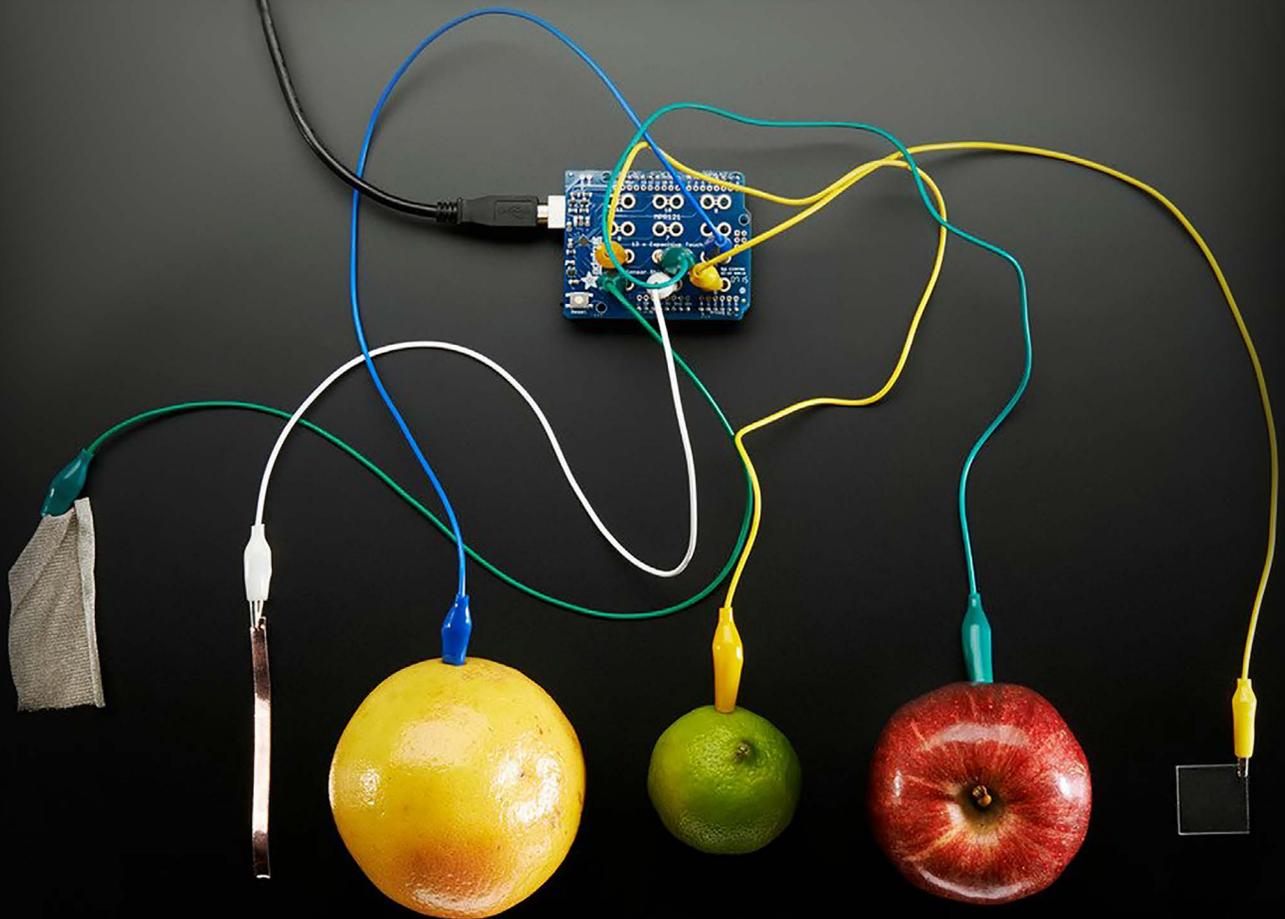


FALL 2022 | BIOMEDICAL ENGINEERING

BUILDING TOOLS, CHANGING LIVES.



Students collaborate with United Cerebral Palsy of Greater Cleveland to develop assistive technologies.

FULL STORY, p. 12

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at Case Western Reserve University and Cleveland Clinic

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#BMEalliance



CWRU, Department of Biomedical Engineering



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The Fall 2022 Newsletter has been created by the BME Alliance Publicity Committee.

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FROM THE CHAIRS



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The fall semester is energizing at any university as students return to campus, and Case Western Reserve University is no exception. There is an abundance of activity within the Biomedical Engineering Alliance – and not just in the expected places like classrooms and research labs.

Two exciting events occurred in September. The first was our Ford Distinguished Lecture Series. Geoff Martha, chairman and CEO of Medtronic, shared insight on the evolution of the healthcare technology industry and new technologies that deliver better outcomes, at lower costs, to more people. Next, we co-hosted the 2022 Cleveland NeuroDesign Entrepreneurs Workshop in collaboration with Cleveland NeuroDesign and Cleveland Clinic. The workshop, which is a weekend program aimed at training the next generation of neurotechnology professionals, was featured in our [spring BME newsletter](#).

Collaboration is key to the success of the BME Alliance, and this issue showcases fruitful partnerships, starting with our undergraduate students. The article “Building Tools, Changing Lives” details how students in the Medical Technology Group team up with United Cerebral Palsy of Greater Cleveland to develop assistive devices for high school students with disabilities. The devices, such as an apple slicer, may seem simple, but they make a world of difference to young people who use them.

The faculty highlights included in the newsletter also attest to the importance of collaboration. The news includes details on more than a dozen grants, nearly all of which were awarded thanks to a team effort between university and hospital researchers. Among those that stand out is a successful joint proposal between several BME Alliance Members. Aaron Fleischman, PhD, staff

scientist with the Cleveland Clinic Lerner Research Institute, was awarded a \$1.2 million grant from the National Institutes of Health to support development of broad bandwidth transducers for high resolution, information-rich intravascular ultrasound (IVUS). Other investigators on the project include members of the CWRU Department of Biomedical Engineering and Department of Electrical, Computer and Systems Engineering.

Yet another highlight reveals how the FES Center – a consortium of the Louis Stokes Cleveland VA Medical Center, MetroHealth Medical Center and CWRU – received a five-year renewal to continue its groundbreaking work in neuromodulation and neurostimulation. In addition, one of the center’s investigators, Dustin Tyler, Kent H. Smith Professor II of Biomedical Engineering at CWRU, was invited to the White House for the announcement of the new federal agency, the Advanced Research Projects Agency.

Members of the BME Alliance build on a long tradition of excellence. In this issue, we recognize the remarkable career of Jim Anderson, MD, PhD, who was appointed professor emeritus in July. With dual appointments in Case Western Reserve’s Institute of Pathology and Department of Biomedical Engineering, Jim was a trailblazer in the field of implanted biomaterials and medical devices for more than 55 years.

We hope you take time to read about Jim and many other students, professors, researchers and clinicians who are impacting biomedical engineering. We are excited to share their contributions and continue to roll up our sleeves this fall and strive to make a difference in the classroom, research labs, clinical settings and beyond.

STUDENT SPOTLIGHT



Three Minute Thesis Competition

Case Western Reserve University held its first Three Minute Thesis (3MT™) competition last February in the Tinkham Veale University Center. Developed by the University of Queensland and now held at over 900 institutions in more than 80 countries, 3MT celebrates the exciting research conducted by graduate students around the world. The competition cultivates students' academic, presentation and research communication skills.

Participating students from the Department of Biomedical Engineering at Case Western Reserve University included Zoe Sekyonda, Yue Xu, Preethisiri Bhat, Aidan Friederich, Bo Zhang, Edward Carson and William Wulftange.



NSF/IEEE Graduate Fellowship

Zoe Sekyonda, PhD candidate, received the NSF/IEEE Engineering in Medicine and Biology Society (EMBS) Akay Graduate Fellowship to attend the 19th NSF International Summer School

on BioX: Biocomplexity, Biodesign, Bioinnovation, Biomanufacturing, and Bioentrepreneurship. Held this year in June on the Greek island Crete, the school trains students in healthcare engineering, technologies and innovations, computational and data sciences in medicine, molecular systems and synthetic biology, brain and life sciences. Sekyonda is mentored by Umut A. Gurkan, Warren E. Rupp Associate Professor, Case Western Reserve University.



Recognition as a Young Professional to Watch

Palak Gupta, a PhD candidate in the Department of Biomedical Engineering at Case Western Reserve University, was selected for *Crain's 20 in their 20s* recognizing up-and-coming professionals in the Cleveland area. Gupta's

nomination highlighted her PhD research, which focuses on how visual and ocular motor function is altered in Parkinson's disease and how we can strategize neuromodulation with deep brain stimulation (DBS) to treat visual dysfunction. Gupta is in her third year and works on a collaborative project with Fatema Ghasia, assistant professor of ophthalmology, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, and Aasef Shaikh, associate professor, Department of Neurology, Case Western Reserve University, School of Medicine. Her results were also seed for their newly funded grant looking at the effects of DBS on vergence and strabismus.

SPIE Medical Imaging Conference

Several biomedical engineering students from Case Western Reserve University presented at the 2022 International Society for Optics and Photonics (SPIE)



Prathyush
Chirra

Medical Imaging Conference in San Diego. Prathyush Chirra, a PhD candidate, gave two podium presentations. The first was entitled, "Identifying radiomic features associated with disease activity, patient outcomes and serum phenotypes in pediatric Crohn's disease via MRI." The second presentation was called, "Deep Hybrid Convolutional Wavelet Networks: Application to Predicting Response to Chemoradiation in Rectal Cancers via MRI." Chirra is mentored by Satish Viswanath, assistant professor of biomedical engineering at Case Western Reserve University.

PhD candidates Ananya Subramaniam and Tasheen Minhaz represented the ophthalmological imaging group led by David Wilson, Robert J. Herbold Professor of Biomedical Engineering at Case Western Reserve University; Faruk Orge, William R. and Margaret E. Althans Chair and Professor in Pediatric Ophthalmology at Case Western Reserve University; and Mahdi Bayat,



Ananya
Subramaniam

research assistant professor, Electrical Engineering and Computer Science, Case Western Reserve University.

Subramaniam had a platform presentation of her paper, "Vessel enhancement in smartphone fundus images to aid retinopathy of prematurity and plus disease diagnosis and classification." This research is aimed at using artificial intelligence in a low-resource

setting to identify retinopathy of prematurity, a condition which can result in blindness of premature babies.

Minhaz won a Best Poster award for his submission titled, "Deep learning segmentation



Tasheen Minhaz

of ciliary tissues using 3D ultrasound biomicroscopy (3D-UBM) images." The group has created a new 3D ultrasound system for imaging the eye. This system allows someone to visualize and quantitatively assess the ciliary tissues important for glaucoma.

The project is funded by the Case-Coulter Translational Research Partnership (CTRP).

2022 BME Graduation Reception



On May 17, 2022, the Department of Biomedical Engineering at Case Western Reserve hosted a graduation reception to celebrate its newest alumni. #CWRUBME alumni.

Send updates to bme-news@case.edu to be considered for the newsletter, website highlights and social media.

2021-2022 Department of Biomedical Engineering Graduate Student Awards



The Department of Biomedical Engineering at Case Western Reserve University presented the following awards:

DOCTORAL OF EXCELLENCE AWARD

Yehe Liu

OUTSTANDING GRADUATE CAREER AWARD

Ruchika Verma and
Mohammadhadi Khorrami

OUTSTANDING MASTER'S WORK

Ziwei Liu

OUTSTANDING PUBLICATION AWARD

Amogh Hiremath

EXCELLENCE IN GRADUATE TEACHING ASSISTANTSHIP

Calin Nicolescu

EXCELLENCE IN DEPARTMENTAL/EXTERNAL SERVICE ACTIVITIES

Victoria Laney

EXCELLENCE IN MENTORSHIP AWARD

Naomi Joseph

GRADUATE STUDENT APPRECIATION AWARD

Prathyush Chirra

FACULTY & STAFF HIGHLIGHTS



Jay Alberts

Jay Alberts, staff, Lerner Research Institute Department of Biomedical Engineering, The Edward F. and Barbara A. Bell Family Endowed Chair, was awarded a five-year, \$3 million R01 grant from the National Institutes of Health for his project titled, "Comprehensive Augmented Reality Testing (CART) Platform for Parkinson's disease." The aim of the project is to develop the CART platform, which will utilize augmented reality technology to systematically evaluate motor and cognitive function, as well as the performance of instrumental activities of daily living on a single technology platform.



James Basilion

James Basilion, professor of biomedical engineering at Case Western Reserve University, has been awarded three R01 grants by the National Institutes of Health (NIH) National Cancer Institute (NCI) since 2021. The supported projects include fluorescence-guided resection of breast tumors using a topically applied molecular probe, highly selective targeted theranostics for prostate cancers and PSMA-targeted AuNPs for MR guided radiotherapy and radiosensitization.



Margot Damaser

Margot Damaser, staff, Lerner Research Institute Department of Biomedical Engineering, was recently featured in Nature Reviews Urology of Nature Magazine for her article, "Potential role of oxidative stress in the pathogenesis of diabetic bladder dysfunction." Another article from Damaser, published in Acta Biomaterialia, explored issues surrounding vaginal wall connective tissues associated with pelvic organ prolapse. Along with a team of other researchers and engineers, Damaser and her lab have generated a small wireless device to be inserted into the bladder and left for a period of time that captures the same data traditionally obtained by using catheters. They are now designing a controller for the device.



Colin Drummond

Research on wearable sensors conducted by Colin Drummond, professor and assistant chair of the Department of Biomedical Engineering at Case Western Reserve University, was featured in a [Forbes magazine article](#), "Five Technologies Athletes Use to Manage Injury and Optimize Performance." The journal Digital Medicine previously published an article on the wearable technology, which measures the internal and external workload of athletes, in 2019.



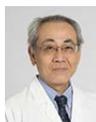
Steven Eppell

Steven Eppell, director of the Nanoscale Orthopedic Biomaterials Laboratory (NOBL) and associate professor of biomedical engineering at Case Western Reserve University, has been appointed chair of Case Western Reserve University's 2022-23 Faculty Senate.



David Escobar

David Escobar, assistant staff, Lerner Research Institute Department of Biomedical Engineering, was awarded a one-year Caregiver Catalyst Grant from the Cleveland Clinic Philanthropy Institute for a project titled, "Objectively Quantifying Rigidity to Optimize Therapies for Parkinson's Disease." Escobar and his lab will develop a robotic system and a methodology to quantify elbow rigidity in patients with Parkinson's disease. The methodology will enable clinicians to systematically tune therapies to increase efficiency and improve outcomes and will allow clinical researchers to advance the development of new therapies.



Kiyotaka Fukamachi

Kiyotaka Fukamachi, staff, Lerner Research Institute Department of Biomedical Engineering, and several members of his lab had the manuscript "Characterization of left atrial assist device implantation: Early results of ex vivo anatomical assessment" accepted in Artificial Organs. Fukamachi is also developing proposals for the team's work on a universal ventricular assist device (UVAD) for either left, right or both ventricular support.



Aaron Fleischman

Aaron Fleischman, PhD, staff scientist, Lerner Research Institute Department of Biomedical Engineering, received a \$1.2 million grant from the National Institutes of Health to support development of broad bandwidth transducers for high-resolution, information-rich intravascular ultrasound (IVUS). The award is the result of a successful joint proposal between several members of the BME Alliance.

Cleveland Clinic investigators include Geoffrey Vince, PhD, chair of the Department of Biomedical Engineering; Russell Fedewa, PhD, project scientist; Samir Kapadia, MD, chair of the Department of Cardiovascular Medicine and the Heart, Vascular & Thoracic Institute; and Rishi Puri, MD, PhD, interventional cardiologist. Case Western Reserve University investigators include David Wilson, PhD, Robert J. Herbold Professor of Biomedical Engineering, and Steve Majerus, PhD, assistant professor in the Department of Electrical, Computer and Systems Engineering.



Chaitali Ghosh

Chaitali Ghosh, staff scientist, Lerner Research Institute Department of Biomedical Engineering, has been published in *Frontiers in Neurology*. The article is titled, "Genetic and molecular features of seizure-freedom following surgical resections for focal epilepsy: A pilot study." Her article on antiseizure medication interactions and their influence on apoptosis was also published in *Frontiers in Pharmacology*.



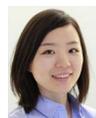
Robert Kirsch

Robert F. Kirsch, Allen H. and Constance T. Ford Professor and Chair of Biomedical Engineering at Case Western Reserve University, and Executive Director of the Cleveland Functional Electrical Stimulation (FES) Center, received a five-year renewal for the FES Center through Sept. 30, 2027. Established in 1991, the Cleveland FES Center is a consortium of the Louis Stokes Cleveland VA Medical Center, MetroHealth Medical Center and Case Western Reserve University. Researchers, engineers and clinicians collaborate to develop innovative solutions that improve the quality of life of individuals with neurological or other muscular skeletal impairments. The Cleveland FES Center leads the translation of neurostimulation and neuromodulation into clinical deployment.



Vijay Krishna

Vijay Krishna, assistant staff, Lerner Research Institute Department of Biomedical Engineering, received a Department of Defense Grant Award with a start date of September 2022 for his proposal, "Engineered Carbon Nanomaterials for Prevention of UV-Induced Melanomagenesis." The grant will fund research in innovative sunscreens that identify methods to decrease risk of melanoma development beyond traditional sunscreen and protective clothing.



Dan Ma

Dan Ma, assistant professor of biomedical engineering at Case Western Reserve University, has received several awards for magnetic resonance fingerprinting (MRF). Ma and Mark Griswold, professor in the Department of Radiology at CWRU, were awarded a grant from the United Kingdom in partnership with Derek Jones of Cardiff University to use MRF methods, including novel diffusion MR fingerprinting methods developed by Ma, to assess brain connectivity. Ma and Chaitra Badve, assistant professor in the Department of Radiology, received a score in the top two percentile on their NIH National Cancer Institute R01 to use MRF to help guide therapies in patients with gliomas. Ma and Irene Wang, staff scientist, Lerner Research Institute Department of Biomedical Engineering, were awarded a NIH R01 entitled, "MR Fingerprinting for Epilepsy."



Paul Marasco

Paul Marasco, associate staff, Lerner Research Institute Department of Biomedical Engineering, and his lab were recently awarded a \$2.3 million NIH R01 Grant. Marasco (principal investigator) and his lab will work with researchers from the LRI Neuroscience Department and collaborators at Columbia University to use intersectional genetics and electrophysiology to learn more about the neural mechanistic substrates of kinesthesia (the sense of limb movement).



George Muschler

George Muschler, staff, Lerner Research Institute Department of Biomedical Engineering, has stepped down as Founding Chair of the Orthopaedics and Musculoskeletal Biology Committee of the International Society for Cell and Gene Therapy (ISCT). He is taking on a new one-year term as a Member of the Joint ISCT and Japanese Society for Regenerative Medicine (JSRM) Committee on Induced Pluripotent Stem Cells (iPSC).



Andrew Rollins

Andrew Rollins, professor of biomedical engineering at Case Western Reserve University, was awarded a training grant by the NIH Fogarty International Center for his work entitled, "Strengthening Research Capacity in Innovative Global Health Technologies for Non-Communicable Diseases in Uganda." The goal is to build capacity for biomedical engineering research and training in Uganda and, by extension, more broadly in Africa. Robert Ssekitoleko at Makerere University in Kampala, Uganda, is co-principal investigator.



Anirban Sen Gupta

Anirban Sen Gupta, Leonard Case Jr. Professor of Engineering in the Department of Biomedical Engineering at Case Western Reserve University, received a four-year, \$2.5 million grant from the Department of Defense Peer Reviewed Medical Research Program (PRMRP) to advance a new technology called SanguiStop for battlefield bleeding management. Early phase research results leading to this technology were published in an article in [ACS Nano](#) in August 2022, and the research was highlighted in the ACS Nano journal cover article in September 2022.

In addition, Sen Gupta's research on neutrophil-targeted nanomedicine for treatment of thrombotic diseases was published in a July 2022 article in [Nature Nanotechnology](#). This research was partly supported by the [Case-Coulter Translational Research Partnership](#).



Dustin Tyler

Dustin Tyler, Kent H. Smith Professor II of Biomedical Engineering at Case Western Reserve University and associate director of the Advanced Platform Technology Center at the Louis Stokes Cleveland VA Medical Center, was invited to the White House as part of the announcement of a

new federal agency, the Advanced Research Projects Agency for Health (ARPA-H). The agency, which aims to accelerate breakthroughs to help patients, is modeled after DARPA (Defense Advanced Research Projects Agency) - the organization credited for contributing to breakthroughs such as the internet, GPS and drones. After the public portion of the event, President Joe Biden met privately with invited experts, as well as a patient using an innovative prosthetic limb with the sense of touch that Tyler developed.



Satish Viswanath

Satish Viswanath, assistant professor of biomedical engineering at Case Western Reserve University, was elected Senior Member of two prestigious institutes: the Institute of Electrical and Electronics Engineers (IEEE) and the International Society for Optics and Photonics (SPIE). Viswanath was also elected a Notable Immigrant Leader by Crain's Cleveland Business. He leads graduate recruitment for the Biomedical Engineering Department through expanded efforts to recruit immigrant scholars. As a result, the nomination says, approximately 50% of his mentees have been immigrants to the United States and about 40% of his students are women and minority scientists.



Xin Yu

Xin Yu, F. Alex Nason Professor II of Biomedical Engineering at Case Western Reserve University, and Chris Flask, professor in the Department of Radiology at CWRU, were awarded a 5-year NIH R01 grant to develop the use of dynamic MR fingerprinting to assess quantitative lung MRI techniques to assess new therapies in children with cystic fibrosis.

BME Welcomes Two New Faculty

Peter S. Hovmand and Christopher Pulliam joined the Department of Biomedical Engineering at Case Western Reserve University.



Hovmand was named the inaugural chairholder of the Pamela B. Davis, MD, PhD Professor of Medicine and professor of biomedical engineering. Hovmand's research focuses on advancing methods for understanding and preventing structural violence, with a specific emphasis on advancing knowledge on multilevel feedback systems.

For 25 years, his work has focused on innovations in applying system dynamics group model building and formal modeling with computer simulations to understand the structures underlying gender inequality, structural racism and social determinants of health across a variety of outcomes, from pediatric obesity and interpersonal violence to household air pollution and cancer. (View the August [chaining ceremony](#) on YouTube.)



Pulliam, who was appointed assistant professor, received his bachelor's degree, master's degree and PhD in biomedical engineering from CWRU. Prior to joining the university faculty, he worked in industry for more than a decade, most recently as a research and technology leader in neuromodulation with Medtronic.

"The opportunity to return to Case was a hard one to pass up," says Pulliam. "The students, faculty and hospitals make this a unique place, and I'm excited to find ways to contribute to the community."

Pulliam's research focuses on developing technologies that provide more accurate assessments of motor function for individuals with neurological injury and using that to drive clinical decision support systems that aid clinicians in identifying the right treatment and the right time to maximize recovery.

University Creates New Research and Technology Role



Case Western Reserve's President Eric W. Kaler named renowned social epidemiologist and research leader [Michael Oakes](#) as the university's inaugural senior vice president for research and technology management.

As the University of Minnesota's interim vice president for research since June of last year, Oakes has led a \$1.1 billion research enterprise that includes sponsored projects and regulatory compliance, as well as 11 interdisciplinary centers and institutes. From 2019 through 2021, he served as associate vice president for research, a position primarily responsible for health sciences. In the 2020-2021 fiscal year, the university's research funding jumped by 31%, an increase largely fueled by COVID-19 related grants. The university

also set a new annual record for start-ups, with 20 launching that year.

Oakes is also founder and director of [Interdisciplinary Research Leaders](#), a national program funded by the Robert Wood Johnson Foundation as part of its Culture of Health initiatives. The program brings scholars and community partners together on an applied research project. Among its goals is to help scholars develop scientific, leadership and team-building skills.

Oakes is excited to join Case Western Reserve in the new position.

"I want to be solving problems and breaking [disciplinary] boundaries," he says. "I want to come be a part of an outstanding team and together have an impact on Case Western Reserve and beyond."

A LIFETIME DEVOTED TO PATHOLOGY AND POLYMERS

For more than six decades, Jim Anderson has influenced biomaterials science and shaped the next generation of leaders in the field.

Jim Anderson was appointed professor emeritus on July 1, 2022, after a 55-year career at Case Western Reserve University.



In 1997, the journal *Advanced Drug Delivery Reviews* published an article on biodegradation and biocompatibility of polymer microspheres co-authored by James Anderson, MD, PhD, a professor with dual appointments in Case Western Reserve University's Institute of Pathology and Department of Biomedical Engineering, and Matthew Shive, a PhD candidate in biomedical engineering. Fifteen years later, journal editors asked Anderson for permission to republish the article.

"It was one of the publication's most cited papers," says Anderson, now professor emeritus. "Of course I agreed!"

The 2012 reprint is just one example of Anderson's lasting impact on the field of implanted biomaterials and medical devices. During his 55-year career at Case Western Reserve University, he conducted ground-breaking research culminating in more than 850 publications and mentored dozens of doctoral candidates. One of those was Terry Collier, vice president for research and development for 3M Electrical Markets Division.

"The reputation Dr. Anderson has in the field is just phenomenal," says Collier, who earned a bachelor's degree in biomedical engineering from CWRU in 1997 and a PhD in 2002. "There was no one else working in inflammatory response to implantable biomaterials during my time at Case. The field has since rapidly exploded. I'm excited to have been part of the work Dr. Anderson has done through the years."

Building an Unconventional Career

Anderson arrived at the Case Institute of Technology in 1967 as a postdoctoral fellow after earning his PhD in physical organic chemistry from Oregon State University. He began research in metal ion oxidations but soon moved into polymers, working on synthetic polypeptides. While his position was with the polymer group, Anderson worked closely with Neil McIntyre, PhD, in the Anatomy Department who was performing chromosomal analysis of birth defects.

"We were trying to find polymer surfaces that would grow cells taken from the biopsy of a fetus more

rapidly than a regular cell culture so the team could then do chromosomal identification," he says. This was Anderson's first foray into biomedical research, and he was hooked. He soon participated in other projects, including the development of anesthetic nerve cuffs and hydrogels with steroids.

In 1970, Anderson and Donald Gibbons, one of the founders of the Department of Biomedical Engineering, created a course on polymers in medicine that is still offered today. Anderson had one foot in polymers and another in medicine, forging an untraveled path and still uncertain where he would land.

"At that time, Case had arguably the best polymer department in the nation," recalls Anderson. "I audited nearly every class offered when I was doing my postdoc, but I realized I needed the other side of the coin. I needed the medical perspective."

Following his postdoctoral fellowship, Anderson had job offers in polymer departments at engineering schools and companies. However, his passion for medicine – specifically, the combination of plastics in medicine – led him to apply for and gain admittance to the Case Western Reserve University School of Medicine. He earned his medical degree in 1976 and completed a residency in pathology between 1976 and 1979.

"Pathology interested me because it's really an investigative discipline," says Anderson. "I liked the thought of exploring ideas and making discoveries."

In 1979, Anderson became an assistant professor in pathology at the age of 39. Soon after, he landed a dual appointment with the Department of Biomedical Engineering and was appointed full professor with tenure by 1984.

"The lesson there is that doors open, doors close. You will find your way," he says. "Take advantage of opportunities even though you don't necessarily know what the long-range outcome will be."

Making a Mark in Biomaterials

Throughout his career, Anderson studied how modifying the properties of polymers might alter, inhibit or activate fundamental interactions with cells, tissue, blood and other systems in the body. His pioneering work led to many breakthroughs.

"Our discovery of the underlying monocyte, macrophage, foreign body giant cell mediated oxidative chain cleavage

of polyurethane insulation on pacemakers led to more resistant polyurethanes – the next generation of polyurethanes for biomedical applications," he says.

Anderson also conducted an in-depth mechanistic study on how monocytes become macrophages and how macrophages fuse together to become foreign body giant cells on implanted polymer surfaces, such as biomaterials, medical devices and prostheses.

A respected leader in the biomaterials' community, Anderson served as editor-in-chief of the *Journal of Biomedical Materials Research* from 1988 to 2021. He has received numerous awards, most recently the Professional Impact Award for Leadership from the [American Institute for Medical and Biological Engineering](#) in 2022. He became an elected member of the [National Academy of Medicine](#) in 2003, followed by an elected member of the [National Academy of Engineering](#) in 2013.

While Anderson is proud of his professional accomplishments, publications and body of research, he says his shining achievement is the collaboration with and success of the students he mentored.

"You won't find anything in the literature about my mentoring students, but of course that's what it's all about," says Anderson. "Sure, the publications and research are important, but it's the people that make it happen."

Creating Connections Between People

Nineteen of the 42 doctoral students that Anderson advised were women, including Kandice Kottke Marchant, MD, PhD, who served as chair of Cleveland Clinic's Institute of Pathology and Laboratory Medicine from 2006 to 2016. She earned her doctorate degree from Case Western Reserve University in 1985 and her medical degree a year later.

Serendipity landed Marchant at Case. As an undergraduate majoring in biomedical engineering and biochemistry at Northwestern University she took a few courses on biomaterials and implant devices that fascinated her. She began considering dual MD/PhD programs after graduation. Then, one day she saw a poster above a water fountain promoting CWRU's program in biomaterials.

"Most other PhD programs involved a lot of engineering, but I was interested in biomaterials," says Marchant. "I called the university and talked to Jim, who was excited

that the program was right in my wheelhouse.” She flew to Cleveland, where Anderson introduced her to faculty, took her to lunch and even treated her to box seats at a performance of the Cleveland Orchestra.

“That didn’t sway me in any way to come to Case, but it didn’t hurt!” she says.

Initially, Marchant worked on a prosthetic valve infection grant with Anderson. Later, she studied thrombosis and implanted devices, developing an in vitro flow system examining platelet reactivity with various implanted devices and blood coagulation parameters.

“My work as a doctoral student in Jim’s lab influenced the type of medicine I wound up practicing,” says Marchant. “I was drawn to understanding thrombosis, so my two choices were pathology or hematology.” After graduating from Case, she took a position in hematopathology at Cleveland Clinic and later became the medical director of the blood coagulation lab.

Collier also notes Anderson’s influence on his career, even though he is no longer in the biomedical field. The work he performed in Anderson’s lab was at the intersection of several technologies and systems within the body, which required Collier and his colleagues to tease out the mechanisms they were trying to solve and find the right tools.

“Dr. Anderson helped me become an incredibly strong thinker – to be able to probe and ask the right questions even in spaces where I wasn’t an expert,” says Collier. “That’s been foundational to what I do now at 3M in almost any area, whether it be developing a new business model, implementing a core technology or working with customers to understand a problem they are trying to solve.”

Collier also calls Anderson a “phenomenal collaborator.” As a PhD student, Collier, an underrepresented minority in the field, partnered with researchers at other U.S. universities and around the world thanks to relationships forged by Anderson. And those reflected only a fraction of the professor’s connections. Through the years, Anderson collaborated with more than 50 colleagues at Case Western Reserve University and consulted with more than 115 companies, from budding entrepreneurs to leading corporations.

Leaving a Legacy

While Anderson was named professor emeritus in July, his collaborations continue.

“I do not believe I know what retirement means,” he quips. “My activities haven’t changed much. I still work with students and faculty.”

Perhaps now he will find a bit more time to pursue his passion for World War II history. He’s visited numerous battlefields, including Normandy. After a scientific meeting in Prague, Anderson and his wife flew to Paris and drove to Sainte-Mère-Eglise, one of the first towns liberated by airborne U.S. troops in 1944.

“You walk into the open-air cemetery there, and it’s like walking into a cathedral,” he says. “It’s awesome.”

So is the legacy Anderson has left at Case.

“He was a great mentor, teacher and advisor,” says Collier. “I certainly grew between the ages of 19 and 26 when I was in the lab with Dr. Anderson. When I think back to Case, he represents quite a bit of it.”

Anderson is enamored with World War II planes and has flown in several, including this Curtiss P40 Warhawk.



BUILDING TOOLS, CHANGING LIVES

**Students collaborate with
United Cerebral Palsy of
Greater Cleveland to develop
assistive technologies.**



From left: Colin Drummond, professor and assistant chair of the Biomedical Engineering Department at Case Western Reserve University; Alisa Jones, former intervention specialist at LeafBridge; and Laurenne Sweet, former education and program development manager of the alternative education program at LeafBridge, display the stamper created for students with disabilities at the American Society for Engineering Education's North Central Section Conference.

In 2020, high school students with disabilities who attend an alternative education program through [LeafBridge](#) at United Cerebral Palsy (UCP) of Greater Cleveland participated in an art project to create drink coasters as part of a larger goal to develop vocational skills. They initially used basic assistive technologies to operate a standard blow dryer and move paint on the surface of the coasters, but there was a notable shortcoming.

“Our students, who have very limited use of their bodies, couldn’t sign their names on their artwork like other artists,” says Laurenne Sweet, PT, MEd, DPT, ATP, former education and program development manager of the alternative education program.

Sweet and Alisa Jones, MEd, former intervention specialist at LeafBridge, reached out to Colin Drummond, PhD, professor and assistant chair of the Biomedical Engineering Department at Case Western Reserve University, for help. He enlisted a handful of undergraduate students who built a simple switch-accessible robotic arm for UCP students to stamp their names on the back of the coasters.



Switch-accessible robotic arm for UCP students to stamp their names on the back of their art projects.

“That initial project has since snowballed,” says Jones, who now works at the Cuyahoga County Board of Developmental Disabilities alongside Sweet. “Colin and the students have supported us in developing a variety

of assistive technologies to meet students’ needs and increase independent access to STEAM-based education.”

Devices Tailored to Students’ Needs

Communication and observation are key to the success of the collaboration. When Sweet and Jones first met with Drummond about the signature stamper, they thought they required a robot.

“Instead of predicting prematurely what they needed after a 10-minute discussion, we decided to spend time at UCP to truly understand their needs,” says Drummond. He serves as advisor to the Medical Technology Group, a co-curricular club comprising undergraduate students from a variety of majors who partner with UCP of Greater Cleveland.

Biology major Emily Ristevski, now a senior at Case Western Reserve University, shadowed and talked to instructors and students at the alternative education program.

“It’s one thing to go in and create a broad solution,” says Ristevski. “My job was to narrow down the vision to exactly what UCP teachers and students need to create very efficient assistive technology.”

Drummond and Ristevski realized that the stamper – and future devices – needed to be low cost, easy to use and durable. Drummond built a prototype device with a stamper attached to an arm and a large on/off button on a sturdy block of wood that students can easily activate.

Biomedical engineering students from Case have since refined the stamper and created other tools, such as an art spinner and an apple slicer used in a home economics class at LeafBridge. They also built a high-low table to accommodate students with various disabilities as they use assistive technologies.

“This collaboration has allowed our students the opportunity to actively engage and participate in meaningful activities using tools that are accessible to them,” says Rebecca Guenther, MA, CCC-SLP, ATP, speech-language pathology manager at LeafBridge.

“The real metric for me at UCP is how much joy we have brought a child with limited mobility. The students just light up using the stamper and apple slicer because they have gained a little bit of control in their lives.”

- **Colin Drummond**

Professor and Assistant Chair of Biomedical Engineering
Case Western Reserve University

“There are commercially available tools that may help our students, but they can be very costly and often don’t have the ‘just right’ adaptations that our students require.”

A Framework for Capacity Building Partnerships

UCP students aren’t the only ones to benefit. The partnership is valuable for Case students, too. While biomedical engineering students often want to design high-tech applications, the team working with LeafBridge has learned first-hand that’s it more important to meet the needs of the end user than create cutting-edge products. And they see the impact.

“With this project, I get to work directly with people and see the end results benefit the users,” says Ristevski. “It’s a really cool way to mix research with actual hands-on experience.”

As the partnership with UCP grew, Drummond also realized the potential for systemic engagement rather than one-off altruistic projects with the organization. He worked with UCP to create a framework for partners to share in capacity building, which the United Nations defines as the process of developing and strengthening the skills, instincts, abilities, processes and resources that organizations and communities need to thrive.

Drummond, Sweet and Jones presented a paper on capacity building partnerships at the [American Society for Engineering Education’s North Central Section Conference](#) in March 2022. In addition, they drafted

a second paper, in conjunction with the non-profit organization [MedWish International](#), on co-curricular immersion as a public-private capacity building activity.

“If capacity building is mutually beneficial, then you’ve got a foundation for immersion,” says Drummond. “We have created a model that others can learn from.”

Future Projects

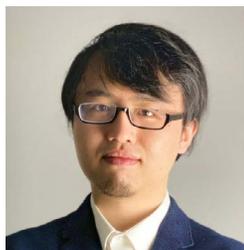
While the model is valuable, the people that it aids are at its crux.

“The real metric for me at UCP is how much joy we have brought a child with limited mobility,” says Drummond. “The students just light up using the stamper and apple slicer because they have gained a little bit of control in their lives.”

Guenther says that her staff and the group from Case are currently discussing future projects, including tools to increase leisure and play, as well as devices for positioning students to assist with daily living activities.

“Every time we meet as a collaborative team new ideas are sparked,” she says.

CHECKING IN WITH ALUMNI



Yehe Liu

Yehe Liu (GRS '21), a postdoctoral researcher at Case Western Reserve University, and Michael Jenkins, associate professor of biomedical engineering, co-founded OpsiClear LLC to develop

slide-free histopathology imaging technology using non-destructive 3D microscopy. Earlier this year, they were awarded a grant from the Small Business Technology Transfer (STTR) program sponsored by NIH's National Cancer Institute. Funding from the grant will support hardware development led by OpsiClear and

development of a new chemical assay tailored for clinical application by the [Jenkins Lab](#).

Liu joined the lab as a doctoral student in 2015, where he focused primarily on biological imaging applications. While participating in the CWRU [Translational Fellows Program](#), he discovered commercial opportunities for his project and learned about the STTR grant.

"I have always been interested in cancer-related clinical applications," says Liu. "The STTR award provided me with a valuable opportunity to pivot both my research direction and career path."



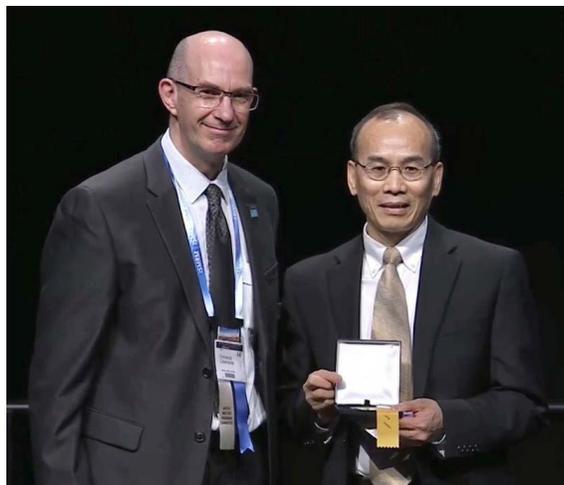
Zhi-Pei Liang

Zhi-Pei Liang (GRS '89), a faculty researcher at the Beckman Institute and the Franklin W. Woeltje Professor of Electrical and Computer Engineering at the University of Illinois

Urbana-Champaign, has received the prestigious 2022 Gold Medal from the International Society of Magnetic Resonance in Medicine (ISMRM). Liang's contributions to MRI and spectroscopy range from spin physics and signal processing to machine learning. His research has led to a new class of model-based imaging methods that have significantly improved MRI's speed and resolution with

numerous biomedical applications, especially for cardiac and brain imaging.

Liang is on the advisory board of the imaging T32 training grant of Xin Yu, F. Alex Nason Professor II of Biomedical Engineering, and David Wilson, Robert J. Herbold Professor of Biomedical Engineering, both at Case Western Reserve. The Interdisciplinary Biomedical Imaging Training Program will prepare predoctoral trainees to become leaders in organism-level, biomedical imaging research. Multidisciplinary teams of engineers, physicists, biologists and clinicians are required to advance biomedical imaging, especially with the advent of in vivo cellular and molecular imaging.



Zhi-Pei Liang receives ISMRM Gold Medal on May 9, 2022, from ISMRM President Fernando Calamante.

Send updates to bme-news@case.edu to be featured in the newsletter.

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