

marquette

# HEALTH SCIENCES

COLLEGE OF HEALTH SCIENCES MAGAZINE

2019



## Guided by ANGELS



The new Neuro Recovery Clinic is harnessing hope and recovery through intensive long-term care.

### Finding A Voice

The Intensive Aphasia Program is revolutionizing aphasia care

### Health Care and Hope

Physician Assistant students learn valuable lessons at the Repairers of the Breach clinic

### Uncharted Territory

The Summer Research Program offers opportunities outside the classroom



It is a pleasure to welcome you to the 2019 edition of *Health Sciences* magazine! There are many exciting developments to report in these pages, including transformational gifts, high profile awards to our talented faculty and alumni, and sizeable extramural grant awards that are allowing us to push our research efforts to new heights. I am particularly excited that we have launched the state of Wisconsin's first Neuro Recovery Clinic, made possible by a \$1 million donation from an anonymous benefactor. This state-of-the-art facility, located in Cramer Hall, is already bringing hope and healing to persons suffering from stroke and other neurological disorders, while simultaneously providing tremendous clinical experiences for students across multiple disciplines. I am grateful to the Dennis and Barbara Klein Family Foundation for investing in our powerful new Biolumaging Core facility, which is currently enabling our faculty neuroscientists to explore the nervous system with unprecedented precision and fidelity. The present issue also features our cutting-edge Intensive Aphasia Program within the department of Speech Pathology and Audiology, our efforts to promote interdisciplinary educational experiences across our clinical programs, our undergraduate student Summer Research Program, as well as the volunteer activities of our physician assistant studies students in our local Milwaukee community.

There is truly a growing sense of momentum and excitement within the college. In thinking about it in some detail, I believe it can be explained by several factors. The expansion of the Physician Assistant Studies program and new PA building at 17th and Clybourn streets are part of it, as are other capital investments being made to the Schroeder-Cramer Complex, which houses the college. It is also due in part to our plans to seat an inaugural class in an Occupational Therapy doctoral program next fall. But I believe the most important factor is the total dedication of our faculty and staff to the core mission of the college and university, and the fact that we are blessed to have an enormously talented and caring group of students who are committed to the challenge of making the most of their time with us, whether in the classroom, research lab or in service to the community. Finally, it has been gratifying to have the support of so many alumni, friends and benefactors who have partnered with us in promoting and living what we have collectively termed "The Science That Heals."

With warm regards,

**William E. Cullinan, Ph.D.**  
Professor and Dean, College of Health Sciences



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2019

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# GIFTS

## BRYON RIESCH PARALYSIS FOUNDATION GIVES \$500,000 TO ESTABLISH THE BRPF EXCELLENCE FUND



**The College of Health Sciences received a \$500,000 gift from the Bryon Riesch Paralysis Foundation, a 2018 member of the Marquette University President's Society, to establish the BRPF Excellence Fund in Spinal Cord Injury Research.**

The Bryon Riesch Paralysis Foundation, located in

nearby Waukesha, Wisconsin, was formed by Marquette alumnus and friend of the College of Health Sciences Bryon Riesch, Bus Ad '02, who was paralyzed in an accident nearly 20 years ago when he was an undergraduate student at Marquette.

The gift will fund research done primarily by Dr. Murray Blackmore, associate professor of biomedical sciences and one of the foremost spinal cord injury neuroscience researchers in the country. Blackmore previously received \$50,000 annually in seed funding from the Bryon Riesch Paralysis Foundation that led, in part, to multiple R01 research grants from the National Institutes of Health, totaling nearly \$4 million.

Blackmore's research focuses on the use of gene therapy to treat brain cells damaged in spinal cord injuries, leading to nerve growth and regeneration at the injury site. The therapy has already been shown to reverse some of the paralysis in an animal model of spinal cord injury, leading to regained movement and motor control.

"Bryon is a great friend and collaborator, and he understands the importance this kind of funding has to lead to breakthroughs," Blackmore says. "My team and I are very grateful to Bryon and to the foundation for helping us continue our work for years to come."

"We're very proud to have a long history and tradition of collaboration with the College of Health Sciences and, specifically, with Dr. Blackmore," Riesch says. "To see the strides he's made in research since we've known each other, it just made sense to make this investment in his lab, his team and his work."

"The Bryon Riesch Paralysis Foundation is very thoughtful in choosing research to fund," says Dr. William E. Cullinan, dean of the College of Health Sciences and director of the Integrative Neuroscience Research Center at Marquette. "Dr. Blackmore is at the leading edge of his field, and Bryon and the foundation have been valued friends of the college for many years. On behalf of the college and of Marquette, I'd like to personally thank Bryon and the Bryon Riesch Paralysis Foundation for this generous investment."

## AN ANONYMOUS DONOR GIVES \$1 MILLION TO ESTABLISH A NEUROLOGIC DISORDER REHABILITATION CLINIC

**The College of Health Sciences received a \$1 million gift from an anonymous donor to establish the Neuro Recovery Clinic** (see story on page 24) to treat individuals with chronic disability following neurologic conditions such as stroke, brain injury and spinal cord injury, through intensive and long-term services not available in our current health care marketplace.

The Neuro Recovery Clinic is the first of its kind in Wisconsin, joining similar facilities in Minneapolis and Chicago. The clinic is modeled on NeuroRecovery Network® programs originally developed by the Christopher and Dana Reeve Foundation in cooperation with the Centers for Disease Control and Prevention.

The clinic, which opened May 17, is located in Cramer Hall on Marquette's campus, adjacent to the Marquette Physical Therapy Clinic and the Marquette Speech and Hearing Clinic, providing opportunities for crossover care for patients with multiple needs as well as opportunities for undergraduate and graduate student clinical experience.

Although the donor wishes to remain anonymous, the reason for the gift to establish the clinic was shared: "Learning of the limitations of insurance coverage and the importance of continued intensive therapy to recovery for those impacted by neurological injury made me realize how important and great the need is for a clinic like this. I am pleased to help Marquette bring these life-changing therapies to the many in need."



*The Neuro Recovery Clinic is the first of its kind in Wisconsin, joining similar facilities in Minneapolis and Chicago.*

# AWARDS & GRANTS

## RESEARCHERS RECEIVE \$1.9 MILLION GRANT TO STUDY NEUROSCIENCE OF ADDICTION, DEPRESSION



**Drs. Robert Wheeler and John Mantsch, faculty researchers in the Department of Biomedical Sciences, received a \$1.9 million grant from the National Institutes of Health that will fund neuroscientific research into psychiatric disorders such as addiction and depression.**



Their project, titled "Aversion Signals in the Reward System," will examine how unpleasant experiences negatively impact people with underlying psychiatric disorders, with the goal of developing innovative behavioral and pharmacological therapies aimed at managing them.

"Aversive life experiences are unavoidable and can vary widely, from very highly stressful events to more mildly negative experiences," says Wheeler, an associate professor of biomedical sciences. "However, each of these experiences is represented by a neural aversion signal in the brain. In someone struggling with an underlying disorder like addiction, these signals can lead to relapse, and persistent aversive signals can also contribute to diseases like depression."

The research team has identified the presence of aversion signals in the nucleus accumbens, an area of the brain also

*"We believe that decoding aversion signals will give us critical insight into both a fundamental aspect of the human condition and a range of stress-sensitive psychiatric disorders."* Dr. John Mantsch

known for processing pleasurable stimuli. Aversion signals in the nucleus accumbens are represented by a reduced concentration of a stress-sensitive neurotransmitter called dopamine. The researchers believe that, in people with underlying disorders, the dopamine response to stressful events triggers addiction and other harmful behaviors.

"Our purpose is to characterize how these signals are represented and how they change behavior," says Mantsch, chair and professor of biomedical sciences. "We believe that decoding aversion signals will give us critical insight into both a fundamental aspect of the human condition and a range of stress-sensitive psychiatric disorders."

## PROFESSOR RECEIVES PROMINENT JOHN P. RAYNOR, S.J., UNIVERSITY TEACHING AWARD

**Mike Danduran, clinical associate professor in the Exercise Science program, has spent more than 20 years working with children in a clinical setting, and it's that work that he says helped shape his classroom philosophy.**



"With kids, there's this enthusiasm required for participation, and I just carried that style into the classroom at Marquette," he says. "It's a challenge because you have 50-some students coming through on a given day with different moods, and keeping them engaged can be tough."

Danduran's students appreciate his commitment to enthusiastic teaching. "Mr. Danduran was a phenomenal professor who made class fun and interactive on a daily basis," one former student writes.

"I teach through stories, through daily experiences and through human expressions. It allows for a human side to the textbook descriptions of clinical scenarios," Danduran says. "At the end of the day, we work for these students, and giving them anything less than our best, than our learned experiences, is cheating them."

Another student says in her recommendation letter for Danduran, "Mr. Danduran has left a lasting impact on me as a current student and future clinician ... (He) should be presented with the Marquette University Teaching Excellence Award because of his commitment to his students, as he is actively shaping the future clinicians of the world. Nothing would serve him more than to know his work and energy he pours into his students are recognized."

## COLLEGE OF HEALTH SCIENCES FACULTY GROUP RECEIVES TEACHING ENHANCEMENT AWARD

**A team from the College of Health Sciences has developed a proposal to promote health equity through a community of practice and public health education. The team is composed of Dr. John Mantsch, chair and professor of biomedical sciences; Dr. Joseph Byonanebye, clinical assistant professor of biomedical sciences; Dr. Nilanjan Lodh, assistant professor of clinical laboratory science; and Josh Knox, Grad '11, clinical associate professor of physician assistant studies.**

The project will attempt to address the widening disparities and inequalities in health across racial, ethnic and socio-economic groups. The Way Klingler Teaching Enhancement Award will help to establish two interrelated entities in a community of practice and a new interdisciplinary minor in public health with two tracks: one focused on global health and the other focused on community health issues in greater Milwaukee.

"We aim to build on the momentum of recent initiatives focused on raising awareness of and addressing health disparities, such as the Scaling Wellness in Milwaukee (SWIM) initiative, as well as campuswide strengths in



From left to right: Dr. Nilanjan Lodh, Dr. John Mantsch, Dr. Joseph Byonanebye, Josh Knox

health equity-related areas. We will bring together an interdisciplinary team of Marquette educators and community partners with the goal of promoting teaching and learning on health equity," Mantsch says.

By creating a formal community focused on health equity education, this project will leverage the diverse interdisciplinary strengths and perspectives at Marquette and in the broader community to inspire and prepare students to serve as future leaders in the battle against health disparities and inequalities and to advocate for health equity.

# AWARDS & GRANTS CONTINUED

## PROFESSOR AWARDED \$1.9 MILLION GRANT FOR SPINAL CORD REGENERATION PROJECT



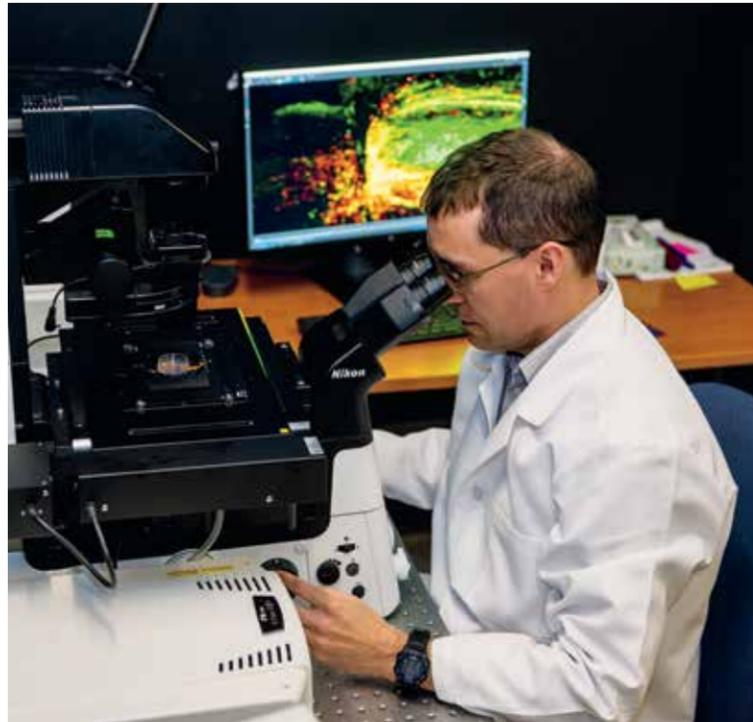
**Dr. Murray Blackmore, associate professor of biomedical sciences, received a \$1.9 million grant from the National Institutes of Health** for a five-year project that targets regenerating injured nerve cells in spinal cord injuries. The grant is his third NIH grant of more than \$1 million in the past six years.

The project, titled “Combinatorial Manipulation of Transcription Factors to Promote (Central Nervous System) Regeneration,” is testing cutting-edge gene therapy approaches to boost regenerative ability in injured nerve cells and help restore connections across the injury site.

“Thanks to grants like this from the National Institutes of Health, as well as seed funding from organizations like the Bryon Riesch Paralysis Foundation, we can continue to tackle the problem of spinal cord injury – specifically, of the regrowth of nerve cells at the injury site,” Blackmore says.

In adults, axons in the central nervous system generally fail to regenerate after they are lost due to injury or disease, leading to permanent disability. Axon growth is prevented by a hostile growth environment, as well as developmental loss as neurons age.

Blackmore’s team will test multiple complementary and mutually supportive strategies to enhance the promising properties of a pro-regenerative transcription factor called KLF6. Blackmore’s research team hopes to harness a newly developed gene therapy that enables retrograde delivery of



genes with unprecedented efficiency. Injection of this gene to the spinal cord results in widespread expression in injured neurons throughout the brain stem and motor cortex, inducing them to extend axons across the damage zone.

*“Dr. Blackmore continues to push the boundaries of what is currently possible within the field of spinal cord injury research.”* Dr. William E. Cullinan

“Dr. Blackmore continues to push the boundaries of what is currently possible within the field of spinal cord injury research, utilizing state-of-the-art scientific approaches,” says Dr. William E. Cullinan, dean of the College of Health Sciences and director of the Integrative Neuroscience Research Center. “The work that he and his research group are doing is both highly creative and innovative, and the reason the National Institutes of Health has invested so much into his research program.”

## ALUMNI AWARDS

### PROFESSIONAL ACHIEVEMENT AWARD – CARLEEN STRANSKY FREESMEIER, H SCI '03, PA '05



**As a leader in emergency medicine, Carleen Stransky Freesmeier was named the Illinois Academy of Physician Assistants PA of the Year in 2015.**

Since her time at Marquette, Freesmeier, a 2018 member of the Marquette University President’s Society, has worked as a physician assistant in emergency medicine with Infinity HealthCare. She serves as director of advanced practice provider services, leading over 130 PAs and nurse practitioners. Freesmeier enjoys practicing clinical medicine as well as working in leadership. She is the only woman and first physician assistant elected (and reelected) to the board of directors of Infinity HealthCare in Milwaukee. This past year she developed an Advanced Practice Provider Council. Freesmeier also is a clinical assistant professor at Marquette and has precepted PA students from six different PA programs.

“It is important we continue to invest in our future providers and partners by participating in their educational journey,” Freesmeier says. “It has been fun to see students who shadowed me during their high school years, rotated with me as PA students and now are practicing PAs.” She also speaks at local schools about careers in emergency medicine and as a PA.

Freesmeier earned her Certificate of Added Qualifications in Emergency Medicine from the National Commission on Certification of Physician Assistants, which less than 5 percent of practicing emergency medicine PAs have obtained. “I push to advance PAs to the fullest extent of their licensing and training in a health care team. It is our human privilege and obligation to serve others,” she says.

Freesmeier attended Marquette for its outstanding academics and because the first time she stepped on campus, it felt like home. She still gets the same feeling every time she visits. Freesmeier has built a home and family with her husband and fellow Marquette graduate, Tom, Arts '05.

## ALUMNI AWARDS CONTINUED

### DISTINGUISHED ALUMNA OF THE YEAR AWARD – DR. THERESA MONACO SPITZNAGLE, PT '86



**As a trailblazer for women's health in physical therapy, Tracy Monaco Spitznagle uses her profession to enrich the lives of women around the world.**

At 14, Spitznagle decided she wanted to be a physical therapist, a goal that was always supported by her parents, who instilled in her a deep faith in God and belief in herself. "Marquette provided me with a wonderful base, my PT education and an environment of faith from which to grow," says Spitznagle.

After receiving her undergraduate degree from Marquette, Spitznagle went on to receive both her master's and doctor of physical therapy degrees from Washington University in St. Louis. She now serves as professor of physical therapy

and obstetrics and gynecology at Washington University School of Medicine, one of the top physical therapy programs in the country.

"I love the diversity of activity that I have cultivated across all aspects of my work: patient care, mentoring, teaching, research and advocacy for physical therapy for women with childbirth injuries. I have been able to combine my personal and my professional values, putting compassion into action," she says.

Spitznagle has made 12 trips to Africa, working in health centers and communities focusing on birth injury education and rehabilitation. Her philanthropy through the Worldwide Fistula Fund has engaged multiple physical therapists in Ethiopia, Niger and soon, Uganda. In 2018 she was awarded the American Physical Therapy Association Humanitarian Award.

### SERVICE AWARD – KRISTIN KEGLOVITZ BAKER, H SCI '02, PA '03



**Kristin Keglovitz Baker is regarded as a pioneer in health care. She is passionate about community wellness – particularly for underserved populations.**

As a child, Baker watched her mom work several jobs to make ends meet. She says that experience taught her about overcoming challenges and the value of hard work. It certainly paid off when Baker was awarded an Evans Scholarship, which allowed her the opportunity to attend Marquette.

After graduation, Baker was selected to be a National Health Service Corps Scholar and served with the organization in central California for three years. She joined Howard Brown Health Center in 2005, and in 2014 was promoted to chief operating officer. Her medical practice focuses on LGBTQ

care, women's health, HIV medicine, health promotion and interdisciplinary medical care for patients at risk.

Baker often speaks at local and national events to help educate others about health disparities in underserved populations. She was invited to the White House to participate in a summit on how to effectively engage the LGBTQ community in the Affordable Care Act. "I strive every day to be the best person I can be. I lead by example and my entire life's work is rooted in service," she says. She credits Marquette for instilling that conviction in her life.

Each summer, Baker volunteers at a camp for children affected by HIV/AIDS. Through the Evans Scholarship Foundation, she pays it forward as a mentor for Mercy Home, an organization providing homes to children and families in need.

### YOUNG ALUMNUS OF THE YEAR AWARD – DR. WILLIAM M. BEER, H SCI '03



**For someone who enjoys caring for any person at any time and making quick and impactful patient connections, the emergency department is a fitting place for Bill Beer.**

Early in his academic career, Beer felt a pull toward the health science field, which led him to Marquette. He admired the university's emphasis on service and helping others – values he applies to his life every day.

After completing his undergraduate degree in biomedical sciences at Marquette, Beer earned his medical degree at Loyola University in Chicago. He joined the Navy, where he served as a flight surgeon before completing his training in emergency medicine. In his two deployments aboard the USS Ronald Reagan, he flew missions into Japan after the Fukushima nuclear disaster to provide medical support for Operation Tomodachi. As chief resident and attending physician at the Naval Medical Center San Diego, he honed his teaching and leadership skills, supporting physicians, nurses and corpsmen in learning vital skills needed to maintain operational readiness. He completed his time in the military at U.S. Naval Hospital Guantanamo Bay. "The Navy pushed me to lead others early in my career and provided inspirational mentors along the way," Beer says.

Beer credits his mother for instilling in him the importance of hard work and persistence. He is grateful for the lesson his father taught him to recognize that every person has value and a story; he says this helps him connect and communicate effectively with his patients.

Beer currently serves as a board-certified emergency physician for Emergency Medicine Specialists of Wisconsin. You can find him working at several different Ascension hospitals in the area or enjoying family life with his wife, Danielle, Eng '04, and four children.

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To make a gift in support of College of Health Sciences scholarship aid, contact Kathleen Ludington at 414.288.1410 or [kathleen.ludington@marquette.edu](mailto:kathleen.ludington@marquette.edu).



# Medical Milestones

Marquette Global Brigades brings its medical mission to Panama for the first time.

By Jesse Lee

This year marked two milestones for the Marquette Medical Brigade chapter of Global Brigades, the world's largest student-led humanitarian organization: the first medical mission trip to Panama and the first time physical therapists accompanied the medical brigade.

More than 60 students, medical professionals, faculty and staff traveled to San Carlos, Panama, in January 2019 for a seven-day trip, where they saw and treated hundreds of local community members with medical, dental and physical therapy needs.

"Seeing these people who are coming from far away, it's completely different from what we experience," says Maddie Lenz, a senior studying biomedical sciences. "We don't sit outside waiting for our doctors to come, but they do, and they're so happy we're there."

Cassie Laibly, a sophomore majoring in biomedical sciences and Spanish for the health professions, was a first-time brigader who appreciated the impact the trip made on her.

"Today I shadowed a dentist, and it was possibly the best day of my entire life – just being able to

work with individuals who don't have access to the type of health care that we do," she says. "It was just extraordinary."

Global Brigades was founded in 2003 by a Marquette student, Dr. Shital (Chauhan) Vora, H Sci '04, PT '06, and has expanded to more than 500 university chapters around the world today. The organization has served 1.1 million patients in Ghana, Honduras, Nicaragua and Panama, providing medical and dental treatment and water systems that bring clean water to more than 16,000 people, and has raised more than \$100 million in aid.

"Global Brigades makes such a big difference in the communities," says Daisy Ocegüera, Arts '19. "It's not just coming to these communities, providing a service and then leaving. It's a holistic model that emphasizes sustainable development.

"We're working to put ourselves out of business," she continues. "We're here to make sure that it's a sustainable project that they can continue for themselves. We're empowering communities, and that's something really special – it's making a big difference."



# Teaming Up for Better Health

Interprofessional education is promoting effective collaboration across health care disciplines.

By Lauren Herb Schudson, Grad '97

Anyone who has been a member of a team recognizes there are pros and cons to teamwork. On the plus side, teams pool the talents of individual members toward achieving a common goal. On the minus side, teamwork can be stressful if interpersonal conflicts arise between team members.

Most modern health care settings have moved to team-based models, where professionals with different skills and abilities are brought together to deliver the best possible care for patients. An effective health care team achieves a synergy that is not only greater than any single team member's efforts, but also greater than the sum of work by the same people if they were each working independently.

Recognizing the widespread health care industry adoption of team-based approaches, also known as Interprofessional Practice (IPP), Marquette began studying how it could ensure students are prepared to work successfully in teams in health care settings.

In 2014 two faculty members – MaryJo Wiemiller, chair of the Physician Assistant Studies program, and Dr. Marilyn Frenn, Grad '81, director of the Ph.D. program in the College of Nursing – started a volunteer task force to study options and develop programming to coach

students to operate on interdisciplinary teams. They began offering Interprofessional Practice Education (IPE) programming in 2015, housed in the Center for Teaching and Learning, which included online and face-to-face workshops.

After receiving the Way Klingler Teaching Enhancement Award in 2014-2015, the program expanded across campus.

In 2017 a new IPE coordinator, Jordan Cannon, was hired by Marquette to collaborate with faculty partners on the development and implementation of interprofessional education experiences for students in classroom and clinical settings.

One of the program's external partners is the Medical College of Wisconsin, so Cannon's position is split between Marquette and MCW. "One of our key goals is to move IPE into clinical practice by working with community partners to establish IPP opportunities for our students," explains Cannon.

IPE brings together students from nearly every program in the College of Health Sciences (Athletic Training, Clinical Laboratory Science, Exercise Science, Physical Therapy, Physician Assistant

Studies, Speech Pathology and Audiology), the School of Dentistry, the College of Education (Counseling Psychology) and the College of Nursing. Marquette's program follows the



From top to bottom:  
MaryJo Wiemiller,  
Dr. Marilyn Frenn  
and Jordan Cannon

A student asks a question during a collaborative interprofessional education event between Marquette University and the Medical College of Wisconsin.



Interprofessional Education Collaborative (IPEC) model, which identifies four competencies as being instrumental in working within an IPP. These include values and ethics, roles and responsibilities, interprofessional communication, and teams and teamwork.

To reinforce these skills, Marquette developed a curriculum required of all health care students. A series of four workshops, each based on an IPEC competency, is offered to students in cohort teams who learn together over four semesters.

The first workshop, held in fall 2018, hosted 329 students and 30 faculty volunteers and focused on team communication. Students reported growth

bring to the table." The full series will finish in spring 2020.

The workshops are held in the evening but will be moving to days to be more in line with traditional class times. Previously affiliated with other courses, the workshops soon will have their own IPEC course numbers, which helps future employers identify students with IPE experience.

According to Wiemiller, prospective students often ask about IPE training, so it is a beneficial offering in terms of recruitment. Wiemiller also says, "Individual programs within the college have a standard for IPE and team-based care, so by championing the IPE program, we're helping many different areas with accreditation in a coordinated way and best preparing our students for clinical practice."

In addition to the workshop series, students participate in unique experiential learning sessions within their classes, each focusing on a team approach to health care. Going forward, a university-wide committee, represented by all participating departments, will offer recommendations for Marquette's future IPE-

related courses and experiences. Called the Interprofessional Education and Collaborative Practice Committee, the group welcomes new faculty members, facilitators and ideas.

The quadruple aim for IPE is to improve patient outcomes, reduce health care costs, and improve patient and provider experiences. Marquette's IPE program is providing students with the skills to navigate the benefits and struggles of teamwork, experience synergy and achieve these goals in the health care community.

**"By championing the IPE program, we're helping many different areas with accreditation in a coordinated way and best preparing our students for clinical practice."**

**MaryJo Wiemiller**

in all learning outcomes for the workshop. Of the student participants, 25% rated the workshop a 10 out of 10 on a satisfaction scale and 77% rated it a seven or higher.

The second workshop, on interprofessional values and ethics, held in February 2019, had 367 students and 44 faculty in attendance. 27% rated the workshop a 10 out of 10, and 79% rated it a seven or higher. One of the participants commented that, "It was nice to be able to discuss with other professionals, as I understood what they would

Medical, physician assistant studies and nursing students come together for "Interprofessional Bedside Manners Play," a collaborative event focused on health care roles and communication.





Graduate student Gina LaBarbera (left) works with Ashley Stich in the Intensive Aphasia Program.

# Finding A Voice

A decade ago, people with aphasia faced a long and difficult road to recovery. With advances in neuroscientific treatment, the Intensive Aphasia Program at Marquette is revolutionizing aphasia care.

By Jesse Lee

**Ashley Stich is a typical 17-year-old who loves to do traditional teen activities – she was a two-time academic all-state golfer, and she played basketball and ran track at Tremper High School in Kenosha, Wisconsin, where she recently graduated. She was active in the school band, playing the flute, piccolo and bass flute.**

Ashley also loves to talk about movies.

“Mom and I went to the movie theater,” Ashley tells Gina LaBarbera, the first-year graduate student in the Speech Pathology and Audiology program who acts as Ashley’s graduate clinician in the Speech and Hearing Clinic’s Intensive Aphasia Program. “My mom wants to see *Incredibles 2*, but I wanted to see a different movie.”

LaBarbera types the sentence into a computer, praises Ashley, then asks her to look at the screen and determine what might be wrong with the sentence she just spoke. After a few seconds of reading, Ashley realizes her mistake.

“Oh, no, my mom *wanted* to see *Incredibles 2*,” Ashley says.

Watching through one-way glass in a separate room, Ashley’s mom, Kim, is unfazed by the mistake but proud that her daughter caught it.

“Less than two years ago, Ashley could only say about five words,” Kim says.

In October of 2017 Ashley was diagnosed with Moyamoya disease, a rare, progressive brain disease caused by blocked arteries at the base of the brain, in the basal ganglia. These structures play a role in movement fluidity and are also thought to affect habitual behavior, emotion and cognition.

Moyamoya affects about 1 in 100,000 people. The disease gets its name from the blood vessels it affects – the word “moyamoya” means “puff of smoke” in Japanese, and it describes the tiny tangle of blood vessels in the basal ganglia that become damaged as they attempt to compensate for low blood flow to the brain. This results in reduced oxygen delivery to the brain, which can lead to headaches, seizures and often stroke.

On December 1, 2017, three days before Ashley was scheduled to have surgery to attempt to treat the disease, she had a massive ischemic stroke.

“Ashley was medically sedated for nearly three weeks after she had the stroke,” Kim recalls. “When she awoke, she couldn’t talk.”

**Less than two years ago, Ashley could only say about five words.**

The stroke resulted in aphasia, damage to her brain’s language center. Ashley stayed at Children’s Hospital of Wisconsin and Froedtert Hospital for weeks, where she worked to recover from the stroke and to regain her language.

“At Children’s and then Froedtert, I couldn’t remember my name or my birthday,” Ashley says. “The only sentence I could really say was ‘out the door.’”

Kim knew that Ashley needed more help with the aphasia, but she and her husband were unsure where to begin.

“We found a program in Florida, but it was very expensive, and it would completely disrupt Ashley’s



Ashley enjoys a number of activities, including art class with her teacher, Peter Kollman, at Tremper High School in Kenosha, Wisconsin.

The key concept behind neuroplasticity is that the brain is constantly adapting in response to external stimuli; that through intensive, repetitive therapy, the brain can change to learn processes and tasks.

school,” Kim says. She continued looking and was happy to learn about Marquette’s Intensive Aphasia Program from Tina Puglisi-Creegan, the Intensive Aphasia Program coordinator.

“I remember when I talked to Tina for the first time,” Kim says. “She really took the time to explain all of the benefits of having Ashley here. She had Ashley come in and interview and Tina said, ‘We’re going to make this work.’ She was so positive.”

Puglisi-Creegan, Sp ‘79, Grad ‘80, clinical professor in the Speech Pathology and Audiology Department, along with Jackie Podewils, clinical assistant professor of speech pathology and audiology, had the idea for the Intensive Aphasia Program more than a decade ago.

“Eleven years ago I went to a conference,” Puglisi-Creegan says. “This is when they were just starting to talk about neuroplasticity in regard to speech rehabilitation. They were moving to that model, but no one was sure how to implement it.”

The key concept behind neuroplasticity is that the brain is constantly adapting in response to external stimuli; that through intensive, repetitive therapy, the brain can change to learn – or, in the case of aphasia, relearn – processes

and tasks. However, the stimuli and the manner in which it is presented is crucial for laying a pathway. That includes regaining language skills lost through traumatic brain injury.

Puglisi-Creegan learned about new therapy models at the conference, including constraint therapy, shaping, modeling a program a level or more above where the patient is currently comfortable and using frustration as a teaching tool.

“This is the opposite of what we were taught,” Podewils says. “Everything we learned when we were in training to become speech pathologists was now negated.”

Podewils and Puglisi-Creegan decided they’d need to do some research into these new forms of therapy, but they hit roadblock after roadblock from fellow speech pathologists unwilling to share their secrets of this new model.

Puglisi-Creegan was frustrated, but given her tenacious nature, was undeterred. There was one name that she’d heard at the conference, and she kept hearing it repeated by other therapists: Friedemann Pulvermüller.

Pulvermüller is a German neuroscientist and speech-language pathologist who was at the forefront of the neuroplasticity movement as it relates to language. He was the leader of



Ashley and Gina hug as Ashley's mom, Kim, looks on.

“This program is the reason I came to Marquette. I wanted to work with people with aphasia, and here I knew I would have a lot of opportunities to work with people like Ashley. I love sitting with her and seeing her progress day to day.” **Gina LaBarbera**

cognitive neuroscience of language at the Medical Research Cognition and Brain Science Unit at Cambridge University.

“I said to Jackie, ‘You know, I’m going to call this Pulvermüller myself,’” Puglisi-Creegan says.

She left a message with her email address, and a short time later, Pulvermüller sent her an email that would form the basis for the Intensive Aphasia Program.

“He sent me a language game – one that most people are already familiar with – called Go Fish,” she says.

The game was based on a key principle of neuroplasticity: saliency. Saliency means that, when you make someone talk, it should be as close to the communicative act as possible. The old model of drills on words and phrases was no longer the standard.

In the game, you say the person’s name, then request a card. “Tina, do you have a seven?” This simple act of forming a complete sentence in the context of the game makes the request, and thereby the act of communication, salient – it carries a specific meaning to the person making the request.

Podewils and Puglisi-Creegan decided to test the theory. They took their patient who was making the least amount of progress and who had a stubborn motor speech disorder along with a substantial aphasia disorder, and they did a trial therapy. The improvement in just a three-week timeframe was incredible.

“She went from a one-word mean length of utterance, meaning she could only say ‘book’ or

‘chair,’ to a 10-plus mean length of utterance,” Puglisi-Creegan says.

An even more amazing result was that the patient’s syntax – their word order – improved without being specifically targeted.

Based in large part on the trial’s success, Podewils and Puglisi-Creegan established the Intensive Aphasia Program. It’s a verbal-specific program in which the patient works three hours every day for three weeks and also has a home-based component. And the cost is far less than other programs of its kind around the country that can range in the thousands – Marquette charges just \$2,500 for the three-week session.

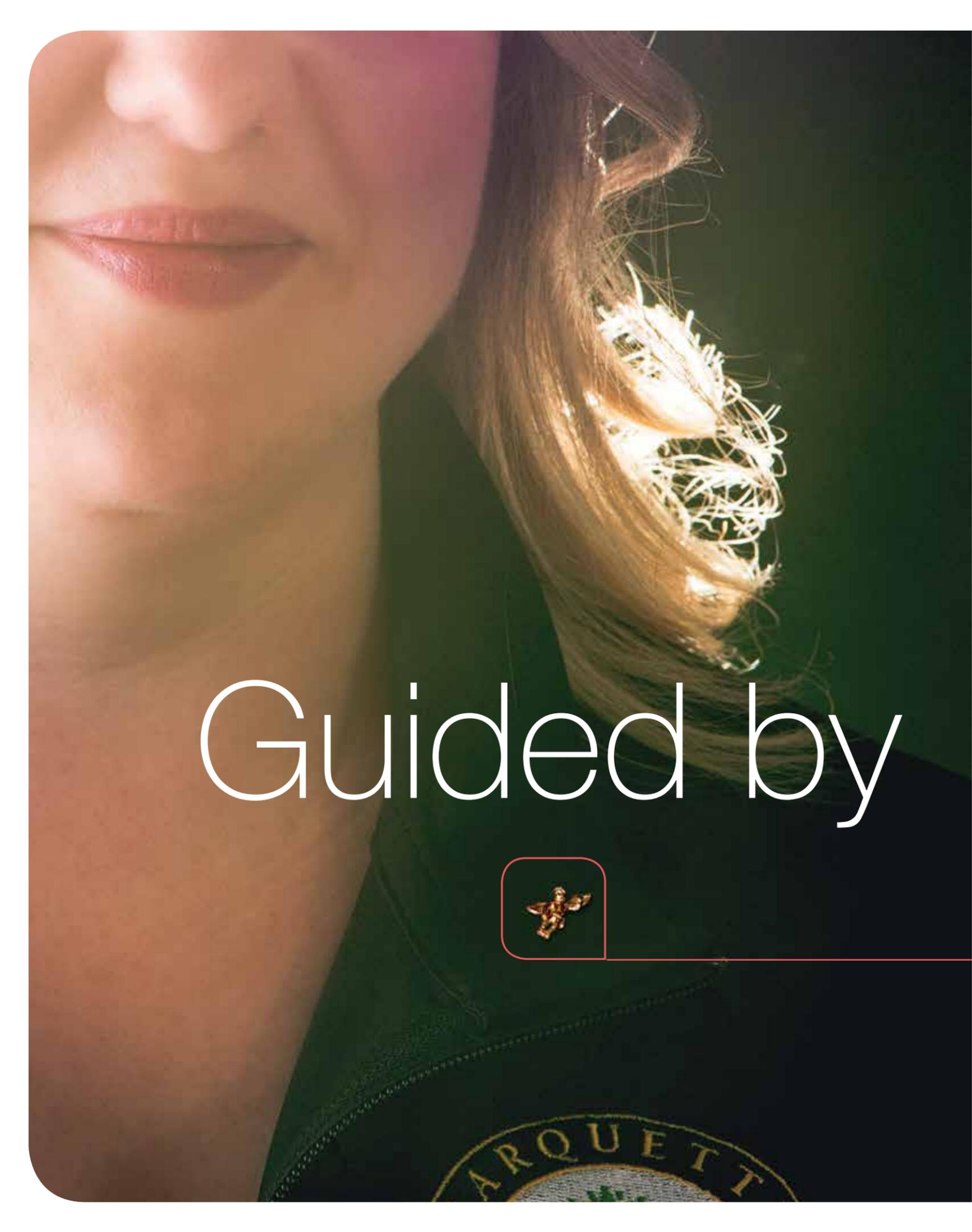
In addition to the two professors, the program allows graduate students, like LaBarbera, to hone their skills in an on-site clinical setting.

“This program is the reason I came to Marquette,” LaBarbera says. “I wanted to work with people with aphasia, and here I knew I would have a lot of opportunities to work with people like Ashley. I love sitting with her and seeing her progress day to day.”

“Gina is – it’s almost like a family kind of,” Ashley says. She tries to continue, but emotion holds her back. As Ashley begins to cry, LaBarbera wipes her own tears and moves to hug Ashley. Soon the two are laughing.

Ashley graduated from high school this year and has been accepted at Carthage College, where she plans to study kinesiology and sports medicine. Kim attributes a lot of Ashley’s success to the Intensive Aphasia Program.

“She would not be going to college if we didn’t have this program,” Kim says. “Now she’s got a better chance for taking the next step.”

A close-up photograph of a woman's face and shoulder. She has blonde hair and is wearing a dark green top with a circular logo that says "MARQUETTE". A golden angel pin is pinned to her shoulder, which is highlighted by a red square.

Guided by



## JEANNIE VODNIK'S SWEET SMILE LIGHTS UP THE ROOM

when she sees her two physical therapists, Dr. Kim DeChant, H Sci '05, PT '07, and Dr. Tina Stoeckmann, enter and greet her. DeChant and Stoeckmann sport identical golden angel pins – gifts from Jeannie and her husband, Tony – because Jeannie calls the two therapists “angels on her shoulder.”

# ANGELS

The new Neuro Recovery Clinic is harnessing hope and recovery through intensive long-term care.

By Jesse Lee



**Neuroscience research has shown that intensive training can change activation of the surviving neurons in the nervous system – a process known as neuroplasticity – accomplished through specific, repetitive training regimens.**

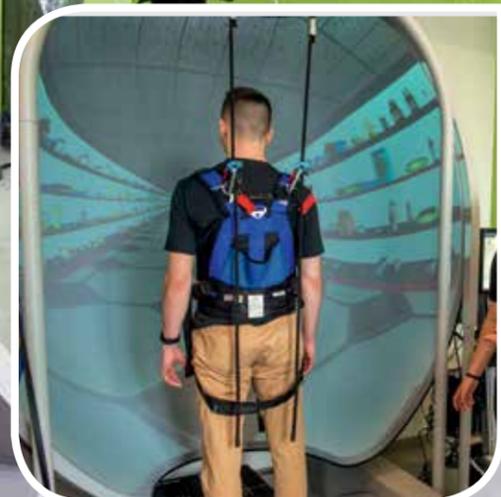
“I first met Jeannie and Tony through (physical therapy chair and associate professor) Dr. Allie Hyingstrom,” says Stoeckmann, clinical professor and director of the Neurologic Residency Program in the Physical Therapy Department. “Jeannie had a very tragic stroke, and Tony had been searching everywhere – he’s such a devoted husband – for someplace to help Jeannie.”

Standard teaching years ago was that, following a brain injury or spinal cord injury, neurons are dead. People with those injuries were taught how to compensate for the damage – they had to learn new ways to do old tasks, if possible, or they had to abandon some of the old ways of doing things. They may use a brace to substitute for muscles that no longer work, for example.

In the past decade, however, neuroscience research has shown that intensive training can change activation of the surviving neurons in the nervous system – a process known as neuroplasticity – accomplished through specific, repetitive training regimens.

“Through years of neuroscientific research, we understand that the nervous system is plastic and that further functional advances can be attained through repeated, rehabilitative exercise and activity,” says Dr. William E. Cullinan, dean of the College of Health Sciences and director of the Integrative Neuroscience Research Center at Marquette.

Tony and Jeannie (who is also enrolled in the Intensive Aphasia Program in the Speech and Hearing Clinic at Marquette – see story on page 18) found a clinic in Alabama that specialized in this type of intensive neurologic therapy that could help Jeannie regain some movement and ability, but unfortunately Jeannie didn’t meet the strict criteria for admittance. They reached out to Hyingstrom, who had seen Jeannie previously as



The Neuro Recovery Clinic is outfitted with state-of-the-art technology.

part of a research study for people who'd had a stroke, and asked Hyingstrom to work with Jeannie to gain enough key activities to allow her to join the specialized clinic program.

Hyingstrom then brought in Stoeckmann to do some work with Jeannie in the hopes that Jeannie would gain enough of the abilities needed to be a clinic candidate, but despite their hard work, Jeannie still didn't get accepted.

The Vodniks didn't give up. It took some time, but Jeannie eventually got into the clinic program in Alabama. But despite that, Tony challenged Stoeckmann to consider what it would take to open a clinic at Marquette that could provide specialized neurologic physical therapy to people with stroke, traumatic brain injury, spinal cord injury and other neurologic conditions. There were only one or two such clinics in the Midwest at the time, and none in Wisconsin.

"Tony is a businessman, and he made me look at the financial side of what it would take to open a clinic," Stoeckmann says. "He was the first person to make us sit down and actually think about how we could not only make a clinic happen, but how we can make it affordable and available."

In 2016 Stoeckmann teamed up with Dr. Jeff Wilkens, Arts '97, PT '99, director of the Marquette Physical Therapy Clinic, to put together a business proposal for a neurologic therapy clinic.

"Jeff had already established an amazing sports medicine clinic at Marquette that has been extremely successful," Hyingstrom says. "And we've seen how that clinic meets the needs of patients but also of our students, who have access to a place for more hands-on learning right here on campus."

"The original physical therapy clinic started in 2011, and after about two years of getting it up and running, we started talking about how we could expand it," Wilkens says. "Neurologic therapy was one of the first ideas that came to the forefront. We really settled quickly on neuro because Tina and I really hit it off and knew it would be a good partnership."

"Our research strengths in the department are neuroscience-based," Hyingstrom says. "So it seemed like it

would be a natural avenue to open a clinic that could also work in tandem with our research focus."

Stoeckmann and Wilkens reached out to DeChant, Stoeckmann's former student at Marquette, who was then working at the VA hospital in Milwaukee as a physical therapist.

"Tina and I used to dream about offering neurologic therapy services of this kind," DeChant says. "We formed a friendship after I graduated, and we never stopped talking about that dream."

Stoeckmann and Wilkens asked to bounce some ideas off of DeChant in order to help flesh out their clinic proposal. They received \$50,000 from an anonymous donor and a matching grant of \$50,000 from the College of Health Sciences in 2016, but it wasn't enough to get a full-fledged clinic operational.

Stoeckmann kept teaching and working with students and patients, and Wilkens kept growing the physical therapy clinic, but the idea of a neurologic rehab clinic was never far from their minds.

"We kept getting calls at the physical therapy clinic from people saying 'I have this,' or 'my mom has that' – specific neurologic conditions that, at the time, we weren't equipped to handle," Wilkens says. "Tina is so passionate about neuro rehab that she would start taking on a few clients who needed care, and it kept fueling the conversation of all the people out there just looking for the next step beyond traditional neurological rehab. That kept motivating us – the more calls we would get, the more leads, the more inquiries, they kept fueling the fire of a need for this type of specialized clinic."

Much like the repetition and intensity necessary for neurological recovery, Stoeckmann, Wilkens, Hyingstrom and others in the college, including the dean, focused their energies on solving the problem of finding the funding and space needed to make the clinic a reality.

Their persistence paid off. In December 2018 the college received a \$1 million gift from the same anonymous donor who provided the initial \$50,000 back in 2016. The gift would officially establish the Marquette Neuro Recovery Clinic.

**"The more calls we would get, the more leads, the more inquiries, they kept fueling the fire of a need for this type of specialized clinic."**

**Dr. Jeff Wilkens**



Jeannie Vodnik (right) works with therapists Dr. Tina Stoeckmann (left) and Dr. Kim DeChant (center).



Participants in the Parkinson's Exercise Group enjoy the expanded space the new clinic offers.

The gift allowed for immediate work to begin on renovating space on the first floor of Cramer Hall, as well as the purchase of high-end, specialized equipment for the clinic.

"Put simply, this clinic would not be possible without the generosity of this donor," Cullinan says. "The college has a long history of friendship and patronage with this person, and with their help we're committed to building a state-of-the-art training center that will provide intensive programming for people living with life-altering brain and spinal cord injuries and illnesses."

"There's been a lot of thoughtful planning on how the space will be used and the atmosphere we want to create," Hynstrom says. "It's in a great location to optimize entry for patients as they come to the clinic. It's just been a very intentionally planned place, because environment does matter – the state-of-the-art equipment we've been able to purchase because of this gift will help elevate the treatment we can offer."

Having the right person to lead the clinic was another key consideration. DeChant was hired as the Marquette Neuro Recovery Clinic coordinator, reuniting her as a colleague with Stoeckmann and allowing them to realize the dream they had put forward years before.

In the announcement of the gift, the donor said, "Learning of the limitations of insurance coverage and the importance of continued intensive therapy to recovery for those impacted by neurological injury made me realize how important and great the need is for a clinic like this. I am pleased to help Marquette bring these life-changing therapies to the many in need."

According to DeChant, the clinic, which will be one of the only clinics of its kind in the Midwest, will be modeled on NeuroRecovery Network® programs originally developed by the Christopher and Dana Reeve Foundation in cooperation with the Centers for Disease Control and Prevention.

In addition to a team of specialized therapists, the clinic is outfitted with state-of-the-art technology, including zero-gravity ambulation stations, upper extremity robotics and a virtual-reality-based vestibular rehabilitation device, among other items.

"We're focused on covering all aspects of traditional, intensive and wellness training," DeChant says.

While DeChant likens the wellness training to seeing a personal trainer, she says that limitations of insurance coverage, especially for the intensive program, is an important factor that must be addressed.

"An intensive program is typically three hours per day, four to five days a week, for eight to twelve weeks," DeChant says. "A program like that can cost as much as \$15,000."

The college hopes that the creation of the clinic will inspire other donors to come forth and set up scholarships or fee deferrals to help people with hardships afford the care they need.

The cost of the program takes into account its intensive nature, with people in the program benefiting from multiple skilled practitioners working with them in sessions that would be impossible in a typical outpatient setting.

"In the clinic, you may practice a therapy as much as possible in a 45-minute session and then send the person home with a home exercise plan," DeChant says. "But there are studies that show that, in a typical therapy session, someone may practice a specific therapeutic movement 20 times. From a neuroplasticity standpoint, we need to see them practicing that same movement 500 times in a series of specific, intensive sessions."

And while it seems like a massive investment of time, training and cost, DeChant says the payoff is worth it.

"We're harnessing recovery," she says. "How you functioned the day before your injury is our goal – so if you go through the 12-week program and can walk without a walker afterward, you should be able to continue doing that without reverting back."

DeChant wears a bracelet engraved with a single word: legacy. "I'm always thinking about how I can leave a legacy," she says. "Whenever I make decisions in my life, I think about where I can make the most impact on people. I'm excited to open this clinic and start working with patients. It's something I'm proud to be a part of."

**In addition to a team of specialized therapists, the clinic is outfitted with state-of-the-art technology.**

# Health Care and Hope

Marquette physician assistants learn the intangibles of health care, including empathy and kindness, at the Repairers of the Breach clinic in Milwaukee.

By Allison Dikanovic, Arts '17

**A man walked into the Repairers of the Breach community clinic on a Tuesday afternoon complaining that his feet were extremely sore. According to Pastor James West, executive director, it's not uncommon for people to stop into the daytime shelter and resource center on West Vliet Street after walking for miles. Most of the people who frequent the center are experiencing homelessness.**

Melissa Gorman, a student in the Physician Assistant Studies program, also walked to the clinic that day, but for a different reason. She was there to provide medical care under the supervision of her professor and a retired physician as part of a partnership between Marquette and Repairers. The community-based clinical experience has become a tenet of Marquette's PA education, and the clinic has gained a reputation in the community as a place where anyone can receive dignified, individual care.

Gorman recalled welcoming the man in, eager to practice the skills she was learning in school in an attempt to offer reprieve and care for his bleeding feet.

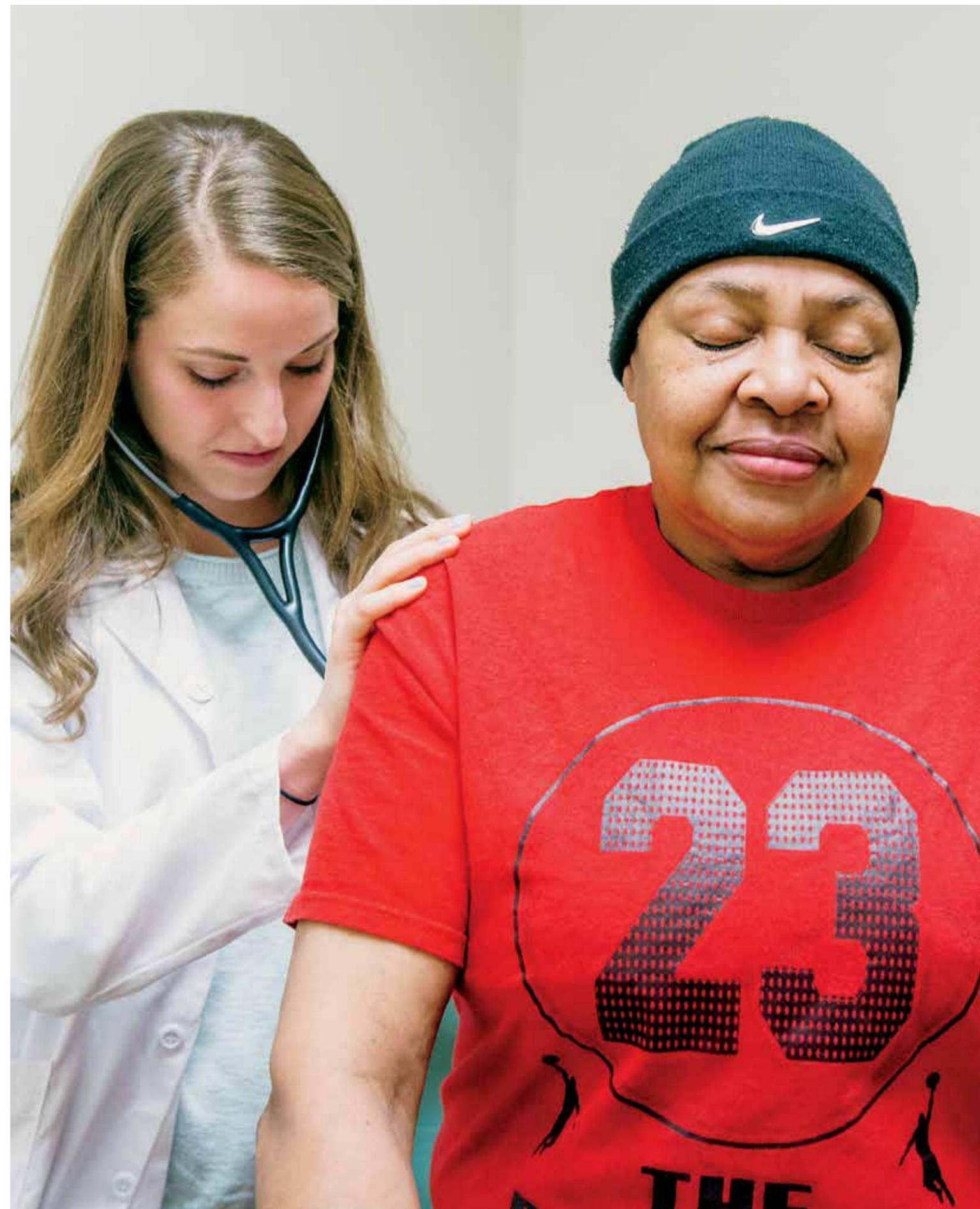
However, despite her best intentions, Gorman's plan for how the exam would go came to a screeching halt when the man refused to take his shoes off.

"He definitely had anxiety around doctors and medical providers," she says. "He was very apprehensive."

Josh Knox, Grad '11, a clinical associate professor who forged this program partnership in 2011, said that a lot of people who visit the clinic haven't had many positive experiences with medical professionals in the past and that seeing a provider can be traumatizing to some people. He said this is something he wants his students to learn to be conscious of when they provide care to people from a variety of circumstances.

When Gorman asked the man again to take off his shoes, she said she could tell he was getting agitated. She realized she would need to take a different approach.

"We took a step back," she says of herself and the fellow student she was paired with. The students paused and then started a more casual conversation with the man, asking about what brought him in, how his day had been going and





“We want to develop an attitude, disposition and belief in our students that everybody deserves health care, empathy and, dare I say, kindness.” Josh Knox

what his living situation was, all in an effort to make him feel more comfortable.

“You could see some of his anger and fear fade away,” Gorman says. “He looked at us and stopped us mid-sentence and says, ‘You know, I think I’m ready to take my shoes off. You can go ahead and look at my feet.’”

Gorman proceeded with her exam and got the man shoe inserts, which is a practical need that Knox said is just as important to providing care as doing a blood pressure check or refilling medication.

After learning more about the man’s medical history – including that his vision was impaired – she also discovered something unexpected.

“We found out he was diabetic,” she says, which would explain his sore feet and blurring vision. “It felt really good to problem solve and get down to the root cause, which had gone untreated for a long time.”

Gorman said she learned an invaluable lesson that day: If they didn’t create the space for this man to feel comfortable enough to share the things that were bothering him, and if they didn’t listen deeply to his individual experiences, they would have mistaken his diagnosis.

This ability to make people feel safe, seen and heard is a goal of Marquette’s PA program, according to Knox, because it is directly connected to the Jesuit idea of *cura personalis* or “care for the whole person.” Building these soft skills is the intention of the community clinic partnership.

“We want to develop an attitude, disposition and belief in our students that everybody deserves

healthcare, empathy and, dare I say, kindness,” Knox says.

“Critical to the foundation of public health is the idea that one size does not fit all. Context matters.”

Pastor West says that he has observed the way the PA students value their relationships with the patients at Repairers, taking the time to answer their questions.

“When we have students who come in and show concern, it is a source of hope for the patients,” he says. “It also helps the members, because you can’t be all you can be when you have a disease and don’t even understand your health problems.”

Health education and referring patients to different resources in the community are integral parts of the visits.

Learning more about the challenges that people in the Milwaukee community experience when trying to access health care or make healthier decisions, especially those who are affected by poverty or homelessness or are lacking legal documentation or insurance, equips the students to provide better care for anyone, Knox explains.

Each PA student visits Repairers of the Breach once a quarter, starting in the spring of their first year in the program, and develops a bond over time while improving their skills.

“If you want to do this work, you have to establish trust,” Knox says. “By building a history, students build a relationship with the organization and also see themselves getting better in real time.”



Students in the Physician Assistant Studies program work with doctors at Repairers of the Breach, treating and consulting patients who visit the clinic.



# Precision Science

The new Bioluminescence Core laboratory brings cutting-edge tools and technology to the College of Health Sciences at Marquette.

By Jesse Lee

**In 2016 alumni couple Dennis, Bus '73, and Barbara, Bus '72, Klein, members of the 2018 Marquette University President's Society, pledged \$1 million to establish the Dennis and Barbara Klein Neuroscience Research Innovation Fund.**

Now, just three years later, their gift is helping push Marquette to the forefront of neuroscientific research.

As part of a Strategic Innovation Fund initiative, the Department of Biomedical Sciences created the Bioluminescence Core, a laboratory and research space that will house some of the most cutting-edge neuroimaging tools available, including a two-photon microscope that allows researchers to view and track neurons and dendrites in a living brain.

"We can look into a brain in real time and actually make repeated assessments over time," says Dr. John Mantsch, chair and professor of biomedical sciences. "Twenty years ago this was unheard of, and even now there are few universities in the region equipped to do this. For a university establishing itself as a leader in research, it is a power play for us to have this type of technology."

Two-photon microscopy works by pulsing a near-infrared laser at roughly 80 million pulses per second, penetrating nearly 1 millimeter into brain tissue. While this may seem like a small area, consider that one cubic millimeter of brain tissue contains approximately 50,000 neurons, and each

neuron could conceivably receive up to 100,000 dendritic inputs.

"With this technology, we can look at dendrites on neurons and track them with manipulations over time," Mantsch says. "We can even track changes in a single dendrite."

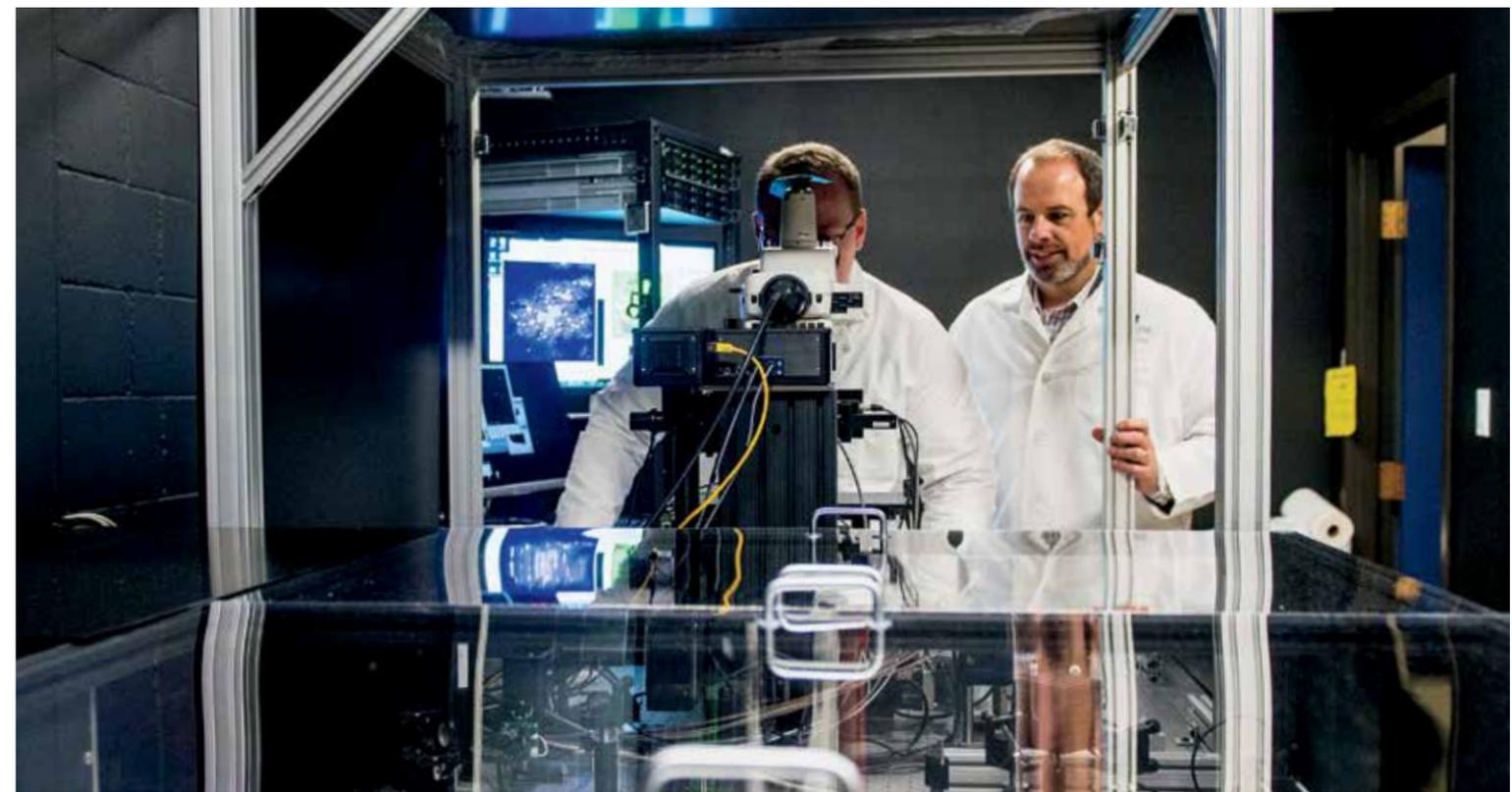
Technology this advanced requires a person with a very specific skill set to implement it. Mantsch and his colleagues searched for someone who could help get the Bioluminescence Core up and running, and found Dr. Iaroslav "Alex" Savtchouk.

"We knew of Alex's research background, but looking at the labs he came from, we weren't sure if we'd be successful in recruiting him," Mantsch says.

Savtchouk did his postdoctoral work at the prestigious Andrea Volterra Laboratory at the University of Lausanne in Switzerland, where he published a number of papers in top scientific journals on neuroscientific imaging, prior to coming to Marquette.

"I was impressed with the collaborative culture in the department – that's very rare," Savtchouk says. "The researchers here seem to have a common vision and ability to integrate – not to step on toes but truly synergize. It appealed to me."

"Alex came to Marquette from a world-leading lab, and he's been at the forefront of developing this platform – this was a strategic hire that took



into consideration the dividends it would pay to the whole research community at Marquette," Mantsch says.

With Savtchouk's expertise leading the way, the department began to set up the foundation of what would become the Bioluminescence Core.

"With high-precision instruments, the environment is absolutely critical," Savtchouk says.

The physical space for the Bioluminescence Core is painted in a matte black that dampens light-loss and allows for more precise imaging. The microscope itself sits on a self-leveling, anti-vibration table weighing 3,000 pounds that actually had to be lifted by crane to be put into place.

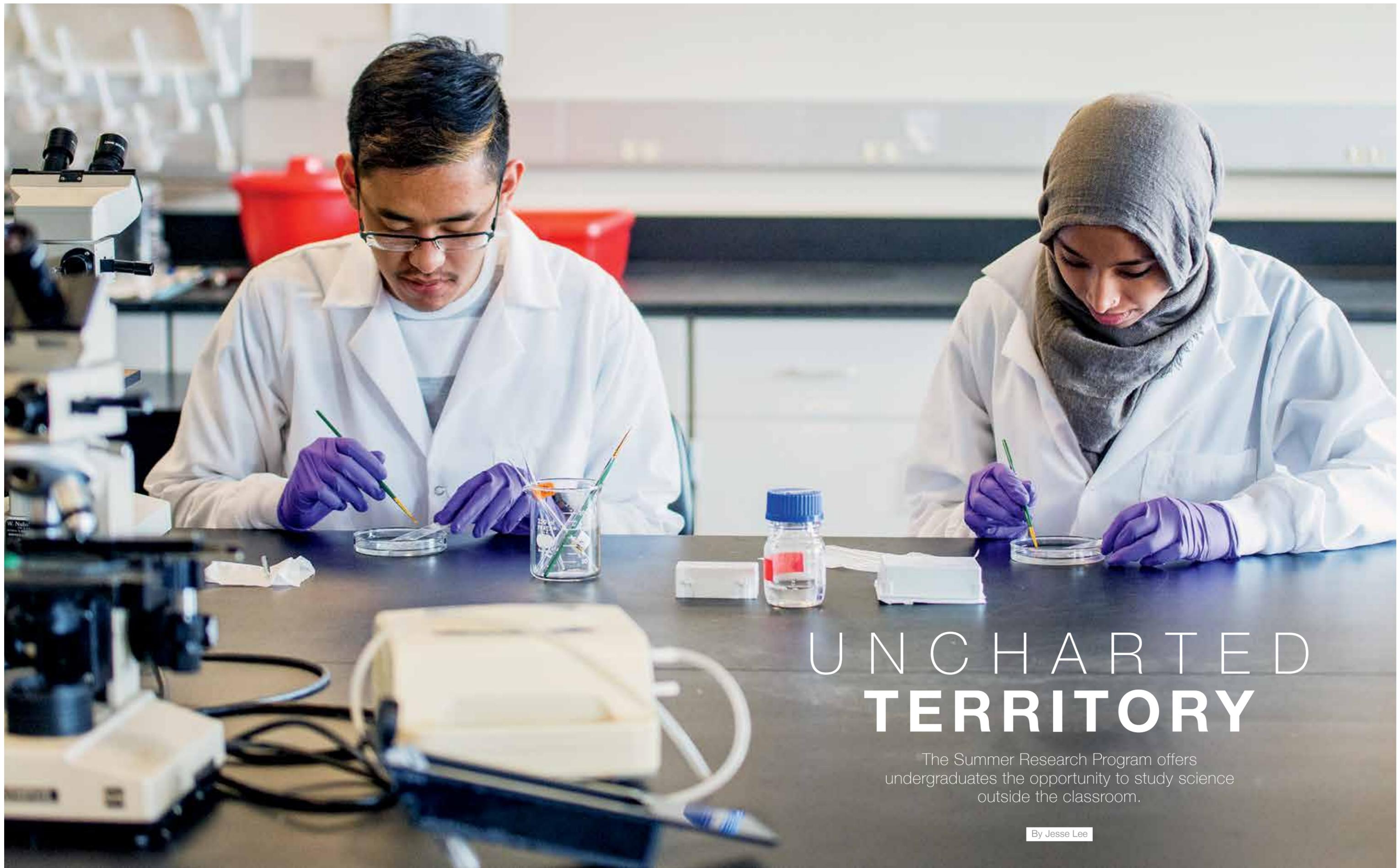
"There's a big push for precision medicine, and precision medicine requires precision science," Mantsch says. "To have this kind of equipment to perform an analysis at the circuit and cell population level will lead to more precise manipulations that can ultimately be used to produce better treatments."

Savtchouk's research in the Bioluminescence Core will first examine how the brain functions under healthy conditions, which will then allow for exploration into pathologies such as depression and addiction.

"We start off studying a healthy brain, just to understand the basic science questions," Savtchouk says. "But we'll also submit grants focusing on a variety of pathologies."

While the Klein gift provided the majority of support for the Bioluminescence Core, much of the work will be supported by the Charles E. Kubly Mental Health Research Center, established by funding from Dr. Michael, Med '63, and Billie Kubly, a member of the 2018 Marquette University President's Society, with additional major gifts from Michael (also a member of the 2018 Marquette University President's Society) and Jeannie Schmitz and Jim, Eng '68, and Kelly, Arts '68, McShane.

"All of the generous supporters of the College of Health Sciences have been very forward-thinking in supporting neuroscientific research that will impact the way we discover treatments for illnesses like depression and addiction," says Dr. William E. Cullinan, dean of the College of Health Sciences and director of the Integrative Neuroscience Research Center. "They understand and appreciate the need for state-of-the-art technology with the potential to power the type of research that we do."



# UNCHARTED TERRITORY

The Summer Research Program offers undergraduates the opportunity to study science outside the classroom.

By Jesse Lee

Saema Khursheed and Jenree Maglasang sit next to each other at a countertop in Dr. Paul Gasser's research lab, their gloved hands holding tools that look like small paintbrushes. They work slowly and carefully, using the tools to move nearly transparent pieces of brain tissue from a dish onto a microscope slide.

**Khursheed, a junior from Milwaukee, and Maglasang, a senior from Gurnee, Illinois, are both majoring in biomedical sciences.** Both are also students in the Summer Research Program, which gives undergraduates the opportunity to work on funded research projects. The Summer Research Program is made possible in part by the college's Sterilizer Monitoring Service (see sidebar) and by a generous, annual \$50,000 gift from an anonymous donor. Student participants receive a \$3,500 stipend for their participation in the 10-week, full-time program.



From top to bottom:  
Dr. Paul Gasser,  
Dr. Marie Hoeger  
Bement

Khursheed explains the slide mounting process: "We use .2% gelatin, and we take really thin slices of tissue – less than 50 micrometers – and try to plate them really specifically," she says. "It has to be in the perfect orientation so that when you look at it under a microscope there aren't any wrinkles."

After it's mounted, the students will visualize the tissue using a powerful electron microscope.

"We're trying to identify the specific cell types in the brain that express a stress-hormone-sensitive dopamine transporter," says Gasser, associate professor of biomedical sciences.

Gasser's lab studies the neurobiology of stress and its effects on diseases like depression. The undergraduate researchers each have specific projects that contribute to the larger scope of the research.

"We look at how stress alters reward and motivation, and have shown that this transporter is one of the mechanisms by which stress increases reward-seeking behavior," Gasser says. "If we can identify which cells express the transporter, it will allow us to better understand the specific effects of stress on the neural circuits that regulate reward-seeking behavior."

"We're learning something that isn't discussed in current textbooks – we're in uncharted territory," Khursheed says. "We're learning brand-new science that could actually be in a textbook someday."

Khursheed, like many biomedical sciences students, hopes to go on to medical school. Maglasang plans to continue on a research track after he earns his undergraduate degree.

"For me, the Summer Research Program is about exposing myself to research to see what I like and don't," he says. "It's narrowing down the path I want to focus on."

Dr. Marie Hoeger Bement, associate professor of physical therapy and head of the Pain Research Laboratory, says that exposure to research and student development is exactly what the Summer Research Program was designed for.

"The reason I did research as an undergrad was to strengthen my application to physical therapy school," Bement says. "Little did I know research would become my career, but it did because I loved it. That undergraduate experience helped define what I wanted to do."





Jenree Maglasang carefully mounts tissue on a microscope slide.

Bement's Pain Research Laboratory focuses on nonpharmacological pain management, specifically in people with chronic pain. Currently Bement is investigating exercise specificity in people with fibromyalgia to determine if one type of exercise is better than another for pain relief. The premise of the research is that exercise is medicine, and Bement's current study will determine if the type or amount of exercise matters.

Kaela Beugnet, a senior from Mt. Pleasant, Wisconsin, majoring in exercise physiology, enjoyed the program so much she came back for a second summer. She works in Bement's lab.

"The students assist with all aspects of the research process, such as data collection, participant recruitment, analysis and literature reviews," Bement says. "The Summer Research Program also provides an excellent mentoring opportunity for my graduate students who are training to be future faculty members."

Beugnet says that, aside from her work in the lab, one of her favorite parts of the program is the final poster presentation, when each of the students displays a research poster highlighting their work and presents their findings to people in attendance. Many of the undergraduate researchers then go on to present their posters and findings at national meetings as well.

"The poster presentation is great because it helps you work on communication," Beugnet says. "Explaining your research to others in a way they can understand it, even if they don't have a science background – it really raises your confidence level."

Gasser also enjoys the poster presentation and the enthusiasm with which the students – many of whom will be listed as co-authors on scientific publications thanks to their work in the Summer Research Program – share their newfound knowledge.

"It helps remind you how exciting it all is," he says. "It's exciting for the students to present their work to an external audience for the first time – it even reminds you of why you wanted to get into this exciting research field in the first place."

## Sterilizer Monitoring Service

**THE STERILIZER MONITORING SERVICE,** founded more than 30 years ago by Dr. William Kos, provides biological sterilization monitoring for around 250 dental practice clients throughout Wisconsin. It also provides funding for a portion of the Summer Research Program, as well as other ventures in the College of Health Sciences.



Dr. Khadijah "Gigi" Makky took over the service in 2012.

"It had run for 30 years, and it was running in 2011 as it was 30 years prior. So we changed the whole structure of the business. We computerized it and made it more efficient," she says.

The idea behind the service is simple but necessary – dental practices use equipment called autoclaves to completely sterilize their dental implements between patients. The Sterilizer Monitoring Service provides weekly monitoring to ensure that all germs and bacteria are actually being destroyed in the autoclave process.

"We send test strips that have bacteria spores on them. When they sterilize their instruments, they include a strip, which is then sent to us," Makky says.

Once the service receives the strip, it is cultured. If there is growth, it means the autoclave process was insufficient in killing the bacteria.

"If there is growth, we call them right away," Makky says. "We troubleshoot with them to help them discover the problem with their sterilizers."

Makky says that the Sterilizer Monitoring Service cultures the test strips and contacts dentists within 48 hours, much faster than other services that can take a week or more to complete the process. In order to meet that demand, the service employs students from the biomedical sciences program.

"I have at least five or six students working for me every year," Makky says. "It's a lot of work but it's a great opportunity for them, and it's great that we can bring in money to support research in the college."

# Pathway to the Brain

Undergraduate mentorship experiences – including shadowing a neurosurgeon – put South Dakota native Dr. Maggie Carmody on a pioneering path.

By Jesse Lee

Dr. Maggie Carmody, H Sci '05, is the only female neurosurgeon in the state of South Dakota. Pretty impressive for someone who didn't even know if she wanted to be a doctor.

"I knew I wanted to do something science-related, but I didn't know if I actually wanted to go to medical school," she says, when asked how she chose this career path.

Carmody credits two teachers and mentors with helping guide her toward what would ultimately become her life's work.

The first is Dr. William Cullinan, now dean of the College of Health Sciences at Marquette. Cullinan was (and still is) a professor in the Biomedical Sciences Program when Carmody was an undergraduate at Marquette, and he teaches Clinical Human Anatomy and Gross Anatomy for the Biomedical Sciences, two of the largest, most demanding courses in the curriculum.

When Carmody was a senior in high school in Sioux Falls, South Dakota, she learned that Marquette had an undergraduate course that involves complete dissection of human cadavers – something that

sets it apart from almost every other university in the country – and that helped her decide to enroll at the university.

"I liked that they had the Biomedical Sciences Program," she says. "It's unique to be able to dissect cadavers as an undergraduate."

Carmody excelled in the program, becoming a teaching assistant in the gross anatomy lab. But she was still unsure where her interests ultimately lay. Cullinan, who is also the director of the Integrative Neuroscience Research Center and instructs an intensive brain dissection course each summer, recognized in Carmody a strength in neuroscience.

"Typically, at that point in your schooling, nobody's going to tell you as an undergrad, 'Hey, go shadow this neurosurgeon,'" Carmody says. "But that was 100 percent Dr. Cullinan. He told me, 'This is what you should be doing.' He saw that in me."

The neurosurgeon was Dr. Shekar Kurpad, the Sanford J. Larson Professor and Chairman of Neurosurgery at the Medical College of Wisconsin, and Carmody's second mentor. Under Kurpad, Carmody

received training and opportunities typically unheard of at the undergraduate level.

"I didn't know what becoming a neurosurgeon meant," Carmody says. "I shadowed him and watched many surgeries, and I thought, 'This is the coolest thing I've ever done. This is what I want to do.'"

Carmody attended the Medical College of Wisconsin for medical school and then went on to her neurosurgery residency – at seven years and a typical 88-hours-per-week work schedule, it's one of the most grueling residencies in medicine – at Case Western in Cleveland.

After her residency, she returned to Sioux Falls, where she's part of the neurosurgery team at Avera Medical Group. But she has fond memories of her time at Marquette.

"Milwaukee is a great city – one of my favorite places in the world to be," she says. "Marquette was such a good experience for me. My career path is proof that you don't have to know exactly what you want to do going in to school. You'll find your path, and Marquette was great at helping me find it."



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# CHANGING HOW TO THINK ABOUT NEUROLOGICAL CONDITIONS.



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Marquette University's Neuro Recovery Clinic is able to provide specialized, life-changing therapies for people with neurological conditions, including stroke, traumatic brain injury and spinal cord injury. The only clinic of its kind in Wisconsin and one of only three in the region, the clinic offers the opportunity to significantly improve the quality of lives for many. The challenges facing those in need of care are daunting. Your support can help remove the financial barrier.

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