FOCAL SPOT

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SPRING/SUMMER 2023 Creating a New Standard of Care for Uterine Fibroids

MALLINCKRODT INSTITUTE OF RADIOLOGY // WASHINGTON UNIVERSITY // ST. LOUIS

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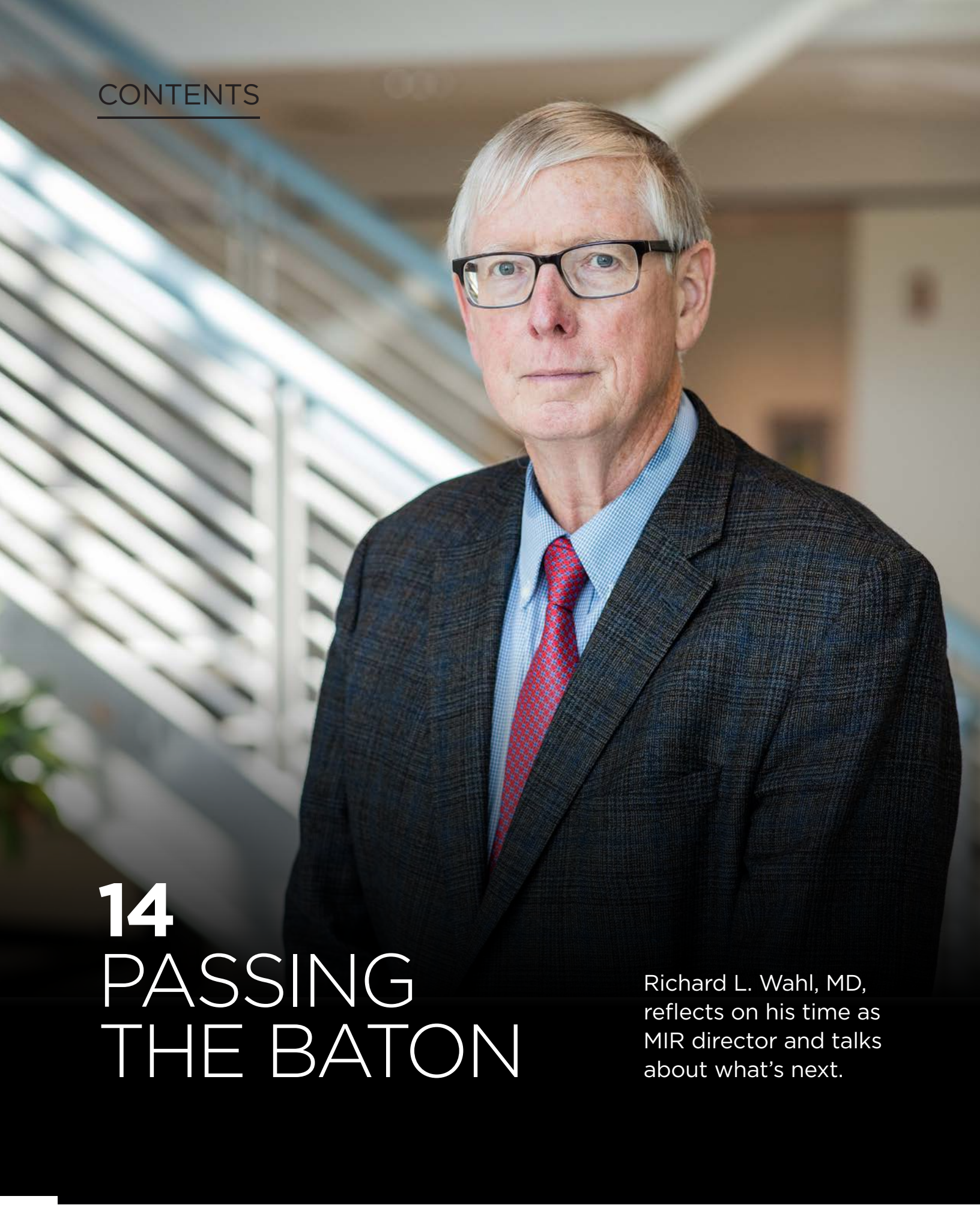
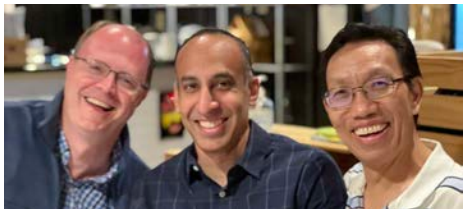


Cover Photo: Sagine Berry-Tony, MD, assistant professor of radiology, during an IR procedure at Barnes-Jewish Hospital.

Left: "He has an impressive grasp of the scientific potential in our recruits," says Senior Vice Chair Robert C. McKinstry, MD, PhD, of Richard L. Wahl, MD (left).



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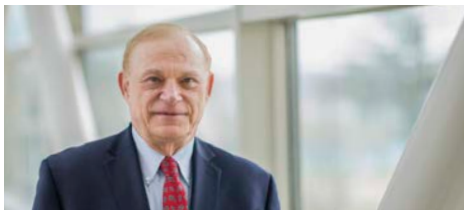


Researchers on the Rise

by Bailey Tripp

As the next generation of MIR investigators, Daniel C. Castro, PhD, and Patrícia M. Ribeiro Pereira, PhD, assistant professors of radiology, are focused on research that could improve treatment for two major public health challenges: substance use disorder and cancer. And beyond their scientific pursuits, Castro and Ribeiro Pereira are devoted to making research a more equitable space.

Daniel C. Castro, PhD

Biophotonics Research Center

During his undergraduate studies, Castro was initially interested in the biopsychology behind questions like why food tastes good — essentially, what makes us perceive something as "good" or "bad" and how that's reflected in the brain. But as he dove deeper, he began to focus on the underlying biology of endogenous opioids, a major player in mediating this phenomenon, and how the human body's inherent opioid systems are supposed to function. Ultimately, his goal is to help develop more effective treatments for those suffering from substance use disorders, neuropathic pain or diabetes.

To understand how complex neuropeptides function in endogenous and pathological states, Castro uses an array of advanced optical tools such as 3D anatomical mapping, fiber photometry and optogenetics. He says opioid research has been pigeonholed to their connection to euphoria or analgesia, but not their fundamental mechanisms. Castro also notes the lack of effective tools to see how these opioids function. One big-picture goal of his is to help create a system to see opioids with high spatial sensitivity and temporal resolution in different kinds of tissues, for example, the pancreas, brain or intestines.

Outside of the scope of his research, Castro wants to raise the flag for his fellow LGBTQIA+ scientists and create an environment where they feel like they belong and thrive in their work — especially given current threats to their fundamental rights, he emphasizes. Our backgrounds inform our perspectives, and the more perspectives brought into a space, the more intellectually exciting your environment is, he says.

Patrícia M. Ribeiro Pereira, PhD

Precision Radiotheranostics Translation Center

Ribeiro Pereira studies the complex and dysregulated biological processes of tumors. Drug resistance at the early stages of disease poses a significant challenge to effective cancer therapy, so she studies early molecular changes in tumors and their drug resistance mechanisms to develop strategies that can reverse them. Driven by a passion to understand the intricacies of tumor biology, Ribeiro Pereira hopes to identify new drug targets and treatment strategies to help develop more personalized and effective cancer care for patients.

To achieve this goal, Ribeiro Pereira is focused on developing more precise and specific molecular imaging techniques to help understand biological processes in cancer cells. She uses PET tools and imaging to provide real-time, whole-body visualizations of how tumors respond to therapy. This insight into the mechanisms that lead to resistance allow adjust treatment plans accordingly. Some of her current projects include developing tumor-targeting biomolecules that enable effective drug delivery and studying receptor membrane dynamics and regulation. The latter may be a key biological mechanism underlying resistance to immunotherapies and other tumor-targeted therapies.

In addition to her scientific work, Ribeiro Pereira values her role as a mentor and strives to empower her mentees by providing support and opportunities to help them achieve their career aspirations. She aims to build a space where scientific achievement and equity go hand-in-hand, and where trainees from diverse and underrepresented backgrounds have equal opportunities to succeed in the field.

From Life-Threatening Situation to Training Opportunity

by Bailey Tripp

During his second year of training, Anurag Chahal, MD, witnessed a patient have a severe reaction to a contrast agent. "The tech walked in and said, 'I don't think this patient is doing too good after contrast,'" says Chahal, a current fourth-year diagnostic radiology resident.

By the time Chahal and attending physician Cary L. Siegel, MD, entered the room, the patient was hypotensive and gasping for air. Siegel mentored Chahal to administer epinephrine within a minute of arrival, saving the patient's life. Chahal says he was amazed at how quickly Siegel turned the situation around, which sparked a realization: "If someone like me — who's had radiology training and completed high-fidelity simulations — doesn't have the structured approach to save someone's life, how can you expect someone without that training to be at their A-game when something like this happens?"

While mild allergic reactions such as nausea and itching aren't uncommon, the likelihood of a patient having a life-threatening reaction is rare. That alarming moment inspired Chahal to create a hands-on contrast simulation training to better equip residents to handle those rare but serious events. He pitched his idea to Siegel, professor of radiology, who recognized the value in developing the simulation program.

"There are a couple of reasons why it's really important that we're doing this," Siegel says. "Residency requirements have increased in terms of educational training and emergency management training for contrast. And we're doing more scanning in the evenings and on the weekends when the residents are there with less staff, so they're going to be called on more often to play a pivotal role."

Chahal began connecting with peers at other institutions to discuss their contrast reaction training models, designing simulation scenarios, and coordinating with the staff at the Wood Simulation Center in the Farrell Learning and Teaching Center to set up the simulation sessions. Each session is a one-hour, high-fidelity simulation with four trainees tending to a life-size mannequin. A proctor manipulates the mannequin's symptoms, vital signs and dialogue to mirror real-life contrast reaction scenarios.

Siegel organized the initial sessions while training other proctors. Over the past nine months, interest in the simulations has grown tremendously from both trainees and attendings who want to be proctors. The current roster has eight proctors, one from each clinical section.

The team is currently averaging three contrast simulation training sessions a month. Moving forward, they plan to hold the trainings annually and ensure each proctor covers the same learning points.

Siegel says this journey shows that residents at MIR have the opportunity to come up with an idea and take it to absolute fruition. "Anurag wrote all the programs. He made contact with the simulation center. He got the introductions. It was collaborative, with faculty members contributing to improve the experience," she says. "But he's the one who had the vision."

"I just realized that this is an area that we can improve as far as patient safety is concerned," Chahal says. "And I became passionate about it because I was part of the team that saved a patient's life."

Below: Proctors, such as Cary L. Siegel, MD, (second from left) and Maria Rosana Ponisio, MD, (third from right), lead residents through contrast reaction simulations to better prepare them for handling real-life cases.

Bench to Business: Raising a Cap to Commercialized Tech

by Tamara Bhandari

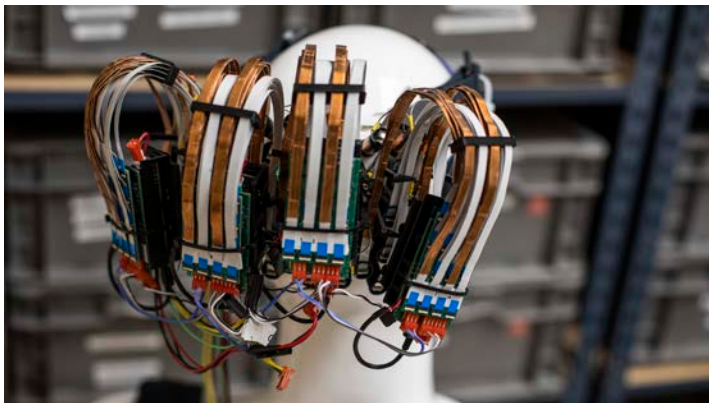
Figuring out what's going on inside people's heads typically requires huge, expensive equipment and volunteers willing to spend hours performing repetitive tasks while lying inside a narrow metal tube. But researchers in MIR's Biophotonics Research Center and at McKelvey School of Engineering are working on an alternative: a cap that can be worn while moving around normally that will use the power of light to generate high-resolution images of the brain in action.

"Functional magnetic resonance imaging (fMRI) is the gold standard for imaging brain function, but fMRI is very loud and very constraining, and that limits what you can do," says Joseph P. Culver, PhD, the Sherwood Moore Professor of Radiology at MIR and the primary inventor of the technology. "Wearable brain-imaging tech would allow us to study how brain areas work together to solve specific tasks and govern behavior under naturalistic conditions."

Culver started designing the first diffuse optical tomography (HD-DOT) instrument for imaging the brain in 2005. The technique uses LED sources that beam in infrared light from outside the head, paired with detectors that measure the light coming back out. The signals collected by each source-detector pair contain information about local brain blood flow. By placing many sources and detectors in an interlaced high-density array all around the head, the researchers can map blood dynamics — a proxy for brain activity — all over the brain. Recently, Culver and colleagues demonstrated that they could use an HD-DOT cap to detect brain signals and then decode them to figure out what a person sees.

The project is supported by a Small Business Technology Transfer grant from the NIH. These grants are designed to help small businesses bring academic innovations to market in collaboration with research institutions. This grant was awarded to EsperImage, a Washington University startup founded by Culver along with Adam T. Eggebrecht, PhD, an associate professor of radiology at MIR, and Jason Trobaugh, DSc, and Ed Richter, both professors of practice in electrical & systems engineering at McKelvey School of Engineering. The four have worked together on HD-DOT technology for more than a decade.

The researchers envision the cap as a research tool for cognitive neuroscientists. Such scientists study how brain activity, as measured by neuroimaging systems, relates to the complex cognitive functioning of the mind. For example, scientists could use such a cap to image the brains of children as they freely talk and interact with their caretakers. This would help us learn more about how language networks in the brain develop and contribute to normal or abnormal language acquisition. Eggebrecht, whose research focuses on applying HD-DOT to studies in childhood development, says the current prototype is a strong step forward.



Above: The NIH-funded cap gauges brain activity in natural, realistic situations — especially helpful for imaging children, as they are able to talk and interact freely.

"Upcoming advancements will further lower the weight such that a child will be able to comfortably wear the imaging cap while naturally behaving with a doctor, researcher, caregiver, or other children," he says. "This will open the door to new opportunities to observe brain function concurrently with ordinary behavior and over longer time periods than current methods allow. Such information may uniquely inform diagnosis and track responses to treatments."

The first-generation HD-DOT devices weigh hundreds of pounds. A participant sat in a fixed chair and wore a headset tethered to a bank of electronics the size of a chest of drawers. The current prototype is 8 pounds, plus a power source that fits inside a backpack. The goal is to get the cap down to 4 pounds, which is about the weight of a football helmet.

The working design calls for a cap studded with 288 optical sensors known as optodes, in the form of small copper-colored boxes about the size of an adult's thumb. Each optode contains a light source, a detector and eight tiny circuit boards that function together as a minuscule computer. In total, 72 minicomputers are connected to a digital network through the cap, and their collective data are beamed by Wi-Fi to a central computer that acquires, analyzes and displays the data.

"The cap we have now probably took five months to build," says Trobaugh, the co-founder and CEO of EsperImage. "The challenge now is to take the lab prototype and turn

it into a commercial system that can be mass-produced and disseminated.

"This is very much a team effort that would not be possible without our four connected but different backgrounds," he continues. "HD-DOT brain imaging was Joe's idea originally, and Adam has helped develop and extend the technology's capabilities, particularly toward pediatric imaging. Ed brings expertise in electrical and computer engineering, mixed analog/digital hardware and software design that has enabled him to redesign this system and build it in new ways. My background is in computational imaging science and signal processing. It takes all of our various skills and expertise to make this cap a reality."

Culver also credits MIR for supporting their efforts. This includes direct departmental funding for his and Eggebrecht's labs as well as the infrastructure supporting the NIH funded research and use of MIR's core facilities and data support services. "The commercialization of our optical brain imaging technology, through EsperImage, builds on the foundation of academic research supported extensively by MIR," he says.

2023 PET-RTRC Annual Meeting

The PET Radiotracer Translation and Resource Center (PET-RTRC) held its Annual Workshops & Scientific Session February 21–23, 2023. The event, hosted by MIR, leverages the university's expertise in PET radiotracer design, development, training and use with that of research groups throughout the country that are studying molecular and cellular processes of interest to facilitate the development and dissemination of novel PET radiotracers.

Battling Blood Clots and Bolstering Clinical Trials

by Lisa Wells

Nearly anyone can develop a blood clot in their leg, a condition called deep vein thrombosis (DVT). But for 40% of patients, painful after-effects become a defining factor of their ability to live normal lives.

DVT is common, impacting up to 600,000 people in the U.S. each year, and can cause two kinds of problems. Blood clots can break off and cause a pulmonary embolism — which can be fatal. Or the clots can remain in the leg, prompting a reaction from the body that ultimately leads to permanent damage of the leg veins and ongoing symptoms for the patient — called post-thrombotic syndrome, or PTS.

Suresh Vedantham, MD, professor of radiology and surgery, leads a large-scale, NIH-funded trial called C-TRACT, which seeks to determine if image-guided therapy can improve the quality of life for those diagnosed with PTS. The standard treatment for blood clots is anticoagulants, which prevent the clot from moving to the lungs or recurrent episodes. But these medications aren't enough to prevent debilitating PTS symptoms, which can include substantial leg aches or swelling that make walking and other activities difficult, and even skin ulcers in some patients.

"There has long been interest in finding ways to do more to prevent PTS because right now it is a lifelong condition with no cure, and it is difficult and expensive to treat," says Vedantham. For the last 30 years, interventional radiologists pioneered and developed a procedure called catheter-directed thrombolysis (CDT) that uses imaging guidance to insert a catheter into the blood clot within the veins and then infuses a clot-busting drug to dissolve it. But there had been no study to determine if the benefits were worth the risks.

"The ongoing C-TRACT study builds on findings from a clinical trial we conducted to determine if the benefits of the CDT procedure on new clots outweigh the risks, which include internal bleeding," says Vedantham about the ATTRACT study conducted from 2009-17.

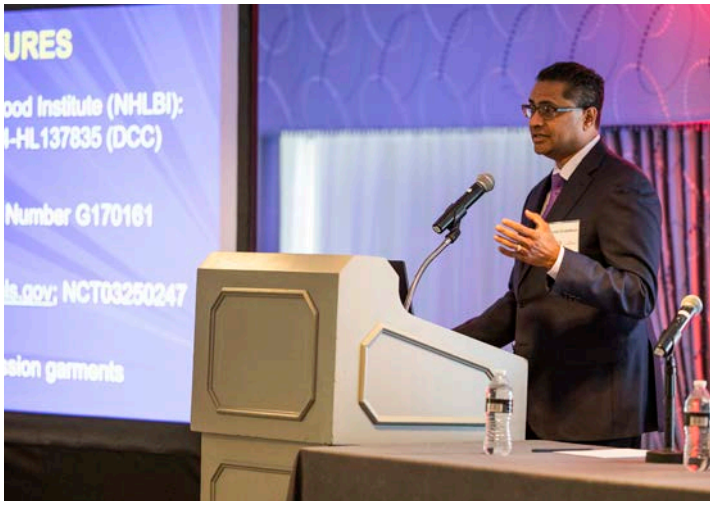
ATTRACT was the first large-scale, rigorous study to address this question and is an example of the type of extensive, investigator-initiated, interdisciplinary, multisite research that Vedantham leads. To enable this experience to benefit more researchers, Vedantham, who also serves as assistant dean of clinical research for the School of Medicine, created Trial-CARE. The multidimensional clinical trial support service is implemented through the Center for Clinical Studies within the School of Medicine, in partnership with the Institute of Clinical and Translational Sciences.

"Trial implementation expertise is a skillset that needs to be viewed as complementary to disease state expertise. If you meld them together, you're going to make the most impact doing clinical trials. Enhancing quality research is not just about regulating it; it's also about actively supporting the investigator teams," says Vedantham. He says his goal is to motivate the next generation of investigators who can use the platforms and pathways his team develops. "It's very complicated to design and administer these multicenter trials, and Washington University previously hadn't had a robust capacity to actively support them. But now we're very well positioned to go to the next level of innovation. We're essentially centralizing a cadre of highly experienced clinical research staff to support research teams and modernize the way we do clinical trials."

The ATTRACT clinical trial, which was endorsed by the Office of the Surgeon General, involved 692 patients across 56 sites in the U.S., as well as 250 multidisciplinary investigators and experts. Results showed CDT didn't stop PTS from occurring but did reduce the severity of symptoms of a subgroup of patients with acute iliofemoral DVT, a large blood clot that extends to the groin or higher.

"When we do these large-scale projects, we're aiming not just at the one trial answering one question. Hopefully it influences the awareness of this disease process and PTS, which often doesn't get recognized by medical physicians," Vedantham says. After ATTRACT, the NIH encouraged the team to look for additional questions to answer, building

Below: Vedantham speaking at the C-TRACT Investigator Meeting held in St. Louis on April 23-24. He is the national principal investigator for the NIH-sponsored clinical trial.



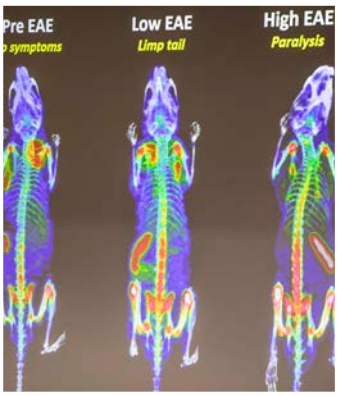
on the substantive platform they had developed. "We zeroed in on the idea that patients who have vein blockage of any kind are likely to do better if a vein stays open or is reopened," Vedantham says.

C-TRACT seeks to evaluate whether opening up the large iliac vein in the pelvis using stents can restore flow and reduce the severity of PTS in patients with old blood clots. With 173 of the 374 patients needed to participate, the study is nearly at the halfway point.

"By doing things in a rigorous way, teaching people about research methods, and encouraging interventional radiologists specifically to participate in ambitious studies, we can show that these kinds of studies are doable and answer important questions for our patients."

2023 MIR Research Symposium

Showcasing more than 60 posters, the MIR Research Symposium provides an overview of basic and clinical research at MIR. Richard L. Wahl, MD, delivered the keynote address, which reflected on his career and the future of nuclear medicine. Aisling Chaney, PhD, Aimilia Gastounioti, PhD, Joseph E. Ippolito, MD, PhD, and Sheng-Kwei (Victor) Song, PhD, gave supporting lectures.



A New Standard of Care for Uterine Fibroids

When Beth Miller Erman, 54, a competitive runner and cyclist, began experiencing pain in her hip, she made an appointment with an orthopedic surgeon. A magnetic resonance imaging (MRI) scan showed she had some arthritis in her hip. It revealed something else as well: Miller Erman had a uterine fibroid.

by Pam McGrath

She soon learned that her hip pain was being exacerbated by the fibroid's position near her hip flexor muscle. It also was the cause of symptoms she had been dealing with for two years: heavy menstrual bleeding that left her incapacitated for a day or two each cycle, a bloated abdomen resulting from a bulky or enlarged uterus, and weight gain.

When Miller Erman visited her gynecologist to find out what treatments were available for uterine fibroids, she was stunned by his answer.

"He told me to get a hysterectomy," she says. "As an athlete, that was a major, life-changing treatment. I was not willing to do that."

A hysterectomy has been the standard of care for treating uterine fibroids for many years, and it continues to be the leading cause of the surgery in the U.S. Since patients seeking treatment are usually in their 40s or 50s, after their childbearing years are over, removing the uterus has been seen as a permanent solution to the problem.

Seeking a second opinion, Miller Erman was told she had another option: uterine fibroid embolization (UFE). The minimally invasive treatment relieves symptoms of uterine fibroids by cutting off their blood supply, causing them to shrink. It was the answer she was looking for, and it brought her to Sagine Berry-Tony, MD, assistant professor of radiology at MIR.

A Common Condition

"Uterine fibroids are extremely common," Berry-Tony says. "They develop in over 95% of African American women and 80% of white women."

Benign tumors made of muscle and connective tissue from the wall of the uterus, uterine fibroids can grow inside the uterus, within the organ's wall or on its outer surface. They can be as small as an apple seed or grow to the size of a grapefruit or even larger. The reason uterine fibroids develop is unknown, but there is a proven connection between fibroids and the level of hormones in a woman's body, because they grow during childbearing years and shrink during menopause. Some women with uterine fibroids have no symptoms and never know they have them. Others develop symptoms so severe they become life limiting.

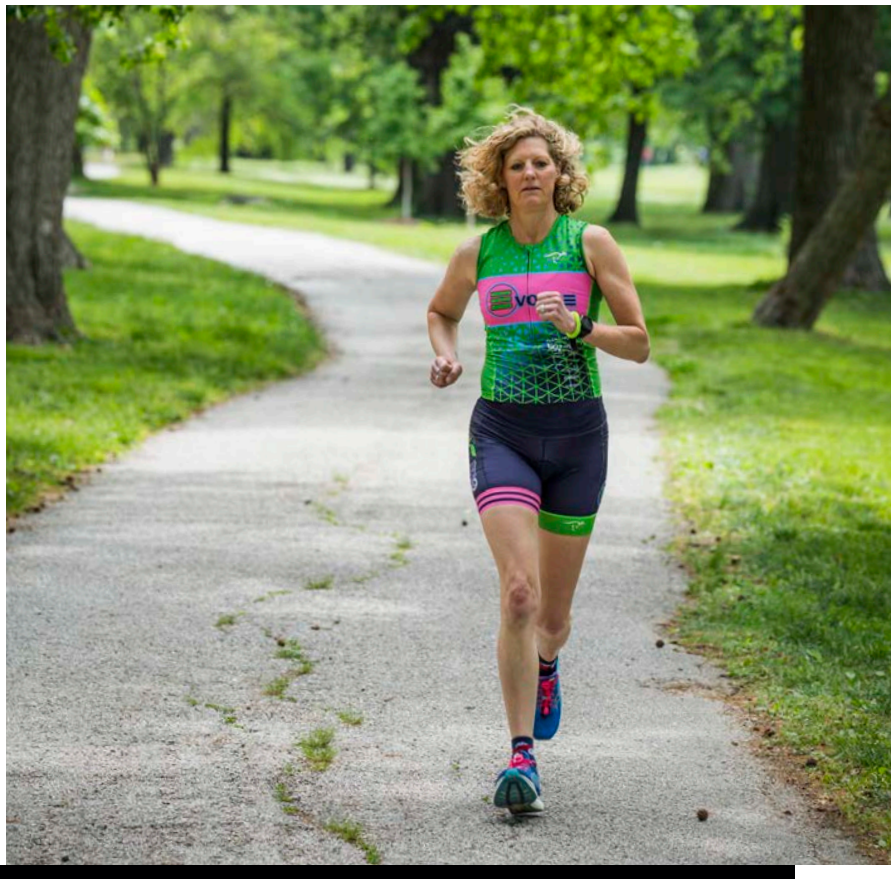
"Some women experience such excessive bleeding during their periods that they have to change their pads several times an hour, sit on a towel or change their bedsheets daily," says Steven C. Sauk, MD, chief of interventional radiology. "They can experience frequent urination, constipation, bloating, back and leg pain, cramps — a host of symptoms that are different for each woman."

According to Berry-Tony, women often tolerate the symptoms and adjust their lifestyle, thinking that what they are experiencing is normal.

"Even going back as far as high school, women talk about having to stay home from school when their period came because the bleeding was so excessive. No one told them that's not normal. It's not until later in life they are diagnosed with uterine fibroids," she says. "And there are women for whom the symptoms develop so gradually they don't realize the adjustments they are making until they become intolerable."

Helena Cody-Perry, 52, had been dealing with symptoms she thought were related to menopause. Once she was diagnosed with uterine fibroids, she grappled with the decision of whether to have a hysterectomy or undergo UFE.

"I was experiencing heavy bleeding, I gained weight, I had headaches, I was moody, I was tired all the time and my blood pressure was high, sometimes 150/100. I was a mess," she says. "I had a lot of people tell me to have a hysterectomy. They reasoned that my having the surgery would be a permanent solution. They believed if I had a UFE, there was a good chance of even more fibroids growing back."



Above Left: Physicians like Sagine Berry-Tony, MD, are setting a new standard of care for uterine fibroids.

Right: After her UFE procedure, Beth Miller Erman is back to training 14 hours a week to compete in half-marathons and duathlons.

Above: Before she was diagnosed with uterine fibroids, Helena Cody-Perry initially thought she was experiencing menopause symptoms.

Cody-Perry took about three months to consider her options. A conversation with Berry-Tony helped her decide on having a UFE.

"She explained the process, that it was outpatient surgery, and I would recover much more quickly than if I had a hysterectomy," she says. "And she told me a hysterectomy was always an option if I wasn't pleased with the outcome of the UFE procedure."

New Standard of Care

A growing number of women regard a hysterectomy as too invasive a procedure. And some don't want to lose a part of themselves that defines them as a person. UFE's minimally invasive approach eliminates both of those concerns.

"The uterine arteries supply blood to the fibroids, and estrogen, the hormone that influences fibroids' growth, is in the bloodstream," Berry-Tony explains. "UFE cuts off the blood supply to the fibroids."

During the UFE procedure, a small catheter is inserted through a blood vessel in the patient's wrist or groin and guided by X-ray to the right and left uterine arteries. Once the catheter is positioned, tiny particles are injected into each artery to stop the blood flow to the fibroids. Without a blood supply delivering oxygen and nutrients, the fibroids shrink, and over time patients' symptoms subside.

"You can compare the particles to how sand is distributed in a river. The sand is carried downstream to an endpoint. In the case of UFE particles, that endpoint is all the capillaries supplying blood to the uterus and the fibroids," Sauk says.

"Interventional radiologists at MIR have been performing UFEs since 2009," he says, "at a time when UFE was still considered an 'experimental' procedure. That has given us significant experience in what is becoming the new standard of care for uterine fibroids."

Most women with uterine fibroids are eligible to undergo a UFE. Prior to the procedure, the patient has an MRI to establish a definitive diagnosis of uterine fibroids and determine their location. Halfway through the MRI, a contrast dye is injected to trace blood flow, which includes the flow to the uterine fibroids. If the fibroids are responsive and active, they will "light up" on the scan.

Uterine fibroids occur in over 95% of African American women and 80% of white women.

"There are some women who have fibroids that aren't using a blood supply," Berry-Tony says. "This can result from fibroids getting so large that they begin degenerating on their own. Since UFE's goal is to stop blood flow, these patients are referred for optional treatments of their symptoms."

Once the procedure is completed, most patients are discharged within a few hours. They are provided with appropriate medication to manage any pain and instructions on what to do if they experience

any problems. Brittany Schmitt is the clinical nurse coordinator who serves as the go-between for patients and their interventional radiologists, and for the radiologists and gynecologists. "Before the procedure, I reassure them that the symptoms they are experiencing are not normal, and I educate them on what will be involved in their treatment.

"I call patients two or three times the week after their procedures," Schmitt says. "I make sure they are comfortable and troubleshoot any symptoms, giving suggestions about what they can do at home to help themselves. And I relay any concerns they may have to the physicians. I serve as their advocate." She continues to follow up at one-month, three-month and six-month intervals.

Symptoms should get progressively better until patients reach the year mark. That becomes their new baseline.

Berry-Tony emphasizes that UFE does not remove uterine fibroids. They remain in the uterus, but without a blood supply, they shrink over time. Since most patients are in their 40s and 50s, the procedure acts as a bridge to menopause, when hormones drop low enough to prevent new fibroids from forming.

"After the procedure, we tell patients it will be about three period cycles before they first start noticing a decrease in their symptoms. And the symptoms should get progressively better until patients reach the year mark. That becomes their new baseline," she says. "If after one-year post-embolization the fibroids have decreased in size by 50%, that should be enough to stop symptoms."

Least Likely to Seek Treatment

Although uterine fibroids occur most frequently in Black women, they are the group least likely to seek treatment, Berry-Tony says. "For good cause, they have a distrust of the medical community and undergoing major surgeries such as a hysterectomy. They don't believe they will be heard by their physicians, and their concern about a major complication developing while they are under anesthesia outweighs any relief they may have for their symptoms."

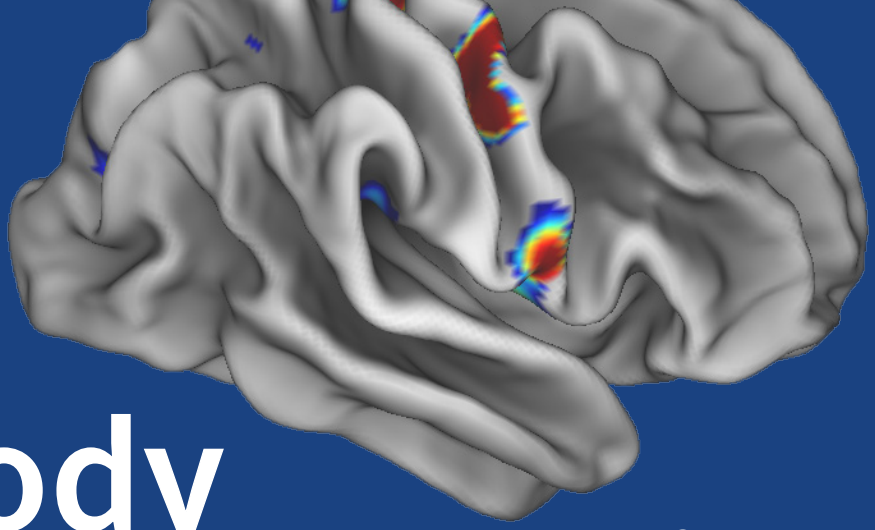
She stresses that UFE can alleviate much of that reluctance. "Patients are under conscious sedation, they are breathing on their own, they can talk to me, I can talk to them. The procedure itself is not painful," she says. "Afterward, patients are given specific instructions on what to do next and when, how to manage their pain and how to contact us with questions. It is a transparent procedure that can allay any fears patients may have."

Following her procedure, Miller Erman experienced no pain or discomfort. "I was given pain pills, but I didn't need to take them," she says. "I was instructed to stay home for five days, which I did, but it was unnecessary — I was running again on day 6." Although she says she can still feel the fibroid when she runs, it is not painful. All of her symptoms are gone, and she is back to training 14 hours a week so she can compete in half-marathons and duathlons.

Cody-Perry felt so good after UFE that she returned to work within two days. "I didn't have any pain. I didn't even have to sit down the whole time I was at work," she says. "My symptoms subsided quickly: I no longer had heavy bleeding, my headaches stopped, I was able to exercise and lose weight, and my blood pressure is under control. It was a great experience.

"As a matter of fact, I was just talking to someone who is going through the same thing I did. I told her about my UFE procedure — and I told her that a hysterectomy was not her only option."

Below: Sagine Berry-Tony, MD, emphasizes the importance of building trust among Black women with uterine fibroids, as they are least likely to seek treatment.



Finding a Mind-Body Connection in the Brain

by Tamara Bhandari

"People who meditate say that by calming your body with, say, breathing exercises, you also calm your mind," says Evan M. Gordon, PhD, an assistant professor of radiology at MIR. "Those sorts of practices can be really helpful for people with anxiety, for example, but so far, there hasn't been much scientific evidence for how it works. But now we've found a connection. We've found the place where the highly active, goal-oriented 'go, go, go' part of your mind connects to the parts of the brain that control breathing and heart rate. If you calm one down, it absolutely should have feedback effects on the other."

Gordon is first author on a new study by researchers at Washington University School of Medicine in St. Louis that indicates that the idea that the body and mind are inextricably intertwined is more than just an abstraction. The study shows that parts of the brain area that control movement are plugged into networks involved in thinking and planning, and in control of involuntary bodily functions such as blood pressure and heartbeat. The findings represent a literal linkage of body and mind in the very structure of the brain.

The research, published April 19 in the journal Nature, could help explain some baffling phenomena, such as why anxiety makes some people want to pace back and forth; why stimulating the vagus nerve, which regulates internal organ functions such as digestion and heart rate, may alleviate depression; and why people who exercise regularly report a more positive outlook on life.

Gordon and senior author Nico Dosenbach, MD, PhD, an associate professor of neurology, did not set out to answer age-old philosophical questions about the relationship between the body and the mind. They set out to verify the long-established map of the areas of the brain that control movement, using modern brain-imaging techniques.

In the 1930s, neurosurgeon Wilder Penfield, MD, mapped such motor areas of the brain by applying small jolts of electricity to the exposed brains of people undergoing brain surgery, and noting their responses. He discovered that stimulating a narrow strip of tissue on each half of the brain causes specific body parts to twitch. Moreover, the control areas in the brain are arranged in the same order as the body parts they direct, with the toes at one end of each strip and the face at the other. Penfield's map of the motor regions of the brain — depicted as a homunculus, or "little man" — has become a staple of neuroscience textbooks.

Gordon, Dosenbach and colleagues set about replicating Penfield's work with functional magnetic resonance imaging (fMRI). They recruited seven healthy adults to undergo hours of fMRI brain scanning while resting or performing tasks. From this high-density dataset, they built individualized brain maps for each participant. Then, they validated their results using three large, publicly available fMRI datasets — the Human Connectome Project, the Adolescent Brain Cognitive Development Study and the UK Biobank — which together contain brain scans from about 50,000 people.

To their surprise, they discovered that Penfield's map wasn't quite right. Control of the feet was in the spot Penfield had identified. Same for the hands and the face. But interspersed with those three key areas were another three areas that did not seem to be directly involved in movement at all, even though they lay in the brain's motor area.

Moreover, the nonmovement areas looked different than the movement areas. They appeared thinner and were strongly connected to each other and to other parts of the brain involved in thinking, planning, mental arousal, pain, and control of internal organs and functions such as blood pressure and heart rate. Further imaging experiments showed that while the nonmovement areas did not become active during movement, they did become active when the person thought about moving.

"All of these connections make sense if you think about what the brain is really for," Dosenbach says. "The brain is for successfully behaving in the environment so you can achieve your goals without hurting or killing yourself. You move your body for a reason. Of course, the motor areas must be connected to executive function and control of basic bodily processes, like blood pressure and pain. Pain is the most powerful feedback, right? You do something, and it hurts, and you think, 'I'm not doing that again.'"

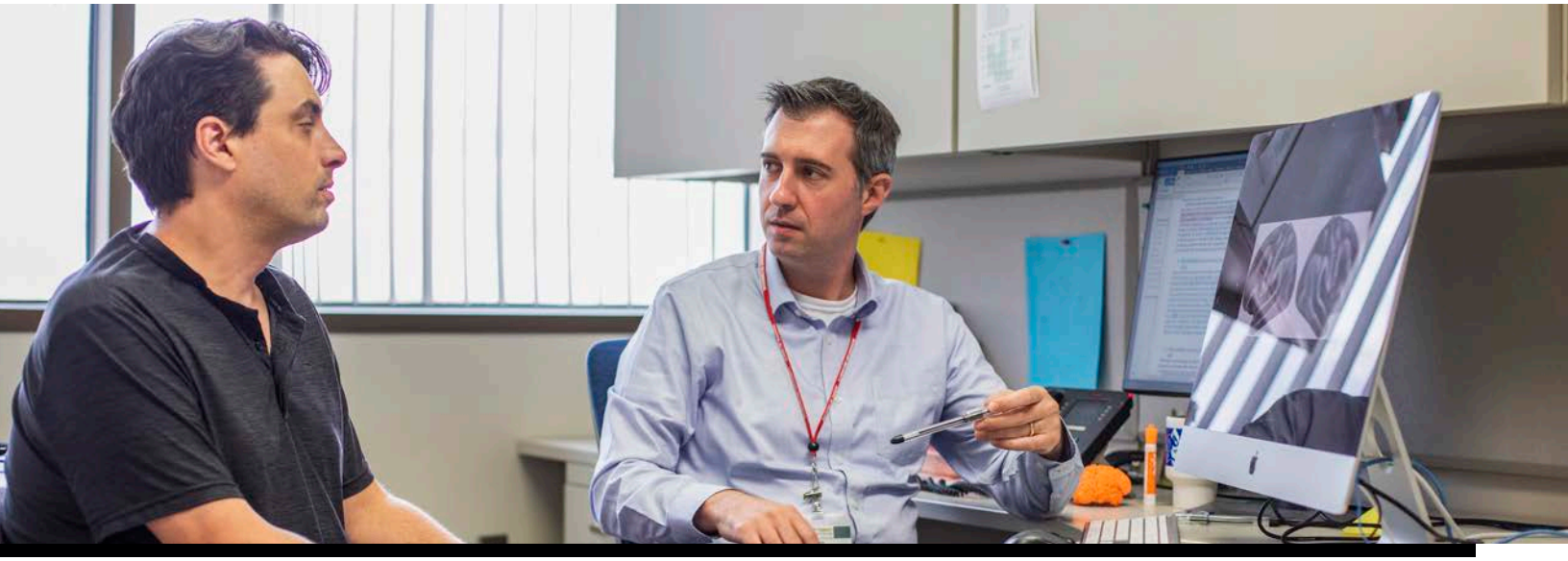
Dosenbach and Gordon, who each have a lab in MIR's Neuroimaging Labs Research Center, named their newly identified network the Somato (body)-Cognitive (mind) Action Network, or SCAN. To understand how the network developed and evolved, they scanned the brains of a newborn, a 1-year-old and a 9-year-old. They also analyzed data that had been previously collected on nine monkeys. The network was not detectable in the newborn, but it was clearly evident in the 1-year-old and nearly adult-like in the 9-year-old. The monkeys had a smaller, more rudimentary system without the extensive connections seen in humans.

"This may have started as a simpler system to integrate movement with physiology so that we don't pass out, for example, when we stand up," Gordon says. "But as we evolved into organisms that do much more complex thinking and planning, the system has been upgraded to plug in a lot of very complex cognitive elements."

Clues to the existence of a mind-body network have been around for a long time, scattered in isolated papers and inexplicable observations.

"Penfield was brilliant, and his ideas have been dominant for 90 years, and it created a blind spot in the field," says Dosenbach, who is also an associate professor of biomedical engineering, of pediatrics, of occupational therapy, of radiology, and of psychological & brain sciences. "Once we started looking for it, we found lots of published data that didn't quite jibe with his ideas, and alternative interpretations that had been ignored. We pulled together a lot of different data in addition to our own observations, and zoomed out and synthesized it, and came up with a new way of thinking about how the body and the mind are tied together."

Below: Nico Dosenbach, MD, PhD (left), Evan M. Gordon, PhD (right), and collaborators redrew the famous motor homunculus, adding regions connected to brain areas responsible for coordinating complex movements.



A Chair to Remember

by Marie Spadoni

On July 12, 2022, Richard L. Wahl, MD, announced that the upcoming academic year would be his last as chair of MIR. Fast-forward to July 1, 2023, when Wahl passed the baton to Pamela K. Woodard, MD. Shortly before the new chair was announced, Wahl spent some time reflecting on his career as a physician-scientist and his nine years as head of the Department of Radiology. He talked about what initially brought him to Washington University, his path to leadership and why he wasn't destined for life in the fast lane.

When did you first start thinking about pursuing science as a vocation?

I had some scientific and math aptitude and thought maybe I'd become an architect. Then my father told me I'd have to design TV towers and if I did that, I'd have to climb to the top of them to check out the quality of the work. We drove by one that was 2,000 feet tall, and I decided to rethink that idea. Then, when I was in ninth grade, my father had several strokes. I remember going to the University of Iowa, where he'd been hospitalized. I thought, 'This is pretty interesting; maybe I should consider medicine.'

You received your bachelor's degree in chemistry from Wartburg College, a small liberal arts college in Waverly, Iowa. How did you end up at WashU?

I knew Washington University had a reputation for training physicians who did research. I had a good experience working with an immunologist named John Atkinson, who got me interested in the physician-scientist model. I felt I'd have more of an impact on the world if I could practice and have scientific observations.

What led you to pursue radiology?

I initially considered being an internist or a cardiologist, but ultimately I liked the breadth of radiology. I remember in one of my labs learning about antibodies, targeting antibodies in vivo and carrying drugs. I had seen this paper about antibody targeting and thought if you can specifically target a molecule in vivo to deliver a payload that would be pretty cool. It got me interested in the overall idea of targeting molecules inside a patient to diagnose and treat disease. I took four months out of my clinical radiology residency to do research, which was very unusual back then.

Above Right: Wahl and Sandy, his wife of 48 years, at the RSNA Annual Meeting in 1982.

A Few (of Many) Milestones

1983

After a fellowship in nuclear medicine at MIR, leaves St. Louis and joins faculty as an assistant professor and co-director of nuclear imaging at University of Michigan Medical Center in Ann Arbor.

1986

Receives the SNMMI Marc Tetalman, MD, Memorial Award, a biannual award that honors the research accomplishments of a young investigator pursuing a career in nuclear medicine. Elected president of SNMMI more than three decades later.

1993

One of the earliest to show the potential of radioimmunotherapy in non-Hodgkin lymphoma in work published in the New England Journal of Medicine.

2000

Named director of the division of nuclear medicine/PET at Johns Hopkins Medical Institution and becomes the first recipient of the Henry N. Wagner Jr. Professorship. Serves as vice chair for technology and new business development.

2005

Receives the Aunt Minnie Award for Most Influential Radiology Researcher.

2014

Named the Elizabeth E. Mallinckrodt Professor and head of radiology at Washington University School of Medicine, becoming the sixth director of MIR.

2015

Named a member of the National Academy of Medicine, one of the highest honors in the field of health and medicine in the U.S.

2018

Tapped for SNMMI's prestigious Georg Charles de Hevesy Nuclear Pioneer Award, which recognizes researchers whose groundbreaking discoveries and inventions have advanced the field of nuclear medicine.

2022

Receives the Society of Nuclear Medicine India (SNMI) Lifetime Achievement Award, which recognizes nuclear medicine scientists who have made tremendous contributions to the field.

2023

Honored by Washington University with an Alumni Achievement Award for noteworthy professional achievements and dedication to the institution.

That's when I got interested in the idea of using the monoclonal antibodies. And because of the tools available here, I was able to figure out how to do antibody imaging in animal models with radiolabeling.

Was being in leadership something you pursued or something that chose you?

I suppose it's a little bit of both. In 1983, I joined the University of Michigan as an assistant professor, then became a full professor in 1990. The first NIH grants I wrote there all got funded, so I was able to focus on my research and clinical work. Eventually I became director of the imaging clinic but didn't have a say over all of the facilities and resources. I reached the point where I thought I needed to have a leadership position. By then, I was established enough and was offered the job at Johns Hopkins to be head of nuclear medicine and vice chair of radiology.

In 2014, you accepted the position of chair at MIR and subsequently left Johns Hopkins. Was changing academic institutions a difficult decision?

I didn't have a lot of second thoughts about it. Hopkins wouldn't have been a bad place to finish my career, but when the opportunity came up at WashU, I thought I should consider it since the roots of my academic career were in St. Louis. And after 14 years as vice chair and section chief, I felt I had experience that I could contribute more broadly to a radiology department.

What do you consider your most significant contribution(s) as chair?

Selecting people who had leadership abilities and then turning them loose to let them lead. Trying to identify really great talent and then giving them the resources they need to be successful.

What advice can you offer the new chair?

If you want to be successful, the job and your department take absolute priority over anything you're doing for yourself. Putting the department and its relationship with other departments as your priority and focusing on the missions. It's a delicate balance because you want excellence in everything. All the missions are important and have to be loved and nurtured. Otherwise, you have imbalance. I also think mentorship as a chair is important. But ultimately, it's about the patients. The next department head has to remember that the patients should really be at the center of what we're doing. It's why we're here.

What do you see for yourself in the next five years?

I'm going to take a six-month sabbatical to get refreshed on more modern research techniques and see if there are any commercialization opportunities. I still find the concept of targeting radiopharmaceuticals in vivo to cancer to be important. We published three papers in the last few months on being able to cure human lymphoma in animal models. About 25,000 people in the U.S. die of lymphoma each year. We have some next-generation agents I want to work on and try to move toward translation to humans. I'll also maintain my practice in nuclear medicine, so I expect to do clinical work and provide mentorship to some of our trainees.

What is something most people don't know about you?

I've taken a course on how to drive a Corvette competitively on a racetrack. It was at the Ron Fellows Performance Driving School outside of Las Vegas. Unfortunately, I wasn't competitive enough. The instructor had to get in the car to tell me to go faster and then stop faster.

Left: Speaking at the SNMMI 2022 Annual Meeting in Vancouver. Wahl served as the society's president from 2021-22.

"The explosion of women in leadership in radiology all happened during the years Rich was chair. He has truly developed a strong platform on which to create a generation of leaders in radiology who reflect the composition of the patients we serve."

Pamela K. Woodard, MD
Director, Mallinckrodt Institute of Radiology

"Dr. Wahl is one of the brightest radiologists I have come across. He is extremely hardworking, a great researcher and innovator, and a strategic businessman who made significant contributions to MIR and radiology."

Vamsi R. Narra, MD
Senior Vice Chair,
Clinical Imaging Informatics & New Business Development

"He was very supportive of clinical and research activities and enjoyed interacting with the residents. He expanded our research infrastructure, and NIH funding increased significantly during his time."

Farrokh Dehdashti, MD
Senior Vice Chair and Division Director, Nuclear Medicine

"He has an impressive grasp of the scientific potential in our recruits. I have changed my approach to assessing talent by watching him over the last nine years."

Robert C. McKinstry, MD, PhD
Senior Vice Chair and Division Director, Diagnostic Imaging

"I've been here since 1988 and so fortunate to have learned from giants in the radiological sciences, including the late Michel Ter-Pergossian and Michael Welch and, currently, Barry Siegel. I can now add Rich Wahl to that group."

Robert J. Gropler, MD
Senior Vice Chair and Division Director, Radiological Sciences

Alumni Spotlight

We recently caught up with three members of MIR's 2011 residency class: Calvin L.T. Barnes, MD, a musculoskeletal radiologist at Coastal Imaging and Globis: Global Imaging Solutions in Savannah; Jessica Porembka (née Huang), MD, associate professor of radiology at UT Southwestern Medical Center in Dallas; and Vilaas S. Shetty, MD, a neuroradiologist at Mercy in St. Louis. We talked about why they chose MIR, the impact it had on their careers, and what they're up to now.

Why did you choose MIR for your residency training?

Barnes: When I went to MIR for my interview, there was such a palpable warmth among the faculty, and I could tell they were trying to probe not just my intelligence, but my character. It was a singular experience, and my other radiology interviews paled in comparison. My choice was obvious.

Porembka: MIR was the best fit for me given the strong clinical training and mentorship. I also chose MIR for its commitment to excellence in all aspects of radiology, including the clinical mission, education and research.

Shetty: I was finishing up an internal medicine residency at Barnes-Jewish Hospital, so staying on was natural. I already knew that MIR was incredible, having ordered radiologic studies and procedures as an internal medicine resident and experienced the clinical product, and that I would come out well-trained.

How would you describe your time at MIR?

Porembka: The relationships I formed during my residency and fellowship have lasted through the years.

Shetty: They were some of the best years of my life. I loved everything about the experience: the people, the work, the great cases and the conferences.

Did any faculty members leave a particularly strong impression on you?

Barnes: A faculty member I think of often is Dr. Franz Wippold. No matter how many complex cases he read during the day, he would treat the last case as if it were the first, with a fresh mind (and wearing a bright, starched white coat daily!). I reflect on that often, and it drives me to make sure I am doing the same in my practice.

Porembka: Barbara Monsees, Cooky Menias and Sanjeev Bhalla. Barbara Monsees was one of the reasons I went into breast imaging.

What were some highlights about your specific residency class (Class of 2011)?

Barnes: The fondest memories of my co-residents are of board review. During that time, we really had a chance to hang out, share meals, talk about life and study like fiends. I was able to enjoy the sheer brilliance of my classmates and learn from our diversity in thought processes.

Shetty: Board review (it was oral boards back then) definitely stands out. Our class spent so much time together that you

Above: Barnes (right), pictured here with wife, Ramona, and son, Rumi, says MIR was the clear frontrunner during residency interviews.

Left: Porembka credits Barbara Monsees, MD, as one of the reasons she went into breast imaging.

really got to know everything about each other, especially what they were like under pressure. I spent so much time with my board review partners, Martin Reis and Srini Peddi, that they were like family.

In what way did your training at MIR prepare you for your career path?

Barnes: MIR didn't coddle residents. We often had more hands-on experience in procedures than fellows coming from different institutions. The days spent in those reading rooms and interventional suites built a mental fortitude that has been invaluable, and I am eternally grateful for the education I received.

Porembka: I did both my residency and breast imaging fellowship at MIR. The breast imaging training I received was top-notch. It prepared me to directly enter private practice and start a breast imaging program coming out of fellowship.

Shetty: The volume, variety of cases and autonomy are everything one would want in a residency program to become an accurate, independent and fast radiologist. My love of teaching, working with residents and aiding referring clinicians all came from my time at MIR.

What are some of your interests beyond radiology?

Barnes: I am a professional jazz musician and when I am not in the reading room, I am often playing on a stage somewhere in the Savannah/Hilton Head region, saxophone in tow.

Porembka: Traveling, spending time with family, hiking and reading.

Shetty: I like trying new foods and restaurants (I am part of a dinner group with a few faculty from MIR that have become close friends) and playing board games.

Top Left: Porembka and her family — husband, Matt, daughter, Lillian, and son, Christopher — enjoy spending their time traveling, as seen here on a recent trip to Alaska. **Top Right:** Shetty credits his love of teaching, working with residents and aiding referring clinicians to his time and experience at MIR. **Bottom Left:** Shetty says he formed strong bonds with his co-residents, such as Vincent Mellnick, MD, and Rex Parker, MD, pictured here at the 2016 American Society of Emergency Radiology meeting in San Francisco. **Bottom Right:** When not in the reading room, Barnes is a professional jazz musician who performs at events like the 2019 Savannah Jazz Festival (photo courtesy of The French Guy Photography).

Woodard Appointed MIR Director

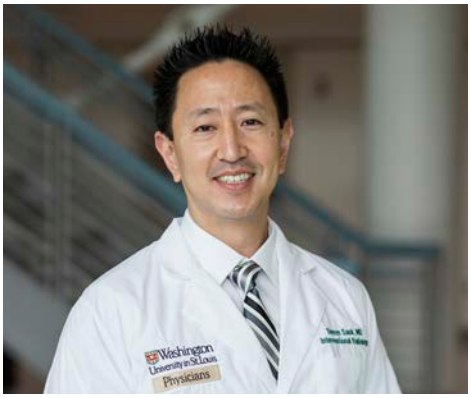
Pamela K. Woodard, MD, has been named the Elizabeth E. Mallinckrodt Professor and director of Mallinckrodt Institute of Radiology. In her new role as chair, she leverages her extensive research, clinical and leadership experience to helm the department.

An alumna of MIR's cardiothoracic imaging fellowship program, Woodard joined the faculty in 1997, rising to professor in 2009, and earned an endowed professorship in 2019. Also a professor of medicine, of pediatrics and of biomedical engineering, she was a principal investigator on a clinical trial that resulted in a landmark paper in The New England Journal of Medicine and established multidetector CT as the standard of care for diagnosing blood clots in the lungs. She conducted seminal research that led to the translation of cardiac MRI into clinical practice and led a team that developed a nanoparticle-based imaging agent for atherosclerotic plaques in blood vessels. Woodard is also involved in the translation of novel PET agents to assess blood flow through heart muscle.

Woodard's career at MIR encompasses numerous leadership roles, including senior vice chair and division director of radiological research facilities, head of the cardiac MRI/CT service line, director of the Center for Clinical Imaging Research, director of the research residency track, and director of the TOP-TIER program, a T32 clinician-scientist training program.

Woodard is a fellow of the American Association for the Advancement of Science, the American College of Radiology, and the American Institute for Medical and Biological Engineering, among others. She has been honored as an Academy of Radiology Research Distinguished Investigator and was named the 2021 Outstanding Researcher by the Radiological Society of North America.

Sauk Named Chief of Interventional Radiology



Steven C. Sauk, MD, assistant professor of radiology, has been named chief of interventional radiology. At MIR, Sauk has applied his experience in private practice and collaborates with vascular surgery as the IR liaison. He has also strengthened relationships with referring services, particularly within Missouri Baptist. A champion of patient-centered consultative interventional radiology, Sauk has had a major leadership role in establishing and growing the interventional radiology clinic.

Before he joined MIR in 2021, he served as an attending physician at Northwestern Lake Forest Memorial Hospital, where he treated venous and arterial disease. He developed new service lines such as advanced portal venous interventions, becoming a leader in vascular care.

Sauk earned his medical degree from UCLA David Geffen School of Medicine after completing his bachelor's and master's degrees in molecular biophysics and biochemistry from Yale University. An alumnus, he completed a diagnostic radiology residency and interventional radiology fellowship at MIR and served as chief resident.

New Hires

M. Hunter Lanier, MD, PhD
Assistant Professor of Radiology

Lisa B. Mogil, MD
Instructor in Radiology

Kushaljit Singh Sodhi, MD, PhD
Professor of Radiology

Kacie L. Steinbrecher, MD
Assistant Professor of Radiology

Christopher A. Swingle, DO
Assistant Professor of Radiology

Allan Thomas, PhD
Assistant Professor of Radiology

Reis Named Director of Diagnostic Radiology Residency Program

Martin N. Reis, MD, associate professor of radiology, has been named director of the diagnostic radiology residency program. Reis has served as program director for the neuroradiology fellowship since October 2021 and previously served as the director of residency education in neuroradiology during his time on the faculty at Saint Louis University.

As neuroradiology fellowship program director, Reis chaired the fellowship selection committee and the fellowship program evaluation committee. This has given him a national presence on the ASNR Neuroradiology Fellowship Directors Committee, which helps to set national guidelines for neuroradiology fellowship training.

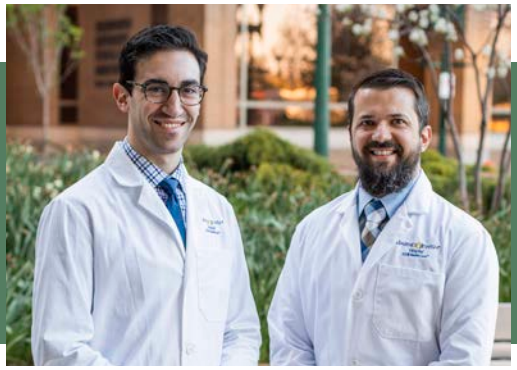
Reis is a member of several professional organizations, including the American Society of Neuroradiology and the Radiological Society of North America. An alumnus, he completed both a residency in diagnostic radiology and a neuroradiology fellowship at MIR. He earned his medical degree from Columbia University and a bachelor's degree from Princeton University.

MIR Chief Residents 2023-2024

From Left: Julio C. Marin Concha, MD (Nuclear Medicine); Daniel D. Friedman, MD; Ryan S. Hirschi, MD

IR Chief Residents 2023-2024

From Left: Dylan J. Assael, MD; Daniel A. Crawford, MD



Promotions

Nelly Friedrichsen (Joseph-Mathurin), PhD; Assistant Professor of Radiology

Matthew F. Glasser, MD, PhD
Assistant Professor of Radiology

John J. Lee, MD, PhD
Assistant Professor of Radiology

Honors/Awards

Hongyu An, PhD, professor of radiology, was named a fellow of the American Institute for Medical and Biological Engineering, among the highest professional distinctions awarded to medical and biological engineers. Members of the College of Fellows represent those who excel in medical and biological engineering, including accomplished leaders and innovators in academia, industry, education, clinical practice and government.

Sanjeev Bhalla, MD, professor of radiology, was honored with a Hero With a Heart Award from the Marfan Foundation. This award recognizes those whose work contributes to advancing care, research or awareness of Marfan syndrome and related aortic conditions.

Andrew J. Bierhals, MD; James R. Duncan, MD, PhD; Vamsi R. Narra, MD; and **Katie D. Vo, MD**; professors of radiology, received the 2023 Dean's Impact Award from Washington University School of Medicine in St. Louis. The award honors faculty whose superior effort represents the highest level of professionalism, innovation and compassion to help lead the medical community through unprecedented times in response to the COVID-19 pandemic.

FYI

Jack W. Jennings, MD, PhD, and **Cary L. Siegel, MD**, professors of radiology, have been named to the 2023 fellowship class of the American College of Radiology, one of the organization's highest honors. Fellowship is awarded to those who have demonstrated service, made significant strides in scientific or clinical research, contributed to literature and provided outstanding work as a radiology teacher.

Abhinav K. Jha, PhD, assistant professor of radiology, has received a five-year, $500,000 CAREER Award from the National Science Foundation. The award will fund his work developing new approaches to help process data from list-mode imaging systems.

Michelle M. Miller-Thomas, MD, associate professor of radiology, was honored with a Distinguished Service Teaching Award from the Office of Education at Washington University School of Medicine in St. Louis. She received the Creativity Distinguished Service Teaching Award for incorporating new and diverse methods of curricular content delivery.

Patrícia M. Ribeiro Pereira, PhD, assistant professor of radiology, received the Hal O'Brien Rising Star Award at the High Country Nuclear Medicine Conference for her outstanding leadership in nuclear medicine science. This award is given to junior faculty, postdocs and fellows who are performing exemplary work in radiopharmaceutical sciences or clinical applications and research.

ISP Retreat 2023

The annual Imaging Sciences Retreat, which was held in March, is hosted by the Imaging Sciences Pathway (ISP), a multidisciplinary fellowship program that trains students in the many different avenues of imaging science. The program is directed by Joseph P. Culver, PhD, the Sherwood Moore Professor of Radiology, who also co-directs the Imaging Sciences Doctoral Program. Joseph O'Sullivan, PhD, the Samuel C. Sachs Professor of Electrical Engineering, serves as ISP's co-director. Monica Shokeen, PhD, associate professor of radiology, and Song Hu, PhD, associate professor of biomedical engineering, direct the annual retreat.

Ashwin Singh Parihar, MD, instructor in radiology, received the President Award from the American College of Nuclear Medicine. This honor recognizes those who have served the college and have been a true asset to the president during the year.

Richard L. Wahl, MD, professor of Radiology, was honored with an Alumni Achievement Award from the Washington University Medical Center Alumni Association for his professional achievements and dedication to the university.

Hanwen Zhang, PhD, assistant professor of radiology, was honored with the inaugural Lalita and Mathew (Madhukar) Thakur Award from the Society of Nuclear Medicine and Molecular Imaging (SNMMI). This award is given for outstanding investigation in translational nuclear medicine and molecular imaging.

Grants

Adam Q. Bauer, PhD, associate professor of radiology, received a $461,226 grant from the National Institute of Neurological Disorders and Stroke. The project aims to examine how inhibitory and excitatory circuits influence functional recovery after stroke.

Kevin M. Bennett, PhD, associate professor of radiology, was awarded a $76,879 grant from the National Institute of Diabetes and Digestive and Kidney Diseases to fund his work developing and testing a new, safe tool to measure and map autoregulatory mechanisms of the kidney using MRI.

Daniel C. Castro, PhD, assistant professor of radiology, received a $541,561 grant from the National Institute of Mental Health. The goal of his project is to determine the computational and functional role of endogenous opioids in specific dorsal midbrain nuclei on motivated behaviors.

Aisling M. Chaney, PhD, assistant professor of radiology, received a $247,672 grant from the National Institute on Aging in hopes of revealing new insights into the complex neuroimmune interactions involved in Alzheimer's disease pathogenesis using novel molecular imaging and immune profiling techniques.

Nelly Friedrichsen (Joseph-Mathurin), PhD, assistant professor of radiology, was awarded a $94,049 grant from the National Institute on Aging. Her project aims to increase the collective knowledge on the contribution of vascular and immune components to the pathophysiology of autosomal dominant Alzheimer's disease.

Patrícia M. Ribeiro Pereira, PhD, assistant professor of radiology, received a $633,832 grant from the National Cancer Institute. Her research seeks to optimize a methodology of antibody-drug internalization to overcome drug resistance in HER2-positive and HER2-negative tumors.

Dmitriy A. Yablonskiy, PhD, professor of radiology, was awarded a $1,991,759 grant from the National Institute on Aging to establish an MRI-based technique (DLA-qGRE) as a platform for quantitative clinical evaluation of brain tissue microstructural neurodegeneration at the early preclinical stages of Alzheimer's disease.

MIR Hosts 2023 Grand Rounds Lectures

Grand rounds lectures are an invaluable resource for the MIR community and help educate across specialties and interest areas: emergency radiology; nuclear medicine; diversity, equity and inclusion; and more. Here are a few of the exceptional speakers that MIR was fortunate to host recently.

The Wendell G. Scott Memorial Lecture — hosted by the Office of the Chair — was presented by Hedvig Hricak, MD, PhD, the Carroll and Milton Petrie Endowed Chair of Radiology for Memorial Sloan Kettering Cancer Center and a professor for Gerstner Sloan Kettering Graduate School of Biomedical Sciences. The Daniel R. Biello Memorial Lecture — hosted by the nuclear medicine division, was presented virtually by Jeremie Calais, MD, director of the theranostics program and an associate professor of molecular and medical pharmacology for the University of California, Los Angeles. And the Hyman R. Senturia Memorial Lecture — hosted by emergency radiology — was presented by Jorge Soto, MD, chief of radiology at Boston Medical Center and professor of radiology and chair of the Department of Radiology at Chobanian & Avedisian School of Medicine.

For the DEI Grand Rounds, MIR's Office of Diversity, Equity and Justice welcomed Soto and Jinel Scott, MD, who explored health equity initiatives and provided valuable insight on creating more inclusive environments. Scott is an associate professor at SUNY Downstate Medical Center and chief quality officer at NYC Health + Hospitals/Kings County.

Below, clockwise from top left: a. Jeremie Calais, MD, presented "FAP-Targeted PET Imaging: Clinical Evidence and Pitfalls" on Wednesday, April 26. b. Hedvig Hricak, MD, PhD, presented "A Global Perspective on Oncologic Imaging: Why Should We Care?" on Thursday, Feb. 9. c. Jorge Soto, MD, presents "A Career in Academic Radiology: A Personal Story" on Thursday, May 25. d. Soto presented "Abdominal Trauma: Lessons Learned at the Workstation" on Friday, May 26. e. Jinel Scott, MD, presented "Nothing New Under the Sun: The Struggle for Health Equity" on Wednesday, May 17.



Christopher Moran, MD: Enthusiasm, Experience and Paying It Forward

by Kristin Rattini

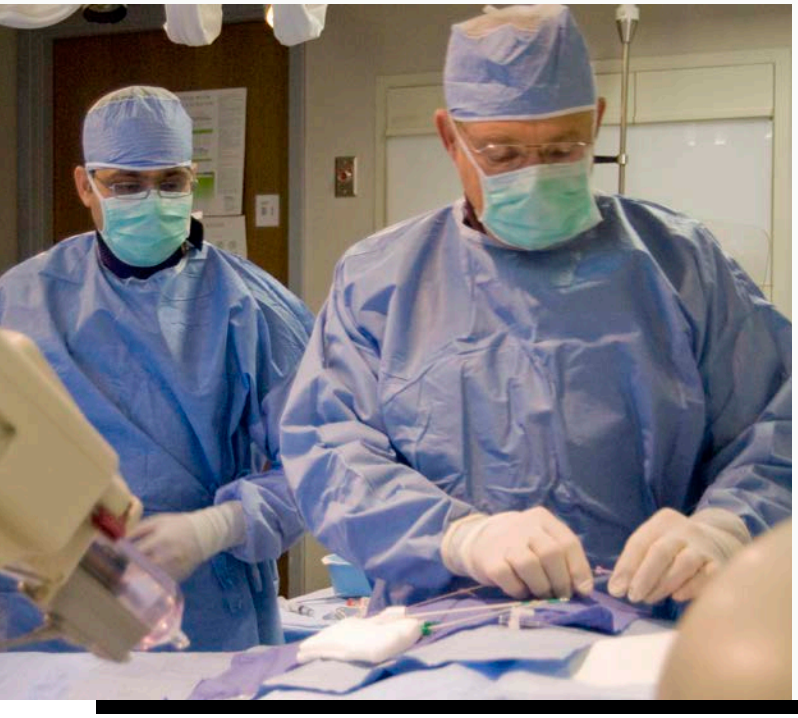
In 1978, after completing his residency and a neuroradiology fellowship at Mallinckrodt Institute of Radiology, Christopher J. Moran, MD, decided to stay and become a faculty member because he saw MIR as he saw himself: an enthusiastic early adopter of promising new technologies and techniques.

During his 45-year career, Moran has helped keep MIR on the cutting edge. He has published more than 175 peer-reviewed papers, earned seven patents, and developed a national reputation as a respected innovator and instructor of lifesaving neuroradiological interventions.

Seizing New Technological Opportunities

When Moran first joined faculty, MIR was a leader in head CTs and angiography, and home to one of the first six CT scanners in the U.S. Five years later, he earned two patents: one for cranial insertion of surgical needles using CTs, and another for creating a surgical guidance apparatus for use with a CT scanner. He honed his skills under the mentorship of Mokhtar Gado, MD, and Thomas Naidich, MD, whom he considers giants in neuroradiology.

"The leadership always let us innovate," he says. "And I like getting those things in my hand to test if they're as good, better or worse than someone else has claimed."



Left: Neurointerventional radiologist Christopher Moran, MD, in the angio suite on the 3rd floor of the MIR Tower in 2010.

In the late 1980s and early 1990s, Moran published several papers and earned two more patents for devices for conductive interstitial hyperthermia, which elevates the temperature of tumor tissue to damage and destroy cancer cells. In 1991, he was joined in the department by DeWitte Cross III, MD, who was there to establish an interventional neuroradiology (INR) service at MIR. Moran and Cross worked side-by-side until the latter's retirement in 2019. Together they helped develop a robust service that now has a faculty of five and, according to Moran, performs more neurointerventional radiology procedures than any other provider in St. Louis and the surrounding areas.

"Dr. Moran always had the enthusiasm of a teenager with the experience of a master," says Cross. "He was very focused on using the latest techniques, being up to date and doing everything he could for the patient."

A Respected Pioneer in Flow Diverters

Moran is especially known for his mastery of flow diverters for intercranial aneurysms. He was part of the landmark PUFS (Pipeline for Uncoilable or Failed Aneurysms) study, published in 2013 in Radiology, which proved the safety and efficacy of the pipeline embolization device (PED). "Previously, a lot of these aneurysms were impossible to treat. Now we had a means of treating them," he says. "The complications were lower and the occlusion rate was higher. Which is spectacular."

He quickly became the go-to expert on the device. He has since traveled to more than 200 medical facilities across the country to serve as a procedure trainer and proctor and has delivered countless lectures on the device.

In 2020, he was named a fellow of the Society of NeuroInterventional Surgery, the most prestigious honor granted to members in recognition of professional achievement in the field. And for the past 25 years, he has served as a scientific advisor for grants issued by the Radiological Society of North America research and education fund. "These grants primarily go to the young radiologists we're training," Moran says. "They're the future of the field."

Dedicated to Quality Improvement and Communication

Moran says that the innovative advances for which he is known can only be successful if patients can be admitted and treated in time. To that end, he has devoted time and effort to quality improvement, serving for a decade as chairman of MIR's Continuous Quality Improvement Committee.

He is particularly proud of a successful campaign to greatly reduce "door to needle" time, the time that elapses from when a patient arrives to when an intervention is started. In 2017, those standardization efforts won the Team Award for Quality for Barnes-Jewish Hospital's Endovascular Acute Stroke Committee.

Quality improvement rests, in part, on good communication between colleagues within and beyond your own service, Moran says. Since 2003, he has held a dual appointment as a professor of neurological surgery at the School of Medicine.

"He saw that it was critical and important to build relationships with other services," Cross says. "He has always been very good at talking with other specialists about the best approach for a patient and then following up and keeping tabs on the patient afterward."

Four Decades of Growth and Dedication

MIR has grown and advanced tremendously over the four-plus decades that Moran has been on faculty. As technology has leapfrogged, he has been there for every hop forward. And as the numbers of residents and fellows have nearly tripled since his class, he has been happy to pass down his institutional knowledge to them.

"I particularly enjoy working one-on-one with residents who are extremely thirsty for knowledge," he says. "I love slaking that thirst and sharing with them all that I learned from those who came before me at MIR."

Right, Top: Moran graced the cover of Focal Spot in 2003.

Right, Bottom: In 2020, Moran was named a fellow of the Society of NeuroInterventional Surgery.

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On June 14, MIR faculty and trainees assembled for the annual House Staff photo shoot.