of a commonly used TB vaccine, BCG, on HIV susceptibility in infants using proteomics and systems biology approaches.

Parker completed a two-year postdoctoral fellowship as an American Society for Microbiology Postdoctoral Fellow at the Centers for Disease Control within the Division of HIV/AIDS Prevention. At the CDC, she evaluated the impact of antiretroviral therapy (ART) on diagnostic assay approaches and identified trends to optimize assay design. Parker received her Ph.D. in bioengineering from Georgia Tech in 2015. Her thesis investigated the effects of pro-atherogenic shear stress, HIV proteins, and antiretroviral therapies on the vasculature using in vivo and in vitro models.

Her lab will use applied proteomics and systems biology approaches to elucidate phenotypic changes in innate immune cells when exposed to bacterial pathogens, data that will be used to predict individual risk factors for HIV transmission. As an overarching goal, her lab aims to better understand the role of chronic inflammation in infectious disease prevention and treatment strategies.

ANDREW SOWINSKI

GETTING A GRIP ON COVID

TEXT WRITTEN BY BRYCE CHAPMAN & OMAR ZERMEÑO

IMAGES BY GRIP STUDENTS

When COVID-19 made its first appearance in the United States in January of 2020, it was hard to imagine how suddenly this virus would latch onto and change everyone's daily lives. In only three months, Florida went from watching the Gators play in the 2020 Orange Bowl in front of 70,000 people to disallowing and frowning upon any social gathering of 10 or more.

The suddenness of the pandemic's arrival had led to a massive shortage of personal protective equipment (PPE). With inventory shrinking and prices skyrocketing, the country's frontline workers were left in dire straits to fend for themselves and improvise. The United States' PPE problem was growing as each day passed.

COVID soon made its way to Florida, with the first case in early March and many more following. As Shands' PPE inventory was shrinking, Justin Kim, a fourth-year student at the University of Florida's College of Medicine, decided to reach out to a local club that he had heard about, Generational Relief in Prosthetics (GRiP), to make PPE for local healthcare workers.

GRiP, a student organization at the University of Florida that primarily uses 3D printing technology to design and donate adaptive technologies to people worldwide, had never taken on a venture of this nature before. GRiP's main projects include upper-limb assistive devices and one-handed adapted video game controllers and span to other research projects, such as a one-handed guitar and muscle sensor-controlled hands. However, after Kim reached out to GRiP, they decided it was time to branch out to a new endeavor by assisting Florida hospitals fighting against COVID.

GRIP MAKES 3D-PRINTED ASSISTIVE DEVICES, AS WELL AS ADAPTIVE CONTROLLERS AND TOYS, FOR THOSE IN NEED ACROSS THE WORLD.

In the initial phase, GRiP members organized efficient methods to fabricate and donate face shields to doctors and nurses around Florida. The group took extra precautions when assembling the shields, wearing their masks and gloves. Once the printing was done, the shields were left alone for three days to disinfect and then delivered to Shands. “Because of the nature of our work, it was easy to adapt our production line to produce face shields rather than our typical Adaptive Technologies,” said then GRiP President Andrew Sowinski. “We were happy to help out the local community.”

“IT WAS REALLY INSPIRING HOW, DESPITE BEING APART DURING THIS TRYING TIME, OUR MEMBERS AND THE EXECUTIVE BOARD CAME TOGETHER TO MAKE A BIT OF A DIFFERENCE.”

After obtaining support from the University of Florida’s Biomedical Engineering Department, GRiP reached out to other clubs at the University of Florida, including the Society of Hispanic Professional Engineers, Women in Electrical and Computer Engineering, the Society of Women Engineers, and the Institute of Electrical and Electronics Engineers. Through the concerted efforts of these organizations, they were able to donate face shields to various hospitals around Florida, including Jupiter Medical Center and West Palm Beach’s St Mary’s Hospital. “It was really inspiring how, despite being apart during this trying time, our members and the executive board came together to make a bit of a difference,” said Andrew. “That’s what engineering is all about!”


BROOKE TOWNS


CARLEY BUTLER


ST. MARY’S HOSPITAL PHYSICIAN

STUDENT SPOTLIGHT

BME STUDENT DIAGNOSED WITH LEUKEMIA GIVES BACK

Heather Blackwell, BME M.S. student, was beginning to plan her biomedical engineering journey when her life abruptly changed. She was diagnosed with acute lymphocytic leukemia with mixed phenotypes in 2019. She had to have a bone marrow transplant to survive.

Cancer starts when cells in the body begin to grow out of control. Leukemias are cancers that begin in cells that would naturally develop into different types of blood cells. Leukemia lowers your power to fight infections, reduces circulating oxygen throughout your body, and decreases your ability to prevent bleeding. Without treatment, leukemia can spread and invade organs throughout the body, and it can be fatal.

HEATHER AND HER DAUGHTER, MEGAN, BEFORE HER START OF CHEMOTHERAPY

Acute lymphocytic leukemia (ALL) is also called acute lymphoblastic leukemia. “Acute” means that leukemia can progress quickly, and if not treated, would probably be fatal within a few months. “Lymphocytic” means it develops from early (immature) forms of lymphocytes, a type of white blood cell. The leukemia cells quickly spread to the blood and sometimes to lymph nodes and bodily organs, including the spleen, liver, brain, and spinal cord. ALL is the most common type of leukemia in children, teens, and adults under 40.

“I was tired and fragile and exhausted,” Heather said. “I thought I had the flu. I noticed I had a strange rash.” She went to the hospital to have it examined.

According to the American Cancer Society, about 6,000 people are diagnosed with ALL each year in the U.S. While ALL is the most common type of leukemia in children, it is the least common type in adults. Only one-quarter of ALL cases are diagnosed in people over the age of 20.

> **“I WANTED TO BECOME INVOLVED WITH ‘BE THE MATCH’ AND HELP RAISE AWARENESS FOR THE SERVICES THEY PROVIDE, AND TO HONOR THOSE THAT ARE GOING THROUGH THE SAME BATTLE WE WENT THROUGH.”**

“I was at the hospital for blood work, and I was told to go get more tests,” she said. “My white blood count was very high, and I needed to start chemotherapy.” ALL gets worse quickly if it is left untreated. Treatment is critical after a diagnosis.

Heather was fortunate; her oldest brother Kevin was a match. Siblings typically have the highest chances of becoming potential bone marrow donors, but only 30 percent of families can find a match.

Heather had ‘conditioning therapy’ to prepare her bone marrow and immune system for the new cells.

HEATHER AND HER OLDEST BROTHER, KEVIN, WHO WAS HER DONOR.

She spent the summer and fall having rounds of chemotherapy and radiotherapy, prepping for her stem cell transplant. She received over 50 blood transfusions while she was hospitalized for treatment. Due to the nature of her disease, she is unable to work. Her husband took unpaid leave to help out after her transplant.

Heather was in the hospital for a month after the transplant and spent time in protective isolation. It usually takes six months to a year before a patient's level of activity gets back to normal. Having a transplant is a very intensive treatment that has a physical and emotional impact on one's life.

Today, Heather is at home in Ocala, Florida. She had her stem cell transplant on November 22 of last year. She's in remission and feels healthy and well. She's in school and researches novel methods for magnetic isolation of hematopoietic stem cells for clinical applications in Dr. Jon Dobson's lab.

She is celebrating her first anniversary this year. The department is celebrating with her by asking the BME community to participate in a blood drive with LifeSouth and register for BetheMatch.org.

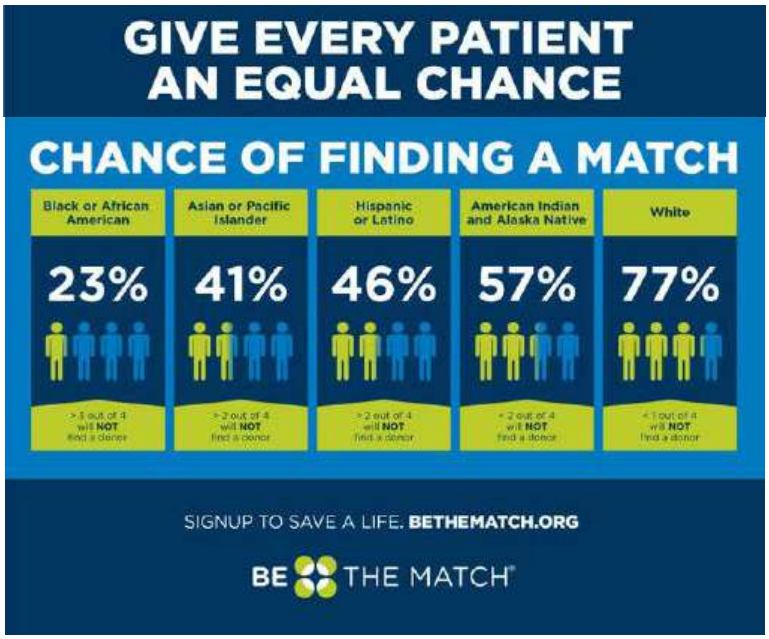
"I wanted to become involved with 'Be The Match' and help raise awareness for the services they provide," she said. "To honor those that gave and to help families that are going through the same battle we went through - I want them to know that they are not alone."

"RINGING THE BELL" IS A RITUAL PRACTICED THROUGHOUT THE CANCER COMMUNITY TO EMBRACE THE COMPLETION OF TREATMENT. WHEN A PATIENT RINGS THE BELL, IT'S A SIGN OF HOPE FOR ALL WHO HEAR IT.

WHAT CAN YOU DO?

EACH YEAR, PASSIONATE CANDIDATES ASK FOR POTENTIAL BONE MARROW MATCHES FOR PATIENTS WITH LEUKEMIA, LYMPHOMA, AND OTHER DISEASES. BE THE MATCH CONNECTS PATIENTS WITH THEIR DONOR MATCH FOR A LIFE-SAVING BONE MARROW TRANSPLANT.

GO TO BETHEMATCH.ORG TO JOIN THE REGISTRY



FACULTY SNAPSHOT

Kyle D. Allen
Associate Professor
Ph.D., Rice University

Novel strategies to diagnose and treat degenerative joint diseases

Wesley E. Bolch
Distinguished Professor
Ph.D., University of Florida

Dosimetry, computational medical physics and dose assessment

Mingzhou Ding
Distinguished Professor & J. Crayton Pruitt Family Professor
Ph.D., University of Maryland

Cognitive neuroscience, signal processing and neural imaging

Jon P. Dobson
J. Crayton Pruitt Family Professor
Ph.D., Swiss Federal Institute of Technology, ETH-Zurich

Magnetic micro- and nanoparticle-based biomedical applications

Ruogu Fang
Assistant Professor
Ph.D., Cornell University

Artificial intelligence, brain dynamics and medical image analysis

Meghan C. Ferrall-Fairbanks
Assistant Professor
Ph.D., Georgia Institute of Technology & Emory University

Quantitative systems biology, mathematical modeling, cancer heterogeneity and evolutionary dynamics

CELEBRATING 14 WOMEN FACULTY 52%!

Daniel Ferris
Robert W. Adenbaum Professor
Ph.D., University of California, Berkeley

Biomechanics, neuromechanical control, locomotion, mobile brain imaging, robotic exoskeletons and bionic prostheses

Eric Fuller
Lecturer
Ph.D., University of Florida

Engineering design and engineering education

Sarah Furtney
Lecturer & Undergraduate Coordinator
Ph.D., Clemson University

BME cellular engineering laboratory and engineering education research

Aysegul Gunduz
Associate Professor, UF Research Foundation Professor & Diversity Officer
Ph.D., University of Florida

Human brain mapping, neuromodulation and neural interfacing

Gregory A. Hudalla
Associate Professor
Ph.D., University of Wisconsin

Molecular engineering for immunotherapies and immune modulation

Benjamin G. Keselowsky
Professor & Associate Chair for Graduate Studies
Ph.D., Georgia Institute of Technology

Biomaterials and controlled release systems for vaccines, immunotherapies and implants

May Mansy
Lecturer
Ph.D., University of Florida

Biomedical signals & systems and engineering leadership

NATIONAL FACULTY AWARDS:

Professional Societies w/Fellows: 11 | **AIMBE Fellows:** 10 | **NSF CAREER Awardees:** 7 | **PECASE Awardees:** 2

Peter S. McFetridge
Associate Professor & Graduate Coordinator
Ph.D., University of Bath

Naturally inspired biomaterials for biologically functional implants and organ regeneration

Parisa Rashidi
Associate Professor & J. Crayton Pruitt Family Term Fellow
Ph.D., Washington State University

Medical artificial intelligence (AI) and pervasive health

Walter Lee Murfee
Associate Professor & Associate Chair for Undergraduate Studies
Ph.D., University of Virginia

Cell dynamics, microcirculation, angiogenesis, lymphangiogenesis and neurogenesis

Carlos Rinaldi
Dean's Leadership Professor & Chemical Engineering Depart. Chair
Ph.D., Mass. Institute of Technology

Nanomedicine and magnetic nanoparticles

Jennifer A. Nichols
Assistant Professor
Ph.D., Northwestern University

Biomechanics, musculoskeletal modeling, predictive simulation and medical imaging

Christine E. Schmidt
Professor, J. Crayton Pruitt Family Chair & Department Chair
Ph.D., University of Illinois

Biomaterials for neural tissue regeneration and neural interfacing

Kevin J. Otto
Professor & Senior Associate Chair
Ph.D., Arizona State University

Neural engineering, device-tissue interfaces and neurostimulation

Blanka Sharma
Associate Professor & J. Crayton Pruitt Family Term Fellow
Ph.D., Johns Hopkins University

Nanomedicine, biomaterials, targeted drug/gene delivery and immunoengineering

Ivana Parker
Assistant Professor
Ph.D., Georgia Institute of Technology

Trained immunity, systems biology, HIV/TB, host-pathogen interactions and applied proteomics

Cherie Stabler
Professor & Integra LifeSciences Term Professor
Ph.D., Georgia Institute of Technology

Biomaterials, controlled release, regenerative medicine and diabetes

Edward A. Phelps
Assistant Professor & J. Crayton Pruitt Family Term Fellow
Ph.D., Georgia Institute of Technology

Cell and tissue regeneration, islet biology, diabetes and immunoengineering

Brittany Taylor
Assistant Professor
Ph.D., Rutgers University

Musculoskeletal tissue engineering, bioactive biomaterials, tendon injury and repair

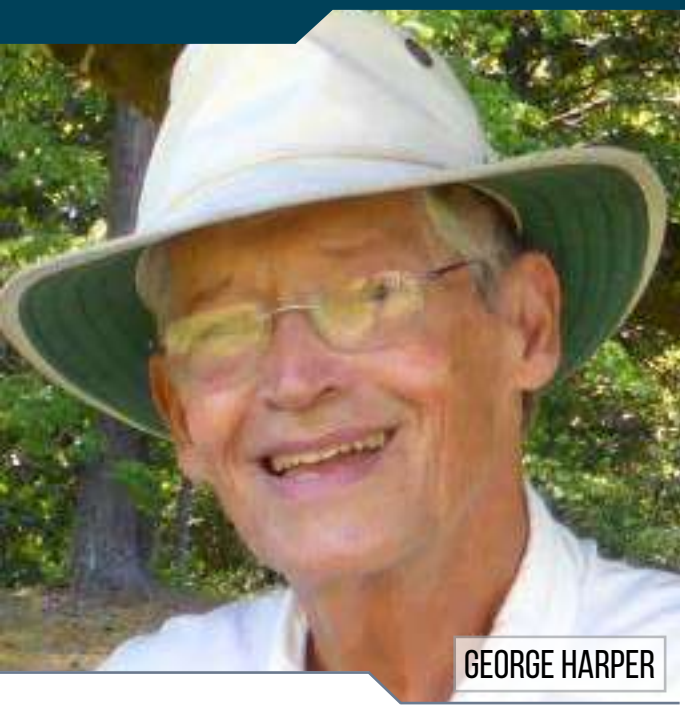
Ana Maria Porras
Assistant Professor
Ph.D., University of Wisconsin-Madison

Biomaterials & tissue engineering to study host-microbe interactions and inclusive science communication

Lakiesha N. Williams
Associate Professor
Ph.D., Mississippi State University

Traumatic brain injury, soft tissue mechanics, bio-inspired design and materials characterization

DEVELOPMENT



GEORGE HARPER

ANNOUNCING THE WILLIAM HARPER BIOMEDICAL ENGINEERING GRADUATE STUDENT FELLOWSHIP

Mr. George Harper of Boca Raton, Florida, has bequeathed $450,000 as a legacy gift to BME to support graduate student fellowships. This substantial gift is a first of its kind for the department.

While not an alumnus of UF, Mr. Harper credits biomedical engineering technology for saving his life after kidney failure that also affected others in his family.

Biomedical engineering has had a profound and beneficial effect on Mr. Harper's family. He and his two brothers had hereditary kidney disease. His oldest brother William, for whom this fellowship is named, died of kidney failure at age 15 in 1946. At that time, a diagnosis of kidney failure was a death sentence until the early nineteen sixties when chronic hemodialysis became possible. Despite technical advances, insurance for dialysis was unavailable for most until the early nineteen seventies when dialysis became covered under Medicare. His middle brother, Tommy, died at age 22 in 1960 after receiving what was at that time an experimental kidney transplant.

George Harper's kidneys failed at age 34 in 1980. Because of technical advances in dialysis and Medicare insurance, he was able to survive and continue working as a high school counselor in Rome, Georgia. George lived and thrived on home hemodialysis for 21 years before having a successful kidney transplant in 2002. He credits his survival to biomedical engineering research, which conceived and built the dialysis technology that saved his life.

WILLIAM HARPER

"I HOPE MY FAMILY'S EXPERIENCE WILL HELP STUDENTS IN BIOMEDICAL ENGINEERING UNDERSTAND THE IMPORTANCE OF THEIR WORK, ITS PLACE IN HISTORY, AND WHAT IT CAN MEAN TO PEOPLE'S LIVES."

- George Harper

UF BME IS TRAINING THE NEXT GENERATION OF PIONEERS IN BIOMEDICAL ENGINEERING RESEARCH. YOUR DONATION ENSURES STUDENT NEEDS CAN BE ADDRESSED AS THEY PREPARE FOR THEIR CAREERS.

NEW MENTORSHIP PROGRAM INITIATED BY THE ALUMNI BOARD

In the Spring, the department announced the establishment of the inaugural Alumni Advisory Board. Their role is to strengthen connections within the alumni community and partner with us in ensuring the department's long-term growth success. One of the board's first initiatives was creating an alumni mentorship program for students. Through this program, alumni can interact with current students, share their unique professional perspectives, and students will have the opportunity to graduate with a powerful professional networking experience.

ALUMNI BOARD PRESIDENT:
TODD GOEDE, M.S.
RESEARCH & DEVELOPMENT DIRECTOR, AXOGEN

IF YOU ARE ALUMNI OR AN INDUSTRY PARTNER AND WILLING TO SERVE AS A MENTOR, EMAIL RLITZINGER@ENG.UFL.EDU

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stryker

UF BME OUTREACH EVENTS: GIRLS WITH NERVE, NATIONAL BIOMECHANICS DAY, AI-4-ALL, NEUROSTIMULATION DANCE TO THE BEAT, VISCOELASTICITY IN FLUIDS AND MANY MORE!

BME COMMUNITY OUTREACH FUND

In partnership with a gift from the Shepard Broad Foundation, the department is developing and implementing hands-on teaching modules that will engage middle school and high school students with engineering and biology concepts. Spearheaded by assistant professor Dr. Edward Phelps, the program will create a cohesive and integrated outreach program that will become part of the BME department culture that reaches students and teachers at both the local and state level.

UF BME FACULTY AND STUDENTS ENGAGED IN OVER 1,000 HOURS OF COMMUNITY EDUCATION OUTREACH IN THE PAST YEAR.

Ryan Litzinger
Assistant Director of Development

If your company or organization would like more information on how to give to BME or become an industry partner, please contact Ryan Litzinger at **352-294-7947** or **rlitzinger@eng.ufl.edu**.

UF | UNIVERSITY of FLORIDA

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Gainesville, FL 32611-6131

ENGINEERS *for* LIFE.

AT UF, WE HELP GREAT STUDENTS BECOME EVEN GREATER.

WITH AN AVERAGE 4.5 G.P.A. AND AN AVERAGE S.A.T. SCORE OF 1405, OUR FALL 2020 FRESHMAN CLASS IS ANYTHING BUT AVERAGE. AND WHILE THOSE NUMBERS ARE IMPRESSIVE, FOR US, THEY'RE JUST THE BEGINNING. IT'S NOT ABOUT THE ACCOMPLISHMENTS OF AN INDIVIDUAL; IT'S WHAT WE CAN ACCOMPLISH TOGETHER.

#6 PUBLIC UNIVERSITY IN THE COUNTRY

U.S. NEWS & WORLD REPORT RANKINGS, 2021